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.')

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VOL. IX.

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.

1842.

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

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We are directed by Mr. Blyth to notice an error in Plate V., Vol. VII., where the name *Ovis Burrhel* is attached to the figure of *Ovis Nahoor*, and *vice versâ*.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

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

No. 55. MARCH 1842.

I.—*Organographic and Physiologic Sketch of the Class Fungi,* by C. Montagne, D.M. *Extracted from* 'Histoire physique, politique et naturelle de l'île de Cuba,' par M. Ramon de la Sagra, *and translated and illustrated with short notes by the* Rev. M. J. Berkeley, M.A., F.L.S.

THE class Fungi is without doubt one of the largest of the vegetable kingdom, and the study of the productions of which it is composed is one of the most difficult in botany, whether on account of the infinitely varied forms and disguises which they assume, their small size requiring the aid of the microscope, or their obscure place of growth.

Neglected by the older botanists, Fungi began to attract attention only towards the commencement of the last century. It is to the immortal Micheli that we owe the first just notions upon these vegetables; it is he who first made known the sporidia of Agarics, of which some modern mycologists claim the discovery, and those other organs which many, even at the present time, regard with Bulliard as real anthers, but to which he assigned other functions. For him again was reserved the honour of placing beyond doubt the reproduction of these plants by seeds or sporidia, which the greater number of botanists before his days believed to be the result of the decomposition of organized bodies, or of a spontaneous or equivocal generation. Gleditsch and Batarra followed, though at a distance, his footsteps, and fully confirmed his observations. Bulliard not only recognised the fact, previously announced by Micheli, that the sporidia of Agarics and Boleti are naked or exogenous, but he was the first to conjecture that these organs, which the illustrious Florentine regarded as destined simply to keep the gills separate, were in fact equivalent to the stamens of higher plants. The very limited number of species known at that time did not require a great degree of perfection in the mode of classification.

But mycology soon increased to such an extent as to require some one to arrange its riches, and render them easily accessible. Persoon, a man of sound judgement and great talent for observation, accomplished with success the arduous task, in publishing in 1801 his excellent Synopsis, entitled by Fries 'opus aureum,' in which are arranged with peculiar tact all the species of Fungi then known. Link, in his new arrangement of the *Gymnomycetes*, and Nees von Esenbeck, in his 'System der Pilzen und Schwämme,' made valuable contributions to systematic mycology. Fries, the last in point of time, but in my opinion the greatest of all, who has passed half his life in the midst of forests, tracing the different phases of evolution of these frequently ephemeral productions, Fries, the worthy successor of Linnæus, has also made various and important emendations of the natural method of the illustrious Nees von Esenbeck. If he is not altogether irreproachable, especially as regards details of intimate structure, which demand imperatively the aid of good microscopes, and considerable skill in their use, not to mention the fact, that when his system was published the modern improvements had not been made, what mycologist will dare to compete with him in loftiness of conception, immense learning, and especially in that genius which all his works exhibit, but more peculiarly his arrangement of the genus *Agaricus*, in the 'Systema Mycologicum?' an arrangement perhaps more philosophic, certainly more calculated to lead to the determination of the species of this difficult genus, than the new method adopted by him in the 'Epicrisis.'

As it is not my intention to give a history of mycology, I must confine myself to a few words. I cannot therefore review the works of those who have contributed to its progress by local floras, monographs, or organographic, physiologic, or medical remarks on Fungi. To enable the student, however, to have recourse to the fountain-head, and to consult the different materials scattered in scientific journals, or particular treatises which have appeared since the time of Persoon, I shall give as complete a list as possible of the most important works relating to this interesting class, reserving to myself the power of showing, in the general remarks which follow, the honourable rank which each has acquired by his labours*.

Fungi then are agamous vegetables, formed of variously-shaped cells, destitute of epidermis, and consequently of stomata. They consist of a vegetative system (*mycelium*), formed of elongated, simple, or articulated filaments, concealed within the matrix, or creeping and expanded over its surface, from which, according to the different degrees of complication of the fungus, arise extremely varied forms of fructification. The modifications which the fruit receives, either from the mode of evolution of the mycelium, or from the stage at which it is arrested, are such, that we may readily consider as very distinct families the six natural divisions generally established in this class.

* I shall confine myself here to indicating the sources from which a more or less complete knowledge may be derived of the structure, functions, nomenclature and classification of Fungi, without omitting those which relate to their useful or noxious qualities. In strict justice I ought to commence with Micheli, but I shall begin at a much more recent period.

Bulliard, Hist. des Champign. de la France, 5 vol. 4to, Paris, 1791.—Paulet, Traité des Champ., 2 vol. 4to, Paris, 1793.—Sowerby, Eng. Fungi, 3 vol. fol. Lond. 1799.—Persoon, Synops. Meth. Fungorum, Gott. 1801, 8vo. Traité Champign. comest., 8vo, Paris, 1819. Mycol. Europ., tom. i. ii. iii. 8vo, Erlang. 1822—1828, not completed.—Link in Berl. Mag. 1809—1815, and in Spec. Plantar. Linn. ed. Willd., tom. v. vi.—Nees von Esenbeck, Das system der Pilzen und Schwämme, 4to, Nurenb. 1817.—Fries, Syst. Mycol., 3 vol. 8vo. Gryphiswald, 1821—1829.—Syst. Orb. Veget., 8vo, Lund. 1825. Elenchus Fungorum, 8vo, 2 vol. Gryphisw. 1828. Eclog. Fung. in Linnæa, t. v. Epicrisis, seu Synopsis Hymenomyc., 8vo, Upsal, 1836—1838.—Adolphe Brongniart, Classif. nouv. des Champ. in Dict. class. hist. nat., tom. v. p. 155, &c.—Trattinick, Die Essbare Schwämme Œsterreichs, Wien, 1830, 8vo (2nd edit.).—Vittadini, Monographia Tuberacearum, Mediol. 1831, 4to.—Krombholz, Naturgetreue Abbild. der Essbaren schädlichen und verdächt. Schwämme, Prag. 1831.—Roques, Hist. des Champ. comest. et vénén., 4to, Paris, 1832.—Unger, Die Exantheme der Pflanzen, Wien, 1833, 8vo, and Ann. Sc. Nat., 2 série, tom. ii. p. 193.—Secretan, Mycog. Suisse, 8vo, 3 vol. Genève, 1833.—Dutrochet, Obs. sur les Champ., Ac. des Sc. Paris, March 3, 1834.—Klotzsch in Dietrich's Flor. Reg. Bor., 8vo, Berol. 1834.—Corda sur les Anthères de Micheli dans les Champ. charnus, Flora 1834, p. 113–116. Sur les Fibres Spirales des Trichiacées, l. c. 1838, p. 419. Ic. Fung., tom. i.–iv. fol. Prag. 1837–40.—Berkeley, Fungi in Hook. Eng. Fl., tom. v. p. 2. Lond. 1836, 8vo. On the Fructif. of the Pileate and Clavate tribes, &c., Ann. of Nat. Hist. i. On the Fructification of Phallus, Lycoperdon, &c., Ann. of Nat. Hist., translated by the author in Annales des Sciences Nat., 2 sér. tome xii. p. 160.—Léveillé, Rech. sur l'Hym. des Champ., l. c. t. viii. p. 321. Recherches sur les Urédinées, l. c. t. xi. p. 5.—Trog sur la Végétation Fongique, Flora 1837, p. 609.—Philippar, Traité organ. sur la Carie et la Charbon, &c. 8vo, Versailles, 1837.

[To which I must add, Sturm's Deutschl. Fl., 3te Abth.—Ehrenberg in Nov. Act. Nat. Cur., tom. x. pars i. 1821; the excellent treatise just published in Ann. d. Sc. Nat. by Tulasne on Elaphomyces, and Montagne passim in Ann. Sc. Nat.—M. J. B.]

These are, commencing with the most simple,

1. *Coniomycetes*; 2. *Hyphomycetes*; 3. *Gasteromycetes*; 4. *Pyrenomycetes*; 5. *Discomycetes*; 6. *Hymenomycetes*.

The 3rd, 4th and 5th of these families have the fructification concentric or included (*Fungi involuti*); the remaining three eccentric or naked (*Fungi evoluti*). Fries gives the name of *Cryptomycetes* to the two first, reserving that of *Phaneromycetes* to the four last families.

Coniomycetes, Nees von Esenbeck.

The fungi of this group were, for the most part, known to the earlier botanists, who regarded them as mere exanthemata. Divided into Epiphytes and Entophytes, according as they are produced upon or beneath the cuticle of vegetables, their origin and nature are still matter of dispute. Some modern naturalists, and amongst them Unger, who has written a treatise on the subject, hold, as regards the latter, that they arise from a pathologic affection of the vegetable itself, or of the respiratory organs. More recent works, however, especially that of Léveillé upon *Uredines,* have successfully combated these two opinions. M. Corda, who had formerly contended for the German notions, has lately proved, in an admirable analysis of *Puccinia graminis* (Ic. Fung. iv. t. 3. f. 37.), that the sporidia, far from being a disease of the utricles, spring clearly from a mycelium whose threads are figured as scattered amongst the intercellular passages of the leaf. Even before these works of Léveillé and Corda, I had published a fact (Prodr. Fl. Fernand., Ann. Sc. Nat., 2 sér. tom. iii. p. 256) which appeared to me decisive on the point, viz. the presence on the same leaf of an *Æcidium* and *Uredo*; and, what is more conclusive, M. Corda has seen* *Pucc. graminis* and *Cæoma linearis* united in the same stroma.

In the species of this numerous family, the vegetative system is filamentous or cellular. In the first case, the mass of filaments of which it is formed is called *hypothallus, hyphasma,* or simply *flocci.* These threads are usually articulated, much branched, and entangled. In the second case it is called *stroma* or *hypostroma.* This is sometimes discoid as in *Tuberculariæ,* sometimes nucleiform and cellular, bearing the spores on its surface. Sometimes the sporidia spring from very short threads (*flocci spurii*), scarcely capable of being regarded as a hypothallus. The mycelium, by its metamorphosis into spores, sometimes forms the whole plant, or it is so obliterated that the least trace is not visible, in which case it is probable that a mucilaginous medium has served as a matrix for the spores, as is the case in the parallel series of *Phyceæ.* Lastly, in more highly developed forms, the mycelium produces a cellulo-membranous pouch†,

* Philippar, however, is of opinion that these two species are identical. *Uredo rubigo vera* is certainly only a form of *Puccinia graminis.* See Henslow's Report on the diseases of wheat, 1840; and a paper on the specific identity of the fungi producing rust and mildew. Journal of Roy. Ag. Soc., vol. ii. part ii. 1841.—M. J. B.

† Corda refers these to his *Myelomycetes,*= in part *Gasteromycetes,* Fr.

which has been called *peridium* or *pseudo-peridium*, from the base of which spring sporidia in moniliform rows, as in *Peridermium*, *Æcidium*, *Endophyllum*.

The fungi of this order are, as stated above, Epiphytes or Entophytes. The former, which grow on dead vegetables, are frequently at first concealed under the epidermis, or amongst the woody fibres which they burst or displace in order to continue their morphosis externally. The Entophytes (*Hypodermii*, Fr.) pass through all the phases of their development* under the thin bark of trees, or under the epidermis of living or dead leaves, or of herbaceous stems. It is only at the moment of the dispersion of the spores, or a little before this epoch, that, rupturing the raised and distended cuticle which covers them, they are exposed to the light, and receive from atmospheric influences the completion of their development. Whatever be the nature of the mycelium, its regular and normal morphosis ends always in the production of the spores, the only aim of nature in the formation of these singular productions, which have been compared, and not without reason, to the Entozoa or intestinal worms of animals.

The sporidia, whether they arise from the metamorphosis of the threads of the mycelium, or derive their origin from the matrix on which they are produced, become at length free. Their forms are numberless; they are simple or articulate, that is to say, formed of a single cell (*Uredo*), or several placed end to end (*Puccinia*, *Phragmidium*), or more rarely side by side in the same plane (*Triphragmium*), constantly deprived of a common envelope (Corda, *l. c.* p. 10). The sporidia, whether sessile or borne by a peduncle (*hypopodium*, Corda), and consisting of one or more cells, are, as regards each cell, formed of a simple membrane (*episporium simplex*), as in *Uredo*, or double (*episporium duplex*), as in *Puccinia*. In the latter case, the two coats of unequal thickness which constitute the episporium are so intimately united, that it is impossible to separate them; the outer is called *exosporium*, the inner *endosporium*. The episporium is smooth, wrinkled, warty, hispid, &c., and encloses the nucleus in its cavity. This, according to Corda, consists of a gelatinous fluid, in which are suspended a few oily globules, and in which swim some granules, endowed, during the life of the plant, with molecular motion, but which, as it approaches maturity, have a tendency to become concrete.

It is superfluous to add, that it is upon the infinite variety of forms assumed by the sporidia and mycelium that the perhaps too numerous genera of this family are founded. In this respect I am of Fries's opinion, who says, *Inter hypodermios maximam partem* (Coniomycetum) *efficientes, typos nosse sufficiat, nisi singulorum mutationibus in singulis plantis observandis vitam velimus dicare* (Syst. Myc. iii. p. 457).

* Professor Henslow, who has lately paid great attention to the subject, has satisfied himself that *Aregma* and *Triphragmium* are a more highly developed state of certain so-called *Uredines*. This too is probably the case with *Xenodochus*. I am myself convinced that many of the brown *Uredines* are merely an early stage of growth of certain *Pucciniæ*.—M. J. B.

The *Coniomycetes*, which are real parasites, grow on dead or living vegetables; in the latter case they attack in preference herbaceous plants, and rather the leaves than the stems, or the reproductive organs, which unfortunately are not always exempt from their ravages. It is in this class that the most injurious fungi are found, producing rust, bunt, mildew, &c.*, the scourge of farmers. It is not my intention to describe these here. It is among plants of this family that we observe that method of reproduction by division † ("tomipare"), which we shall again notice in the following family. With regard to the mode of generation and propagation of *Coniomycetes*, I shall make some observations in the general remarks on the class.

Hyphomycetes, N. von E.

This family is not distinguished from the foregoing ‡ merely by the presence of a vegetative system, as Fries supposes, for we have just seen that a great number of *Coniomycetes* possess one. We must then look for the difference in a higher degree of development, in a more complicated structure, and especially in the free evolution of the mycelium and sporidia.

It is divided into two grand sections, characterized by a filamentous stroma, but which differ in this, that in the one the sporidia are naked or merely clothed with the same coat as the matrix, while in the other they are at first contained in a sort of peridium, formed by the swelling of the end of the filaments, from which they escape when mature.

The mycelium, though always free, is not alike in both these sections. In the first its filaments form a sort of floccose stroma on which the sporidia are fixed, or rather in the midst of which they are dispersed; these filaments are called *flocci*.

In *Sporotrichaceæ* § all the filaments recline upon the matrix, and the spores, scattered amongst them, are in some degree covered by them, as by a veil, an organ which we shall find more decided in *Phaneromycetes*. Here then the mycelium is confused with the fertile or spore-bearing threads, or rather the whole plant consists of mycelium. But in the *Botrytideæ* these filaments are of two kinds; the one erect and fertile (*flocci fertiles*), the other barren, reclining on the matrix (*hyphasma* or *hypopodium*). These may be regarded as the vegetative system, from whence spring the former,

* It is curious, that in England, rust, though often extremely abundant, is seldom considered injurious, except perhaps to some of the new wheats, though it appears to be very destructive in France. See Henslow, *l. c.*—M. J. B.

† Compare the observations of Mohl and others on the formation of cells. —M. J. B.

‡ It would be better perhaps to place this family first, at least if we adopt a circular or reticulate system. There would then be a natural transition on the one side to *Hymenomycetes* through *Isaria*, and on the other to some of the more obscure *Pyrenomycetes* through *Stilbospora*, &c. This is of course on the supposition that *Gasteromycetes* be entirely reviewed.—M. J. B.

§ It is however to be remarked, that most species of *Sporotrichum* are spurious. *Trichothecium roseum* is in reality a *Dactylium*, &c.—M. J. B.

which bear the fruit. It is amongst the barren filaments that the granules called *conidia* occur, analogous to the *gonidia* of Lichens, and which must be cautiously distinguished from true sporidia*. In proportion as the structure is more complex, these filaments, erect or decumbent, which were at first free, or only more or less loosely interwoven, are closely united, especially at the base, so as to form a stem-shaped stroma, the extremity of which, at a greater or less distance, supports the sporidia. We see this disposition in the genera *Coremium* and *Isaria*†, which M. Corda refers to *Hymenomycetes*.

In the second section, composed of *Mucorinæ*, the erect tubular filaments, whether springing or not from a mycelium or decumbent threads, swell at their free extremity into a vesicle. By observations which throw a brilliant light on the morphosis of these plants, Corda (Ic. Fung. ii. p. 19. t. 11. f. 75.) has proved that the vesicle or sporangium, at first in connexion with the cavity of the stem, is soon separated by a columella or septum which is hemispherical, campaniform, &c., of which he has been able to follow the development, and upon which the spores, most frequently united like necklaces, acquire at length the degree of development necessary for the reproduction of the species ‡. This vesicle, which is termed *peridiolum*, opens regularly or irregularly.

In two genera (*Pilobolus* and *Chordostylium*), analogous forms to which we shall find in the *Gasteromycetes*, the peridium separates entire from the summit of the simple filament which bears it, and is thrown to a distance by an elastic force. Persoon and Corda, perhaps with reason, place them in the following family.

The fertile filaments of *Hyphomycetes*, extremely variable in their form, are simple or branched, continuous or articulate, hyaline or dusky, &c. Their mode of ramification varies with the species and genera; it is dichotomous, verticillate, virgate, &c. Indehiscent, and in themselves generally colourless and pellucid, they owe their various hues to the juices which they contain.

In *Dematiæ*, the fertile filaments, besides being usually destitute of mycelium, or having one of a crustaceous nature, are remarkable for their rigidity, and their olive, dingy or black hue; they are septate, and bear sporidia adhering to the sides or tips of the threads

* They often abound in the mycelia of *Hymenomycetes*, which are in consequence described as *Sporotricha*.—M. J. B.

† As regards the first at least, Corda's notion is quite untenable, for it is more than doubtful whether its species be not mere modifications of *Penicillia*. *Isaria* most beautifully unites *Hymenomycetes* with *Hyphomycetes* through *Typhula*.—M. J. B.

‡ On the strength of these observations, Corda has separated from true *Hyphomycetes* this second section, in order to unite it to the following family, changing its name into *Myelomycetes*. Ought we however to place more reliance on the presence of a peridiolum than on the filamentous structure and mode of vegetation? The same might be said of *Æcidium*, at present included in the foregoing family, and of which the same naturalist, in consequence of the presence of a peridium, has likewise changed the place in the system.

and their branches; they are usually termed fibres (*fibræ*). We still observe in them reproduction by division; that is to say, in *Cladosporium*, for example, the septate extremity of the principal filament or branch is changed into sporidia which separate from it and fall successively.

The sporidia are simple or compound. The first are formed of a single hyaline membrane (*episporium*), sometimes marked with a hilum, and always containing a sporaceous, variously coloured mass, which is termed *nucleus*. They enclose also, though more rarely, granules which have been considered as sporidiola*. Though frequently isolated, they are sometimes heaped about the tips or sides of the filaments which support them. At other times, they form, as it were, necklaces whose grains are either contiguous, or separated by a connecting band (*desmos*) interposed between each of them. The compound sporidia are observed only in *Dematiæ*, where, according to Corda, they present the same structure as that which I described after him in the spores of *Puccinia*. As to general form, they are spherical, ovoid, oblong, elliptic, reni-, pyri-, or clavi-form. They are smooth, angular, scabrous, wrinkled, papillary, rough, with hairs or prickles. Their colour is extremely variable, with the exception of deep green and blue†.

In the greater number of the species of this family, the sporidia originate clearly from the granular sporaceous mass, suspended in a viscid or watery fluid which circulates in the tubes of the continuous filaments. Fries has seen an ascending current in the fluid of *Ascophora Mucedo*. I have confirmed the fact in my experiments on Muscardine, without being able to decide whether this motion be vital or molecular. But at the same epoch I have certainly seen in *Botrytis Bassiana* the sporidia, or globular cells which did not seem to differ from them, rise incessantly in the tube, from the base to the summit of the filament, at the time when the reproductive bodies are formed, that is to say, the second day from the evolution of the flocci on the outside of the body of the silk-worm. But whatever be the mode of formation of the sporidia in this family, their morphosis or evolution is not the same in both the sections. In the one they issue, or appear to issue, from the extremity of the filament, and are grouped after a peculiar manner predestined for each genus and species. In the *Sporotrichaceæ* they are free and dispersed among the filaments; in *Isariæ* they are acrogenous, or adnate on the summit of a branch; in *Botrytideæ* united usually in spherical heads of greater or less size, around the tip of the principal thread or its branches. This grouping takes place successively, as I have convinced myself in tracing from hour to hour the evolution of *Botrytis*

* It is probable that they are not, properly speaking, sporidiola, at least if we may judge by what takes place in the germination of compound sporidia of the fourth family, where a shoot is given off *opposite* to each globule. See Mont., Ann. Sc. Nat., t. xiv. pl.19. fig. 6 *i*; and Berk., Ann. of Nat. Hist., vol. vi. tab. xi. fig. 8 *b*.—M. J. B.

† The nearest approach is in *Phycomyces nitens* and the Brazilian *Mucor virens* and *cyanocephalus*.—M. J. B.

Bassiana. My belief was, that the spores, formed in the tube of the principal filaments or branches, issued from their tips, carrying before them the extremity of the thread like a cul-de-sac, which formed their second coat or episporium, and in the end adhered at the point of their passage*. In some genera, instead of being grouped in this manner in more or less fertile heads, the sporidia (*moniliformiter concatenata*) form necklaces which crown the digitate, fasciculate, or verticillate branches of the plant (*e. g. Penicillium, Aspergillus*, &c.). In the genus *Torula*, these same chains or necklaces of sporidia constitute almost all the fungus, and *Oidium* is formed of filaments which are changed almost completely into spores.

In *Mucorinæ* this morphosis takes place in quite a different way. It is between the kind of columella with which we have seen most of the species are furnished, and the peridiolum which arises from the dilatation of the tip of the filament, that the sporaceous mass, accumulated at first by the ascent of the juices, passes successively through a multitude of changes, extremely well indicated by Corda (Ic. Fung. ii. p. 19), before arriving at the state of spores, and acquiring their perfect maturity†.

We must not forget that the sporidia of *Mucedines* are capable of being developed in liquids, and giving rise to confervoid productions which have often been taken for Algæ‡. They show the analogy, or, as it were, the link between these productions; but they are easily distinguished by the absence of all fructification so long as they remain submerged; it is only when they reach the surface of the liquid that the evolution of the spores can take place. The genus *Leptomitus* and many others offer examples of these barren mycelia; they are, as regards liquids, what the genera *Hypha, Himantia, Byssus*, &c., are to places deprived of light. A multitude of species in the work of Biasoletti (Di alc. Alg. Microsc., Trieste, 1832) have no better origin. I believe that the same may be said of the transformation of the globules of milk into *Penicillium glaucum* §.

* This is perhaps one of the most important questions in the physiology of Fungi. If the learned author himself has not leisure to repeat his observations, which unfortunately I know to be the case, it is greatly to be wished that some competent and unprejudiced naturalist would undertake the task. In *Hymenomycetes* the spores are gradually produced at the tips of the spicules, and certainly are not developed within the threads; and this is the case with *Botrytis parasitica* and its allies. I am not aware that the memoir itself has ever been published. The only account I have seen of it is in 'Comptes Rendus.'—M. J. B.

† It is necessary to mention that the author is not responsible for the correctness of statements like the present. They are given on the faith of the respective authors, it being impossible to verify every observation.

‡ Schimper imagines that the greater part of freshwater Confervæ originate from an analogous cause, viz. the anormal development of the sporules of Mosses; and that each species of moss corresponds to a species of conferva, &c. See Soc. Hist. Nat. Strasb., 3 December 1833.

§ Consult on this subject, Fries, Syst. Orb. Veg., p. 42.—Dutrochet sur l'origine des Moisissures, Ann. Sc. Nat., 2 sér. tom. i. p. 30, &c.—Berkeley on a conferv. state of *Mucor clavatus* in Mag. of Zool. and Bot., tom. ii. p. 351, and Meyen's remarks on this paper in his Jahresberichte.

There is still a remarkable fact which we must not omit. *Thamnidium elegans*, Lk. (*Ascophora elegans*, Corda, Ic. Fung., iii. p. 14. t. 2. f. 43.) has presented to Corda two sorts of fructification*, as is the case with all other agamous plants. The verticillate ramuli are terminated by reproductive gemmæ, while the main thread is tipped by a true sporigerous peridiolum.

The little plants which form this family are worthy of the greatest attention, especially in a physiological point of view. They are not less capable of exciting in the highest degree the curiosity of the naturalist, whose pleasure it is to contemplate the wonders of creation. If they less attract the vulgar eye, it is because without the microscope to it they scarcely exist. What a new world do we owe then to this instrument! The *Mucedines*, for example, which rival in elegance some of our prettiest articulated hydrophytes, form sometimes in the space of a square inch an immense forest of trees from one to two lines high, varied, but always elegant in their ramification, bearing at the extremities of their whorled, umbellate, or panicled branches, bunches or heads of seed producing the most exquisite effect. Sometimes they are less branched, and have their uncinate, clavate, umbellate or shrubby tips loaded with fruit. Nature, in compensation for their brief existence, reproduces them everywhere, so that it is always easy to find individuals for examination.

The *Hyphomycetes* grow on vegetable or animal substances in the course of decomposition†. In general they are not difficult in their choice, though some species are confined to particular habitats. The most common of all, *Penicillium glaucum*, grows on all sorts of substances, and in all latitudes.

On the one side the *Hyphomycetes* approach the *Coniomycetes*, the lower individuals in the series differing only in the free development of their *hyphasma*; on the other side they touch upon the *Gasteromycetes*, by those *Mucorini* which have a separable peridium, (*e. g. Pilobolus*). Fries compares them to his *Ulvaceæ* (Fl. Scan. p. 357), our subfamily *Zoospermæ*, and remarks that, like these, they have both their inarticulate and septate representatives.

In the two families which I have just examined, the individuals of which have little use in the œconomy of nature, except to hasten the decomposition of animal and vegetable substances, or to furnish nutriment for a multitude of insects, the threads at the extremity of which the sporidia grow may be called *erecto-divergent*; in the following families these same filaments, variously woven and entangled, end always, except in the *Pyrenomycetes*, in becoming *erecto-convergent*.

[To be continued.]

* Something of the kind is exhibited by *Ag. racemosus*. The lateral heads have the structure of *Stilbum*.—M. J. B.

† An account has lately been published in Ann. Sc. Nat. 1841, of a mould developed in the stomach of a living bird. A fact of the same kind has been described before, in Dr. Valentin's Repertorium für Anatomie und Physiologie, bd. 1. 1836.—M. J. B.

II.—*On* Hirudo geometra, *Linn., and some other species of British Freshwater Leeches.* By T. Brightwell of Norwich, F.L.S.

Early in March of the present year (1841), about twenty specimens of a small leech were taken from the back fin of a roach caught in the river Wensum. They agreed generically with the characters given by Savigny of his genus *Hæmocharis*, viz. body cylindrical, composed of indistinct articulations, terminated by large flattish circular* discs or suckers; head without any toothed tubercles; eyes four.

These leeches were from one to two inches long, slender, cylindrical, diminishing in size from the tail to the head; anterior disc or sucker smaller than the posterior; colour light brown, with broken rings of a darker colour; posterior disc with eight or nine small dark spots and brown longitudinal streaks. These characters are nearly those of *H. piscium* or *geometra* of authors, the only described species of this genus.

These leeches being placed with a gudgeon in water, instantly attached themselves to the edge of the fins or lip, and remained fixed some days. Being placed by themselves in a glass vessel, and having fresh water put to them every morning, several instances of sexual connexion were observed to take place immediately after the fresh water was added, one of the leeches suddenly twisting itself round the neck of another, and closing upon a longitudinal opening which at this time was very conspicuous in the neck of each. During this union a white substance could be perceived on each side of the part where the bodies were connected. They continued united generally several hours, and in one case during the whole day. When the leeches separated, a white filmy substance was detached from the parts where they had been united, which in one case had the appearance of an egg, but from subsequent observation was found to be part of the film in which the eggs are enveloped.

Within twenty-four hours after the union took place eggs were deposited, and were found firmly attached to the sides of the glass vessel. By an experiment made with a pair which were kept separate for that purpose, twelve eggs were found to proceed from two individuals. These eggs were semitransparent, of a reddish brown colour, oblong-oval, with one end truncated; they were covered with a white filmy web-like secretion, and had longitudinal elevated ridges on the sides. The shells of the eggs were found, on dissection, to be extremely hard.

* Oblique is the character given by Savigny.

On the thirtieth day after the eggs were deposited the first young leech made its appearance. Each egg produced only one leech—this was ascertained by detaching an egg and keeping it in a glass by itself, when one leech only proceeded from it. The young leeches were the size of a small thread, about one-third of an inch long, and appeared perfectly formed; the brown annular markings of the body, the longitudinal lines upon the posterior disc, and the four eyes in the anterior disc or sucker being clearly visible. They were very active and vigorous, and exceedingly beautiful little animals.

One of the young leeches being placed in a small cup of water with a tadpole, instantly fixed itself to the edge of the tadpole's tail, and remained so for some hours; but several tadpoles being placed in the vessel where the young leeches were, they had all disappeared on the following morning, the tadpoles having probably devoured them. The adult leeches all became faint and died, a few days after they had deposited their eggs.

These leeches were rarely, if ever, observed to move in the geometrical manner which is described by Linnæus and others, and from which character the trivial name *geometra* was given to them. Our species all moved in the same manner as the common medicinal leech, and often swam about in the undulating manner of that species. Both the young and the old ones also, frequently, after attaching themselves firmly by the posterior disc only, assumed a rigid appearance, and flung their bodies about as if eagerly seeking some object to fix themselves to, which they did, if any object presented itself, in a moment, and were very difficult to detach.

Cuvier (or rather Latreille), 'Règne Animal,' vol. v. p. 215, describes the genus *Hæmocharis* as *never swimming*; but if our species be of this genus, this must be incorrect. M. de Blainville seems of opinion that the *Hirudo cephalotes* of Carena is of this genus; but this species is not only described as *never swimming*, but also as *viviparous*; characters which will not agree with our species, and from which those in Cuvier and other authors may probably have been taken.

The figure given of *H. geometra* in the 'Encyclopédie Méthodique,' pl. 51. fig. 12—19, which professes to be copied from Rösel, differs much from our species both in the form of the discs or suckers, the situation of the eyes, and the markings.

We add a few general observations on the freshwater leeches occurring in our neighbourhood, *Hæmopsis sanguisorba* (Sav.), the common horse-leech. This species is common in our ponds and ditches. We have not been able to determine whether it be oviparous or not, though there is little doubt of its being so. We have found its young, in an early stage, in the same places as the adult, but never adhering to the parent. We have in our possession a singular variety of this species, which has the posterior part and a large spot on the abdomen of a pale flesh-colour.

Sanguisuga medicinalis (Sav.), the medicinal leech. This species is occasionally found in our neighbourhood, but is by no means common. A dealer in leeches, residing in Norwich, keeps a stock of about 50,000 leeches in two large tanks of water, floored with soft clay, in which the leeches burrow. On examining these tanks we found many capsules or ova deposits of the leech, which the owner (ignorant of their nature) stated to be, at times, very numerous, but which he had neglected and generally destroyed. The Austrian variety he keeps in a separate tank, as he says it destroys the others.

Nephelis vulgaris (Sav.). This species abounds in all our fresh waters, and the brown capsules containing its ova may constantly be found on the underside of the leaves of water plants among the ova of the freshwater helices. We have kept several of this species through the summer, and the following are our notes as to the deposit of the ova and the development of the young:—On the 2nd of June *H. vulgaris* deposited one capsule containing ova; on the 5th another; on the 10th another; and on the 15th two more, each of them containing from seven to ten eggs. On the 22nd young appeared in the capsule deposited on the 2nd, and on the 13th of July they emerged from the capsule, so that in three weeks the young were seen alive in the capsule, and in six weeks were fully developed and left the capsule.

Examining the young of this species under a power of about sixty linear, we detected a *Cypris* and four specimens of a common rotiferous animalcule in its stomach, one of the rotifera being still alive.

Nephelis tesselata? In June last we captured in the river at Costessey in this county a single specimen of a leech which nearly agrees with the descriptions given of this species. It is described by Blainville as follows:—"Body elongated or oval, eighteen lines long, with eight eyes in a double longitudinal series; ash-coloured, with orange or whitish-coloured spots above, the sides marked with white or partly gray and partly orange-coloured spots; the abdomen gray, with two round spots in the middle."

Our specimen is nearly cylindrical, about an inch long, the posterior disc larger than the anterior; eight eyes, in two rows of four each; colour green, with two indistinct, whitish, longitudinal series of spots above and two spots underneath; the whole body, magnified, appears studded with small, dark, irregular spots.

Müller says the female is sometimes filled with 300 young ones. The abdomen of our species was, when captured, covered with young, which adhered solely by the posterior disc. We kept this specimen from the 24th of June to the 28th of August, when it died. The young remained attached to the parent during all this time, and we took some pains to ascertain their exact number, and found they amounted to 143. We never saw the parent or the young ones take any food. The young differed altogether in colour from the parent, the latter being a deep green, the former a light ash-colour: the eyes of the parent could scarcely be discerned with a lens; the eyes of the young were very conspicuous, and could be seen with the naked eye. The motion of this species is geometrical, and it never swims. The abdomen of the parent had no pouch, but was much expanded by the adhesion of so numerous a progeny, so much so as to make the form appear very different to the young.

Clepsina (Sav.). This genus or family of *Hirudinidæ* (which comprises the leeches furnished with a retractile proboscis) does not appear well understood. They are found adhering to the undersides of the leaves of the larger aquatic plants, where the small helices (upon which they feed) abound; they are also found adhering to stones in running waters. The proboscis is rarely seen exserted.

C. complanata. We have kept many of this species during the whole summer, and never saw the proboscis unless we compelled the animal to protrude it, which it may be made to do by a glass compresser. We have seen it devour one of the common *Planorbes*, which it did by thrusting itself up the shell of the snail and sucking the body of the animal. The five-lobed stomach of the leech and of several young ones adhering to it, were, when it left the shell, filled with a clear dark red fluid, which, contrasting with the transparent straw-colour of the rest of the animal, gave it a very unique and beautiful appearance. The ova of this species are first observed to proceed from the ovary in two longitudinal rows to the abdomen, which is dilated and drawn up into a kind of pouch or bag to receive them. The young are gradually developed, and when excluded remain adhering, by their whole length, for many weeks to the body of the parent.

C. stagnalis. This little species is said to be common, but we have never met with it; all the leeches we have seen of this family having six eyes, whereas this species is described as having only two. *C. complanata* varies much in size, and we have seen a specimen full of ova as small as *C. stagnalis* is described to be.

C. hyalina? We have taken a single specimen of a leech of this family, which nearly agrees with the descriptions of this species. It was more than twice as large as any other individual of this family which we have seen, being about an inch long, of a yellow-brown colour, with two rows of longitudinal dark lines upon its back. The whole body was remarkably hard and tough. We saw the proboscis of this animal well developed; it had no ova or young attached to it.

REFERENCE TO PLATE I.

Fig. 1. *H. geometra*, a pair united, mag. nat. 2. The fore-part of the same, magnified. *a, a.* White substance. 3. Eggs, mag. nat. 4. Young, idem. 5. Eggs, highly magnified (about 150 linear). *b.* Lid of the egg whence the leech escapes. 6. Anterior disc or sucker of the young, free, highly magnified. 8. The same attached. 7. Posterior disc attached.

Fig. 9, 10, 11. Eggs or capsules with ova of *Nephelis vulgaris*. 9. Mag. nat. 10, 11. Magnified. 12. The same, the ova near hatching. 13, 14. The same, with the young in the egg just before they come out.

Fig. 15. *Nephelis tesselata*? mag. nat., with the young adhering. 16. The same, upper side. 17. One of the young, highly magnified.

Fig. 18, 19. *Clepsina complanata*, mag. nat., with the ova attached.

Fig. 20. *C. hyalina*? mag. nat.

III.—*Contributions to the Ichthyology of Australia.* By John Richardson, M.D., F.R.S., &c., Inspector of Hospitals, Haslar.

Mr. Gould having had the kindness to place in my hands for examination a collection of fish, procured by his assistant Mr. Gilbert, at Port Essington, on the north coast of New Holland, I purpose in the following paper to give a summary of my observations thereon, together with a few remarks upon some drawings made by Lieutenant Emery, R.N., of fish captured on the north-west coast of the same country. I shall also introduce several notices of species from Van Diemen's Land and New Zealand, now existing in the museum at Haslar, with the view of enumerating as many Australian fish as the materials in my possession enable me to do.

Mr. Gilbert's specimens, numbered from 1 to 37, are all dried skins of one side of the fish. The colours of most are consequently altered, and in a few instances the vomerine and palatine bones have been cut away, but in other respects they are in excellent condition. Lieut. Emery not being an ichthyologist, has sometimes omitted to portray the minute serratures of the opercular pieces, and has not always distinguished the spinous from the articulated rays. On this account it is difficult to fix the genus of the undescribed species; but the drawings exhibit no mean share of artistical skill, and, judging from the few known species among them, are correct representations of the recent fish, and consequently valuable records of their real tints of colour. In preparing the following notes, I have availed myself as often as my professional avocations and residence at a distance from London would allow, of the valuable collection of drawings made in Cook's first and second voyages by Parkinson and Forster, now in the Banksian library. Many of these figures are referred to in the posthumous edition of Bloch by Schneider, and also in the 'Histoire des Poissons'; and it may be advantageous to mention, that the mode in which the fin-rays are noted in pencil at the bottom of the drawings, viz. by putting the number of spinous rays as the numerator, and the whole number of rays of each fin, both spinous and articulated, as the denominator of a fraction, has sometimes led the authors of the works just named into error, the denominator being quoted as the amount of the soft rays alone. In most instances, however, the quotation is correctly made.

Mr. Gould destines his collection for the British Museum.

Apogon aprion (Nob.), Rough-tongued Apogon.

No. 11. Mr. Gilbert's list.

Mr. Gilbert states that the aborigines name this fish 'Munduruk,' and that it is a very local species, having hitherto been seen only in King's River (near Victoria, Port Essington), and not in the other very similar and closely adjacent streams. The species seems to differ from all those described in the 'Histoire des Poissons,' in the total absence of serratures on the preoperculum, and in the presence of a small cluster of teeth on the tongue.

It is more compressed than the *A. rexmullorum*, but does not differ much from that fish in the general form of its profile. Its height in the middle is contained three times and a half in the total length, caudal included. The length of the head exceeds the height of the body, and the thickness is greatest at the gill-covers, being there equal to about half the height behind the ventrals. The muzzle is also wide at the preorbitars. The preoperculum has the raised acute edges posteriorly and inferiorly, proper to the genus; there is a less conspicuous ridge on the foremost border of the operculum, and they are all perfectly smooth. The operculum exhibits no vestige of a spine, but its broad membranous border is supported by a thin, narrow, cartilaginous rib, which runs out from the suboperculum. The teeth form pretty broad and densely villiform bands on the jaws, the posterior ones near the symphysis being a little longer, but all are short. On the vomer and palatine bones these teeth are very short, and there is a small cluster in the middle of the tongue which is just perceptible to the naked eye, and very sensible to the finger. The pharyngeal teeth are not longer than those in the jaws.

Rays:—B. 7 – 7; D. 5|– 1|10; A. 2|9; C. $15\frac{4}{4}$; V. 1|5; P. 11.

The branchiostegous rays are very slender.

The dorsal commences over the anterior third of the pectorals, and rather before the middle of the ventrals. The first spine is very short and acute; the second is the longest and strongest, and tapers suddenly at the top, which is slightly curved; the third is a little shorter, and the fifth is half the length of the second. This fin has a smaller number of rays than is ascribed to any other species in the 'Histoire des Poissons.' They are alike in our two specimens. The spine of the second dorsal is not quite half as long as the soft rays. The first anal spine is barely perceptible, and the second spine and soft rays are shorter than those of the second dorsal. The ventrals are scarcely shorter than the pectorals, and are attached a little further forwards. The spine is one-third shorter than the soft rays. The caudal is rounded; it has fifteen forked rays and four graduated, simple, jointed ones above and below.

The collection contains two specimens—one dried, the other in spirits, neither of them retaining much of their original colours. There are no traces of any stripes on the body, or caudal spots having ever existed. The upper parts appear to have been dark in colour, gradually softening off towards the belly. The specimen in spirits exhibits faintly the hue of the grounds of Port wine, which probably was diffused over the head and upper part of the body. The fins appear dark. These traces of colour agree with the tints of *Ap. nigripinnis* or *vinosus*, but the number of dorsal rays is different. The only previously known New Holland species is banded (*Mullus fasciatus*, White).

The scales are orbicular or widely oval, with about twenty furrows and corresponding marginal crenatures on the basal half of the circle, radiating from towards the centre, but not reaching it, and a narrow chequered border with very minute teeth exteriorly. The lateral line has nearly the curve of the back, and changes to a straight course through the tail very gradually. It is composed of forty scales, each having a simple but rather uneven elevated tube on its surface. There are two scales on the base of the caudal, beyond the termination of the lateral line. The two central rays of the caudal diverge rather more at their bases than the other rays, thus dividing the fin into two parts. There are five rows of scales above the lateral line, and about thirteen below it, under the first dorsal.

Dimensions.	inches.	lines.
Length from intermaxillary symphysis to extremity of caudal	6	0
——— base of caudal	4	9½
——— anal fin	3	4
——— first dorsal	2	3
——— tip of gill-flap	1	11½
——— edge of orbit	0	5¾
Diameter of orbit	0	5½
Length of second spine of first dorsal	0	8
——— rays of soft dorsal	1	0
——— rays of anal	0	10
——— pectorals	1	1
——— ventrals	1	0
Height of body	1	8
Thickness at gill-cover and nape	0	9
Length of caudal fin	1	2½

Serranus lepidopterus (Nob.), Butterfly-barber.

"*Perca lepidoptera*, J. R. Forsteri, MSS.," Schn.
Epinephelus lepidopterus, Bl. Schn., p. 302.

A drawing of a *Serranus* nearly related to *S. rasor* (Zool. Proceed., vol. ii.), made by a convict artist at Port Arthur, Van Diemen's Land, under the inspection of Dr. Lhotsky, exhibits all the characters of the New Zealand fish described in Schneider's edition of Bloch under the appellation of *Epinephelus lepidopterus*, except that there is some discrepancy in the numbers of the fin-rays.

The colour of the parts above the lateral line is clove-brown, which lower down gradually softens into brownish-red, and towards the belly changes to a dilute roseate tint. The scales forming the lateral line are truncated and smaller than the others, and have a rich umber-brown colour. Below the line the sides are thickly dotted to about half-way down with small irregular umber-brown spots, of different degrees of intensity. Under the posterior third of the soft dorsal, about the middle of the height, there is a large rectangular brownish-black mark. The top of the head and upper part of the operculum are tinted with clove-brown, approaching to lead-gray; there is a pale orange-brown bar crossing the preorbitar to the anterior angle of the eye, and the membranous parts about the mouth have a sky-blue hue. There are some dark shades on the preoperculum, and a patch of orange-brown on the interoperculum. The dorsal fin is coloured with a mixture of more red than the adjoining part of the back; the caudal is scarlet, with a tinge of orange-brown at the base and along the edge of the forked membrane. The pectorals, ventrals and anal are rose-red, the rays being more deeply coloured than the membrane, and there are a few very pale reddish-brown spots on the pectoral.

A curved canine tooth is represented on the middle of each limb of the lower jaw, and the maxillary is densely scaly, as well as the snout, cheeks, and all the opercular pieces. The preoperculum has a rectangular form, with the angle rounded, and the whole margin is represented as ciliated. Two conspicuous, flat, triangular spines are shown on the operculum, and the edge of bone is rounded away in a semi-circular arc, to a small angle adjoining the top of the gill-opening. The pectoral is large, and has an oval outline, its central rays reaching as far back as the anterior third of the anal. The ventrals are also large, and reach to the anal. The second anal spine is the largest of the three. The spinous dorsal moves in a densely scaly integument, there being only a triangular piece of smooth membrane behind the top of each spine. The base of the soft dorsal is also scaly, but the scales are not represented as advancing far on the anal. The caudal is forked to the depth of one-third of its length.

RAYS :—D. 10|14 ; A. 3|7 ; P. 12 ; V. 1|5 or 6 ; C. 15 :—Figure.
D. 10|20 ; A. 3|9 ; P. 16 ; V. 1|6 ; C. 18 :—Schneider.

The vertical height of the body is equal to one-half the length of the fish, caudal excluded ; the length of the caudal being equal to two-thirds of the height of the body.

The total length of the figure, which is said to be of the natural size of the fish, is eleven inches.

SERRANUS GILBERTI (Nob.), Gilbert's Serranus.

No. 18. Mr. Gilbert's collection.

This fish is stated by Mr. Gilbert to inhabit deep rocky places near the entrance of the harbour of Port Essington. It belongs to the group of spotted *Serrani*, of which the *Merra* (Bl. 329.) is a typical species. The members of this group are characterized in the 'Histoire des Poissons' by the various combinations they exhibit in the forms and denticulations of the opercular pieces, the development of scales on the jaws, the form of the dorsal fin, and the distribution of spots on the body and fins. The phrases by which their peculiarities are described, though sufficient to distinguish the species that the authors of the work had actually under observation, are inadequate, in the absence of correct figures, for the purposes of the ichthyologist who desires to characterize fully the new species or varieties which may fall under his notice. These must, therefore, be proposed with some degree of hesitation, until an opportunity offers for comparing the specimens with ascertained examples of known species. The Port Essington fish, which I have named after Mr. Gilbert, exhibits characters which I do not find combined in any *Serranus* described in the 'Histoire des Poissons.'

Upper jaw and maxillaries destitute of scales ; the lower jaw and snout clothed with minute ones. Ascending limb of the preoperculum arched, finely toothed, and having a small slightly projecting lobe at the angle, armed with five or six somewhat larger teeth : the under edge of the bone is straight, and almost entire, there being only some very indistinct crenatures perceptible by the aid of a lens.

The suboperculum and interoperculum have entire margins. The upper opercular spine is scarcely visible through the skin of the dried specimen; the acute point is all that shows of the under one: the middle one is flat but pointed, and conspicuous enough. The third dorsal spine is the highest, and equals the tallest of the soft rays; the others decrease very little in height, the last or eleventh being only one-fifth shorter than the third, and nearly equal to the second: the first is half the height of the third. The soft dorsal, like the anal, is highest posteriorly, and both are moderately rounded. The anal spines are strong, more particularly the second, which is also rather the longest, and equal to the second dorsal spine in height. Caudal much rounded.

RAYS:—P. 17; V. 1|5; D. 11|17; A. 3|9; C. $15\frac{3}{5}$.

The head forms somewhat less than one-third of the total length, caudal fin included. Teeth on the jaws brush-formed, and, as in most of the allied species, taller and more slender posteriorly. The anterior row is short and conical, but, with the exception of one or two small canine teeth near the symphysis, it is concealed by the lips.

The whole body and the vertical fins are covered with round, dark, umber-brown spots, which correspond in size with those of *Serranus faveatus*. The ground-colour is paler, and on the back and sides appears like the threads of net, with round or slightly hexagonal meshes, enclosing the dark round spots, which are largest on the shoulders, and smaller on the tail and towards the belly. A space between the gill-openings and anus, beneath the level of the pectorals, is spotless, and was seemingly white in the recent fish. There are about a dozen spots in a row, between the gill-opening and caudal fin. No distinct spots are visible on the head; but some parts round the eye, about the jaws, and the edges of the pieces of the gill-cover are darker than the rest. There are also some darker shades towards the tips of the pectoral and ventral rays, but no spots on these fins. There are four rows of spots on the dorsal, the smallest on the edge of the fin, and the largest along the base. On the spinous portion of the fin the spots are less distinct, and the highest row forms merely a black speck on the notched membrane behind the tip of each spine. The anal is similarly marked: on the caudal there are about six rows of spots.

The scales of the body are moderate in size, or they may be designated as rather small, and they are much ciliated. Very minute scales cover the membranes of the fins, and even encroach on the rays.

Serranus merra, judging from what is said of it in the 'Histoire des Poissons,' differs from the above in having scaly jaws, a rounded preoperculum, very pointed opercular spines, in wanting spots on the spinous part of the dorsal, and in the numbers of the rays being different. *S. faveatus* approaches nearer to our specimen in the numbers of its rays and in the size of its spots, but it has four large dark spots at the base of the dorsal and an odd one on the top of the trunk of the tail; whereas *S. Gilberti* has a series of twelve spots running along the base of the spinous and soft dorsal to the caudal, smaller, though darker, than those on the body. *S. hexagonatus* has the same large spots along the dorsal with *faveatus*, the same number of rays, and is further distinguished by white dots on the body. Its second anal ray is stated to be long and pointed. In *S. Gilberti* the second spine is decidedly the strongest, but it scarcely exceeds the third one in height. *S. ura* has a rounded preoperculum, equably denticulated on its margin. *S. maculosus*, as far as one can judge from the short description, scarcely differs from ours in form, except that it has two articulated rays fewer in the dorsal, and one in the anal. There are no spots on its caudal, but, as the only specimen noticed had been long kept in spirits, there is no great weight to be attached to their absence. *S. bontoo* has no spots on its fins. *S. suillus* has very strong spines at the angle of the preoperculum, and no spots on the dorsal.

This comparison of the species which come nearest to Mr. Gilbert's fish in the number of rays and general distribution of colours, shows that the latter differs as much from any one of them as they do from one another; and until an examination of many individuals at their native haunts has shown how far the rays may vary in the same species, and what changes may take place in the patterns of colour at different seasons, it will be most convenient to assign a distinctive name to the Port Essington fish. The analogy of the nuptial dress assumed by the *Salmonidæ* and other anadromous fish may prepare us to expect a very considerable variation in the brilliant tints of the *Serrani* on the approach of the spawning season. It is certainly desirable that new species should be proposed chiefly on the existence of some tangible peculiarities of external form or of internal structure; but to do this properly, the ichthyologist requires to have access to a well-filled museum.

Dimensions.	inches.	lines.
Length from intermaxillary symphysis to extremity of caudal	12	3
——— base of ditto	9	10
——— anus	5	9½
——— tip of gill-flap	3	7
——— of pectorals	2	4
——— of ventrals	1	10
——— of caudal	2	5
Height of the highest dorsal spine	1	4
——— soft dorsal	1	4
——— second anal spine	1	0
——— soft anal	1	9

There are two *Serrani* in the museum at Haslar of unknown origin, though from some circumstances they are supposed to be from Melville Island, on the north coast of New Holland. One of them agrees so well with the account of the *S. merra* in the 'Histoire des Poissons,' that I have considered it to be an example of that common and somewhat variable species.

It differs from *S. Gilberti* in the head being rather longer in proportion, and forming exactly one-third of the entire length of the fish, caudal included; in the presence of some very minute scales on the limb of the maxillary, and in the very regular round spots being distributed over *every part* of the head, body, and fins. The ground-colour, after long maceration in spirits, has a pale leaden tint; the spots are dark umber-brown, and are smaller on the snout and lower jaw, and less crowded on the belly. There are but few on the ventrals, and on the pectorals they are small, though distinct, being confined to the rays, and forming about six rows. They are paler and less distinct on the spinous dorsal, but the fillet of membrane behind the tip of each spine is black. On the soft dorsal, anal and caudal, they are as in *S. Gilberti*, and the forms of these fins are the same. The opercular spines are more acute, but less conspicuous, particularly the middle one, which is nevertheless much larger than the other two, and the preoperculum is more rounded, both limbs being arched, without any distinct lobe at the moderately obtuse angle, above which, however, there is a slight re-entering curve. The ascending limb curves forwards considerably, and the lower one declines very slightly, so that the spherical angle which they form does not exceed a right one. The ascending limb is finely denticulated, with the teeth enlarging towards the angle; the lower one is faintly crenated. There is a canine tooth on each side of the symphysis above and below, but no exterior row of short conical teeth on the sides of the jaws. The bands of teeth on the limbs of the jaws, palate, and vomer are finer and more even than in *S. Gilberti*, approaching to villiform. The *second anal spine* is a little longer and much stronger than the third one. There is a further slight difference between the species, in the fourth and fifth dorsal spines of *merra* being rather taller than the third one. The soft dorsal is as tall as the highest spine; but the spines becoming shorter, though only a little, as they approach it, the soft fin appears taller than the spinous one, as is the case also in *S. Gilberti*. The under jaw of *S. merra* projects very evidently beyond the upper one, even when the mouth is shut. The scales of the body are small, and strongly ciliated.

Rays:—P. 16; V. 1|5; D. 11|16; A. 3|7, last ray deeply divided; C. $15\frac{3}{3}$.

Specimen $5\frac{1}{2}$ inches long.

Bloch's figure 329 gives a good idea of the specimen above mentioned, though it does not exhibit the slight re-entering curve above the angle of the preoperculum.

Serranus stellans (Nob.), Star-spotted Serranus.

This is the second *Serranus*, mentioned in a preceding page as belonging to the museum at Haslar, and as being supposed to have come from Melville Island, on the south side of Torres Straits.

The specimen bears a strong general resemblance to that which we have considered to be the *merra*, having the same distribution of the scales on the jaws, fins, &c., the same spines on the operculum and denticulations on the preoperculum, whose limbs form the same arcs; but the angle appears more rounded, from the absence of the small re-entering curve above it: the crenatures on the under limb are also more readily discovered. The teeth are rather more brush-like and unequal than in the *merra*, but the canines are the same,—a pair above and below. The under jaw is shorter, being just equal with the upper one when the mouth is closed. The dorsal is less arched anteriorly, the spines diminishing more gradually after the fifth, which is the tallest. From this cause the soft fin seems to be lower in proportion than in *merra*, but its posterior third actually equals the highest spine in height. The spines generally are more slender, and somewhat taller than in a *merra* of the same size. The *second anal spine* is stout, and exceeds the third one conspicuously in length. The caudal is much rounded, and the soft vertical fins moderately so, as in *merra*. The dark round spots are more crowded, so as to show little of any paler ground-colour; but instead thereof each spot is surrounded by six triangular specks of white, giving a somewhat hexagonal form to the meshes, though the dark areas are quite round. These spots exist on the caudal fin also, on the whole soft dorsal and anal, and the posterior part of the pectoral; but they are confined to the inferior halves of the spinous dorsal and fore-part of the pectorals; they are absent on the lower jaw and under surface of the fish from thence to the anus. The vestiges of spots of any kind are very faint on the ventrals. The dorsal and anal are edged with black.

Rays:—B. 7 — 7; P. 16; V. 1|5; D. 11|15, the last one divided; A. 3|8; C. $15\frac{7}{3}$.

This is much like the species sketched by Parkinson at Otaheite*, where, as we learn by a note in pencil on the drawing, it is named 'tarao' or 'tarao opoppe.' "The ground-colour and the spots are darker, and softened into one another. Round about each spot there are small dots of white or straw-colour; the same across the fins. There is of this fish as large again." (Solander.) The spots on the body are coloured dark purplish-brown, those on the pectorals being redder. The figure shows twelve dorsal spines; the *third anal* spine is much the tallest, equalling the soft rays, and the lower jaw is longer than the upper one. The two latter characters disagree with *stellans*. *S. hexagonatus* (Cuv. & Val.), (*Perca hexagonata*, Forster),

* Fig. No. 36. Parkinson; pl. 75, Banks. Libr. (*Perca maculata*); *Serranus Parkinsonii*, Cuv. & Val. ii. p. 239.

which is also said to bear the name of 'tarao' at Otaheite, has four large spots at the base of the dorsal, one large odd one before that fin, and another behind it; but in other respects it does not seem to differ much from *S. Parkinsonii*. *S. summana* has small white spots on the body and fins, but there is a conspicuous black mark on the tail, and the under edge of the preoperculum is finely denticulated.

Dimensions.	inches.	lines.
Length from intermaxillary symphysis to tip of caudal	5	1
——— base of ditto	4	2
——— anus	2	$8\frac{1}{2}$
——— tip of gill-cover......	1	$8\frac{1}{2}$
Height of body at beginning of dorsal	1	$3\frac{1}{2}$
Thickness there	0	8
Height of tallest dorsal spine	0	$7\frac{1}{4}$

Serranus ura (*Cuv.* & *Val.*?), The Ura.

No. 27. Lieut. Emery's drawings.
Ura, a Japanese name (Cuv. & Val. ii. p. 332).

Lieut. Emery's portfolio contains a drawing of a *Serranus* captured at Depuch Island, which agrees tolerably well with the account of *S. ura* in the 'Histoire des Poissons.' The species was discovered by M. Langsdorf in Krusenstern's voyage on the coast of Japan.

In Lieut. Emery's drawing the body is represented as fuller and higher, and the dorsal spines as decreasing more in height as they approach the articulated portion of the fin, than in the other species closely allied to the *merra*. The depth of the body is equal to one-third of the total length, caudal included: the head forms one-third of the total length, caudal excluded. The middle opercular spine only is indicated in the drawing, and we therefore conclude that the others were inconspicuous in the recent fish. The third dorsal spine is the tallest, and is fully twice as long as the eleventh; it is about equal to one-third of the height of the body. The soft dorsal is one-fifth part higher. The second anal spine is stouter, but not so long as the third one. All the fins are rounded.

Rays:—D. 11|14; A. 3|7; V. 1|5; &c.

It is possible that one or two soft rays may have been omitted in the drawing, as Lieut. Emery was not aware of the importance of enumerating them correctly.

The general colour of the fish is gamboge-yellow, which fades to white on the middle of the belly. The fins are a paler lemon-yellow. Yellowish-brown spots, roundish, but not very regular in form, are evenly distributed over the head, body, and fins. There are about six in a line between the gill-cover and caudal. On the fins and middle of the belly the spots are paler, and they are not so numerous on the pectorals, head, and under jaw as elsewhere. On the anterior part of the operculum they unite, to form an irregular blotch.

The length of the individual from which the drawing was made was seven inches.

Serranus crapao (*Cuv.* & *Val.*), The Crapao.

Serranus crapao, Cuv. & Val. iii. p. 494.
Crapao, Malagese name. (Ditto.)
No. 1. Mr. Gilbert's collection.

Mr. Gilbert states that "this fish inhabits the shallow parts of Port Essington." The specimen possesses the characters ascribed to the *S. crapao*, which was taken by M. Reynaud in the roadstead of Batavia.

In general it bears a close resemblance to *S. Gilberti*, having the same very small scales on the under jaw, snout, and cheek. There exists, however, a cluster of minute scales on the maxillary, which I could not detect in *S. Gilberti*; the opercular scales are somewhat larger than in that species, and the under jaw is a little longer. The preoperculum is rather more rounded at the angle, there being no distinct lobe there, but merely a slight change in the curve embracing the five lower teeth. The upper limb is finely denticulated, the teeth becoming gradually larger towards the angle. Some very slight crenatures may be perceived on the lower limb. The middle opercular spine is flat and scarcely pungent, and more than its own length distant from the tip of the gill-flap. The upper and under spines are buried among the scales, and are but just perceptible. The interoperculum and suboperculum are perfectly entire. The spinous dorsal is even, and rather lower than the soft portion of the fin. The third and six following spines are of the same height; the two last are but very little shorter, and they are a little taller than the second, which is twice as high as the first. The *second anal spine* is rather stronger than the third one, but it is not so long by about one-eighth part. The vertical soft fins and the pectoral are about as much rounded as in the *S. merra*. The scales on the fins are likewise the same, but those on the body are rather more strongly ciliated. The dental surfaces of the jaws are more strongly brush-formed, forming pretty broad bands towards the symphysis; but on the limbs of the intermaxillaries the teeth are short, curved, and not very slender, and there is an exterior even row of short conical ones, not rising above the lips. On the limbs of the lower jaw the teeth are all curved, and longer and stronger than in *merra*, and there is no exterior row of conical ones. There are two or three canine teeth near the symphysis, above and below, not much stronger than the rest. The vomerine teeth are similar to those of the upper jaw, short, curved, and moderately strong. The palate bones have been cut away.

The colours of the dried skin have evidently faded greatly; but the whole body, the gill-covers, cheeks, and lower jaw appear to have been marked with dark spots, generally roundish, but not very exactly defined, nor disposed in any regular order. Their diameter is less than half that of the spots of *S. stellans*, and they are much less crowded. Four irregular blotches, of considerable size, range along the base of the dorsal. The anal and ventrals appear dark towards their tips, and traces of vertical bars or dark blotches are visible near the distal extremity of the caudal. There are also some dark shades on the top of the head and ascending limb of the preoperculum. Traces of spots remain on the vertical fins, but the spinous dorsal does not appear to have been tipped with black as in *S. merra* and *stellans*.

RAYS:—D. 11|14; A. 3|8; C. $15\frac{3}{3}$; P. 17; V. 1|5.

DIMENSIONS.

	inches.	lines.
Length from intermaxillary symphysis to end of caudal	12	4
——— base of ditto	10	3
——— anus	6	6
——— tip of gill-cover	3	10
Length of pectorals	2	0
——— ventrals	1	6
——— caudal	2	1
Height of third dorsal spine	1	1
——— soft dorsal	1	$4\frac{1}{2}$
——— third anal spine	0	11
——— soft anal	1	$5\frac{1}{2}$

No. 22, *Serranus punctulatus*, and No. 24, *Serranus marginalis*, of Mr. Gilbert's collection, were procured at Copang, in the island of Timor, and do not therefore come within the scope of this paper.

MESOPRION YAPILLI (*Cuv.* & *Val.*), The Yapilli.

Yapilli, Russell, pl. 95.
No. 21. Mr. Gilbert's list.

This fish is stated by Mr. Gilbert to be common in all the rocky parts of Port Essington, but he did not ascertain its appellation among the aborigines. The specimen was taken at the Tamar rock in November 1840.

The short characters of the Mesoprions noticed in the 'Histoire des Poissons' being strictly comparative, and turning much on the patterns of colour, are of difficult application when the naturalist has only a single species before him, and especially when the specimen is, as in the present instance, a solitary dried skin. All the particulars, however, which are mentioned in the work in question of the Yapilli are to be found in our specimen, and the resemblance of the fish to Russell's figure is very close.

The length of the fish is twenty inches, caudal included. The preoperculum has a slightly arched under-edge continuous with the rounded angle, which appears to project solely from the existence of the re-entering curve above it. The vertical limb is minutely toothed to within one-fourth of its upper end. The teeth are more acute in the sinus; and on the rounded angle and under edge of the bone, the teeth, though short, are wider, and are separated from each other by obtuse sinuses: two or three of the anterior ones are slightly inclined forwards. The thickening of the interoperculum opposite the preopercular sinus is very slight. The bony operculum ends in a flat, tapering, but obtuse lobe, whose lower margin is not concealed by the scales; a re-entering angle above its base forms the rounded upper corner of the bone into a minor and much shorter lobe. The membranous flap which tapers from the point of the operculum, but is not acute, is supported by a cartilaginous prolongation of the sub-operculum. The two rows of large supra-scapular scales are rendered very conspicuous by each of them being bounded anteriorly by a patch of small scales. The semioval projecting limb of the supra-scapular is minutely undulated on the margin. The edge of the humeral bone is entire. The pectoral has the pointed and tapering sparoid form, and reaches back nearly to the anal fin. The dorsal spines are strong, much compressed and acute, and the membrane is attached alternately to their right and left sides. The third anal spine is longer, and fully as strong as the second one; the first one is short, tapers suddenly to an acute point, and is furrowed anteriorly: these spines are also right and left. The soft dorsal and anal fins are rounded; their bases are scaly, and fillets of scales run between the rays for one quarter of their length: very short fillets of scales recline against the base of each spinous ray. The caudal is crescentic on the margin.

Scales.—There are about fifty furrows running to the basal edge and part of the adjoining lateral margins of each scale, the alternate ones being short, and the longer ones reaching nearly to the middle. The exposed surface of the scale is smooth to the touch, and its margin looks to be thin and membranous; but when examined through a lens the surface appears to be shagreened, or reticulated by minute obtuse eminences, and some very small and irregularly placed teeth may be discovered on the edge. Each scale is pale on the border and dark towards its middle, the dark tint occupying nearly the whole exposed surface of the scales above the lateral line, and becoming proportionally smaller and fainter on the sides, so as to be scarcely perceptible at the level of the pectorals. They produce longitudinal lines on the sides corresponding to the number of rows of scales.

Teeth.—Each limb of the upper jaw is armed with an even row of about twenty conical teeth, which are so short as to be concealed by the lips; and there are also two conspicuous canines close to each other near the symphysis. Behind these, on the whole length of the concave surface of the jaw, there is a narrow stripe of very short irregularly crowded teeth, which must have been almost concealed by the soft parts in the recent fish. Through a lens each of these minute teeth appears blunt, and answers better to the term '*dents grenues*,' used in the 'Histoire des Poissons,' than to that of villiform. Each limb of the lower jaw is furnished with about eight strong conical teeth of unequal heights and unequally distributed, as if some had dropped out and were not yet replaced. The lateral ones are rather the tallest, but they do not equal the two upper canines, though they are much larger than the upper lateral teeth and project beyond the lip. The minute teeth of the lower jaw are restricted to a very small and not crowded cluster near the symphysis. A portion of the vomer which remains, and the edge of the anterior half of the palate bone, show a few microscopical teeth just protruding from the bone, which is however roughened by minute pits, apparently the sockets of teeth which have dropped out. The soft parts are entirely gone.

Dimensions.	Inches.	lines.
Length from intermaxillary symphysis to end of caudal	20	6
——— base of ditto	16	4
——— anus	10	2
——— beginning of dorsal	6	11
——— tip of gill-flap	6	3
——— centre of orbit	2	7
Diameter of orbit	1	0
Length of pectoral	5	2
——— ventrals	3	4
——— dorsal	8	10
——— spinous part of dorsal	5	6
——— articulated part of ditto	3	4
——— anal	2	4
——— caudal	4	2
Height of tallest dorsal spine (the 4th)	2	6
——— second and tenth spine of dorsal	1	3
——— soft dorsal	2	3
——— third anal spine	1	10
——— soft anal	2	5
Length of space between anal and anus	1	0
——— anal and caudal	2	9
——— dorsal and caudal	1	10
Height of head at the nape	4	6

Mesoprion carponotatus (*Nob.*), The Mungundju.

No. 20. Mr. Gilbert's list.

The native inhabitants of the shores of Port Essington call this fish 'Mungundju,' and it frequents the deep water in rocky places at the entrance of the harbour (Mr. Gilbert).

Cuvier mentions the resemblance between his Mesoprions and fish of the genus *Dentex* in external form. In the Mungundju the sparoid likeness is carried to the utmost by the rounded operculum, the almost entire preoperculum, and the dark spot at the base of the pointed pectoral. Indeed, until I had softened and extended the branchiostegous membrane so as to show its seven rays, and discovered some microscopical teeth on a small part of the edge of the palate bone, I had supposed that this fish might be the *Dentex cynodon* of the 'Histoire des Poissons.' As the Yapilli of the preceding article is the only Mesoprion that I have access to for the purpose of comparison with the Mungundju, the following description has reference throughout to that species.

Form.—Having a close general resemblance to that of Yapilli; but the lips, which in that species form a broad reverted fold on both jaws, are not so much developed in the Mungundju. There are no pores on the lower jaw of either, the integument being very smooth and nacry. The preorbitar in both has a perfectly even edge; and in Yapilli the thick integument passes so evenly from the surface of the bone, over the row of large scales which encircle the lower half of the orbit, as greatly to increase the apparent size of the bone: in the

Mungundju the posterior extent of the preorbitar is defined, and the large suborbitar scales partly hidden by a band of small scales which runs under the orbit and covers their bases. There are only six rows of scales on the cheek of the Yapilli beneath the large suborbitar row, and all the convex surface of the preoperculum is naked: in the Mungundju there are seven rows of scales on the cheek and concave side of the preoperculum, and two rows of smaller ones on the middle of the convex limb of the bone, similar to those which exist in *Dentex vulgaris*; but in neither of the Mesoprions are the convex and concave faces of the preoperculum divided from each other by a distinct ridge, as in the *Dentex*. The whole surface of the interoperculum is clothed by four rows of small scales. In the Yapilli this bone exhibits only a single row of scales, which are larger than those on the cheek. The opercular scales are also larger than the cheek ones in this species; but in the Mungundju the difference between their sizes is scarcely perceptible. In the Yapilli, the scales of the suboperculum, which form a single row, gradually diminish in size as they approach the tip of the gill-flap, and thus expose the lower edge of the lobe of the bony operculum; but in the Mungundju all the scales of the row are of equal size, and they are tiled by the lower row of opercular scales so as to conceal the junction of the bones entirely. The two rows of large nuchal scales are rendered less conspicuous in the Mungundju by the patches of small scales before them being more extensive and encroaching over their bases. The scaly surface in this species also extends to opposite the middle of the orbit, while in the Yapilli it ends at the posterior angle of the eye, and does not come so far as the vertex. The lower edge of the preoperculum is much shorter than in Yapilli, and is quite entire; the angle is rounded and projects slightly, the ascending limb being undulated slightly without any distinct re-entering curve. Two or three irregularly scattered teeth are with difficulty discovered by the aid of an eye-glass about the middle of the vertical limb, and on the upper half of the rounded angle. The interoperculum is perfectly destitute of the very slight thickening which the Yapilli shows in the site of the tubercule of the *Diacopes*. The operculum is rounded, as in the sparoid family, with a shallow re-entering arc which divides the margin into two obtuse lobes, neither of them so wide as the arc itself. The membranous edge of the gill-flap is very narrow, and the tip of the suboperculum is not prolonged into an angular flap beyond the operculum. The supra-scapular has one small notch on its edge; the edge of the humeral can scarcely be perceived among the scales.

RAYS:—B. 7; D. 10|15; A. 3|10; C. $15\frac{4}{4}$; P. 14; V. 1|5.

The pectoral is pointed, but more suddenly acuminated, and considerably shorter than in the Yapilli; its point falls short of the anus. The spines of the dorsal are more slender, and the soft part of the fin is longer, not so high, and much less rounded than in the Yapilli. The last ray, both of the dorsal and anal, is small, and may be only a branch of the preceding one, so that fourteen and nine may be respectively enumerated; but as they are both distinct, and the fact cannot be ascertained without removing the scales from their bases, they have been set down as 15 and 10. The anal is also lower, and its spines considerably softer than those of the Yapilli: the soft part is more obtusely rounded than in Yapilli. The caudal is slightly crescentic on the margin. The ventrals resemble those of Yapilli, but they are not so long, and the triangular scaly folds outside their bases are much smaller and less acute.

Scales.—The scales are smaller than in Yapilli, and more densely and less regularly tiled. The structure of the lateral line is alike in both. Each scale is roundish or quadrangular, with the corners rounded off: the exterior margin is finely toothed, the adjoining surface rough, and the basal half marked by about eighteen furrows, which produce crenatures on about one-third of the margin of the scale. There are about sixty-eight scales in a longitudinal row between the gill-opening and caudal fin. Short fillets of scales recline against each dorsal spine as in Yapilli, and the bases of the articulated parts of the dorsal and anal, and of the caudal, are scaly, precisely as in that fish.

Teeth.—The dentition is very similar to that of Yapilli. There are three canines crowded on one side near the symphysis, and about fourteen short conical ones in the exterior row beneath the lip. The minute teeth on the concave surface of the jaw are more acute, and merit the name of villiform better than in Yapilli: the cluster of minute teeth near the symphysis of the lower jaw is longer and more crowded. The eight outer conical teeth in that jaw exist as in Yapilli, but they are followed by five smaller and closer ones in the same row, which are not present in that species. The vomer has been cut away; but a small projecting lobe of the edge of the palate bone is rough with minute setaceous teeth, which may be readily felt with the finger, yet cannot be seen by the unassisted eye.

Colour.—The back of the dried specimen has a darkish and somewhat clouded tint, which gradually fades on a level with the upper edge of the pectorals into the pale and spotless under surface. All the fins are pale and unspotted, and seem as if they had been yellow or orange-coloured when fresh. The remains of a yellowish tint prevails on the caudal and extends to its scaly base. A dark spot girdles the base of the three upper pectoral rays, and there seems to have been another on the lower lip, near the symphysis.

Dimensions.	inches.	lines.
Length from intermaxillary symphysis to end of caudal	14	0
——— base of ditto	2	9
——— anus	7	6
——— beginning of dorsal	4	11
——— tip of gill-flap	3	10
——— centre of orbit	2	2
Diameter of orbit	0	10½
Length of pectoral	2	10
——— ventral	2	10
——— whole dorsal	5	8
——— spinous part of ditto	3	3
——— articulated part of ditto	2	5

	inches.	lines.
Length of anal	1	6
——— caudal	2	9
Height of tallest dorsal spine (4th)	1	4
——— second spine	1	1
——— tenth dorsal spine	0	$9\frac{1}{2}$
——— soft dorsal	1	1
——— anal	1	4
——— third anal spine	0	8
Length of space between anus and anal fin	0	$9\frac{1}{2}$
——— anal and caudal	1	9
——— dorsal and caudal	1	1
Height of head at nape	3	4

[To be continued.]

IV.—*Descriptions of several new species of Nudibranchous Mollusca found on the coast of Northumberland.* By Joshua Alder, Esq., and Albany Hancock, Esq.

During two short periods of residence at Cullercoats last summer, we devoted some leisure time to an examination of the Nudibranchous Mollusca of the coast, for the purpose of ascertaining the number of indigenous species, and of observing the habits and œconomy of these little-known animals. In the former respect our success was beyond our most sanguine expectations. Although our researches were confined to a very small portion of the coast, not exceeding two or three miles, in the immediate neighbourhood of Cullercoats, and without the assistance of a dredge in collecting the deep-water kinds, we succeeded in obtaining thirty-four species, a number nearly equal to what has yet been recorded as inhabiting the whole of the British seas. Of this number about one half are entirely new. Careful drawings of the whole have been made while in a living state, which, together with more full descriptions than are now offered, may be given to the public at some future time, when further investigation shall have enabled us to clear up some points in their history of which we are at present in doubt, and perhaps to increase the list by the discovery of additional species. In the mean time we take the liberty of sending for insertion in the 'Annals' short characters of seventeen species which appear to be undescribed.

The most interesting point of physiology that we have observed in this tribe is the existence of eyes in *Doris* and *Goniodoris*, genera that have hitherto been described as entirely devoid of these organs; they can be most distinctly observed in young individuals, where the skin is very transparent. In this state we have succeeded in detecting them in *Doris repanda* and *Goniodoris nodosa*, situate behind the dorsal tentacula, as in other genera of the same order. The greater opacity of the skin generally prevents their being observed in older individuals. In what degree the faculty of vision may be possessed by these animals in different stages of their growth, or whether the full-grown animal may in some instances be deprived of a sense enjoyed during youth, it may be difficult to determine. From the feeble development of these organs the sense is no doubt at any time very imperfect; but the fact of their existence is interesting, as showing a greater unity of structure in the whole of the Nudibranchous order.

Doris aspera.

Body depressed, white or yellowish, semitransparent. Cloak filled with spicula running in all directions, covered with large obtuse tubercles, interspersed with a few smaller ones, not crowded; firm and rough to the touch. Dorsal tentacula long, slender, white or yellowish. Branchiæ consisting of nine small, simply pinnate, transparent white plumes. Foot, when in motion, extending beyond the cloak behind. Length $\frac{4}{10}$ths of an inch.

Common among the rocks at Tynemouth, Cullercoats and Whitley.

D. depressa.

Body much depressed, transparent, of a pale sandy colour, spotted with orange or reddish brown. Cloak covered with delicate pointed papillæ, and having strong imbedded spiculæ arranged transversely across the back and diagonally at each side. Dorsal tentacula pale yellow. Branchiæ consisting of ten or eleven very short, simple, transparent white plumes, arranged in a horse-shoe form round the vent. Foot broad, truncate anteriorly, of a pale grayish pink colour. Veil above the mouth large, semicircular. Length $\frac{3}{10}$ths of an inch.

Under stones at low-water mark, Whitley; very rare.

D. repanda.

Body depressed, of a waxy semitransparent white. Cloak widely expanded, covered with minute, opake-white, granular tubercles, irregular and rather distant; a row of sulphur-yellow or opake-white spots extends down each side. Dorsal tentacula ovate-oblong, strongly lamellated, without sheaths. Branchiæ small in proportion to the size of the animal, of four or five broad, tripinnate, transparent white plumes. Foot narrow, showing the cloak much beyond, which appears veined on the under side. Length $\frac{8}{10}$ths of an inch.

Among the rocks near low-water mark at Cullercoats; not uncommon.

D. similis.

Body rather convex, transparent white. Cloak regularly covered with numerous conical, opake-white papillæ. Dorsal tentacula large, swelling in the middle, yellowish white, issuing from short denticulated sheaths. Branchiæ of nine narrow transparent white plumes, tripinnate, with a strong denticulated central rib. Veil above the mouth extended at the sides into two leaf-like appendages. Foot extending a little beyond the cloak behind. Length $\frac{6}{10}$ths of an inch.

At low-water mark and from deep water, Cullercoats; very rare.

Approaching very nearly to *D. pilosa*, but differing in the stouter papillæ, and in the number and form of the branchial plumes, which are also entirely devoid of the stellated appearance of that species.

Polycera ocellata.

Body greenish black, varied with chestnut and yellow, and covered with irregular ocellated spots of a pale yellow or fawn-colour, capable of being raised into tubercular points. Veil denticulated, short, yellowish white, interrupted in front, continued along the sides of the head and back in an elevated ridge with scalloped edges, and terminating in two or three irregular lobes or tubercles on each side behind the branchiæ; the two lines approach each other in the middle of the back so as to form an imperfect figure of 8. Tentacula two, dorsal, large, club-shaped, strongly lamellated towards the tips. Branchiæ consisting of three or four large flocculent plumes, tripinnate, pale greenish black with light margins. Foot yellowish, inclining to red, mottled with black. Length $\frac{4}{10}$ths of an inch.

Under stones at low-water mark, Cullercoats and Whitley; rather rare.

The *Triopa Nothus* of Dr. Johnston may be the young of this species. At present however we prefer considering them distinct, not having been able to detect any spicula in our animal.

Tritonia felina.

Body slender, rather opake, firm to the touch, compressed at the sides and slightly rounded on the back, rough with small warts; richly spotted and marked with dark red or reddish brown, and speckled with white tubercular spots. Tentacula yellowish, lamellated, issuing from long, cylindrical, rather tight sheaths, divided at the top into five short branches. Veil consisting of about four unequal branched appendages on each side. Branchiæ stout, two or three times branched and warty; six on each side of the back, the hinder ones very small. Foot transparent white, slender. Length nearly an inch.

On corallines from deep water, Cullercoats.

This may prove to be the *T. arborescens* of British authors, but it is surely distinct from that of Cuvier.

T. pulchella.

Body slender, soft, transparent, pale rosy flesh-colour, with minute, opake, yellowish tubercular spots. Tentacula strongly lamellated, issuing from branched, deeply divided sheaths; the tubular part rather short. Frontal veil consisting of four slender branched appendages, with four intermediate linear ones. Branchiæ slender, transparent, flesh-coloured, spotted with opake yellow; five pairs, the last very short. The front ones consisting of three branches divided into smaller ones. Foot transparent white, tinged with rose-colour. Length nearly half an inch.

Among the rocks at low-water mark, Cullercoats; very rare.

Much more delicate, transparent and graceful in its proportions than the preceding, to which it is nearly allied.

Melibœa ornata.

Body slender, pale yellow or buff, with pink streaks and spots. Tentacula filiform, issuing from wide sheaths much produced anteriorly. Veil truncated in front, extending into points at the sides. Branchiæ, six pairs, large, elliptical, pedunculate, papillose, the papillæ much produced and each terminated by a dark red spot, set in three circles of four to seven each, and a terminal one at the apex. Foot slender, transparent white, tinged with yellow. Length $\frac{2}{10}$ths of an inch.

On corallines from deep water, Cullercoats.

Very much resembling *M. coronata*, Johns., from which it differs in the form of the veil and in the more produced papillæ. It is altogether a more slender animal.

Eolis rosea.

Body rather broad, pointed behind, watery white, tinged with rose-colour and buff on the back. Dorsal tentacula short, linear, obtuse, tinged with rose-colour. Oral tentacula short, white. Two pale lines proceeding from the latter terminate in a point near the dorsal tentacula, as in *E. papillosa*. Branchiæ numerous, short, ovate and pointed, of a bright rose-colour, pale towards the edges, and thickly sprinkled with opake white; arranged in fifteen or sixteen close-set transverse series, five or six in each, on the sides of the back. Foot watery white, broad and truncated in front, obtusely pointed at the sides. Length upwards of $\frac{3}{10}$ths of an inch.

At Cullercoats, rare.

This comes very near to *E. papillosa*, but differs in size, colour, and the number of branchial papillæ.

E. obtusalis.

Body rather short and thick, of a uniform ochry yellow with reddish brown blotches on the head and back. Dorsal tentacula short, cylindrical, reddish brown. Oral tentacula short and wide apart, yellowish. Branchiæ numerous, very short and obtuse, ovate, yellow, thickly set in about twelve rows on the sides of the back. Foot transparent, rather broad, capable of being extended into a very slender tail behind. Length $\frac{4}{10}$ths of an inch.

One specimen only has occurred, from deep water at Cullercoats.

This species is also very nearly allied to *E. papillosa*, from which it differs in size and colour, and is much more obtuse in all its parts.

E. aurantia.

Body rather stout, buff-coloured, transparent. Dorsal tentacula orange, approximating, conical, annularly wrinkled. Oral tentacula rather shorter than the dorsal ones, lineal, depressed. Branchiæ numerous, stout, elliptic-oblong, orange-coloured above with an intermediate circle of white, and of a warm purple-brown below; set in ten or eleven close transverse rows of five or six each on the sides of the back. Foot transparent, the front angles blunted and not much produced. Length $\frac{6}{10}$ths of an inch.

Under large stones near low-water mark at Whitley, rare.

E. olivacea.

Body pale yellow, sprinkled with white and orange-red or brown, Dorsal tentacula approximating, linear, obtuse, with a central reddish band. Oral tentacula shortish, linear and obtuse. A streak of red runs on each side of the head between the oral and dorsal tentacula, extending behind the latter a short way down the back. Branchiæ few, thickish, elliptic-oblong, set in six or seven rows, three or four abreast, on each side of the back, of a pale olive-brown colour, the interior of a granular appearance. Foot watery white, broadish and rounded in front, extending to a fine point behind. Length $\frac{4}{10}$ths of an inch.

Under stones at Whitley and Cullercoats, rather rare.

It is the most soberly coloured of the genus.

E. Hystrix.

Body slender, white, with olive-brown spots on the back, and a row of large blotches of the same along the sides. Dorsal tentacula linear, approximating, white with an olive-brown band in the centre. Oral tentacula rather shorter than the dorsal, banded in the same manner. Branchiæ elliptic-oblong, pointed, white, with three circular olive-brown bands set in six or seven distant transverse rows of four or five each on the sides of the back, diverging. Foot transparent white, rounded in front and slightly produced at the sides. Length $\frac{4}{10}$ths of an inch.

Among the rocks at low-water mark, Cullercoats; rare.

E. vittata.

Body slender, pale buff speckled with fawn-colour. Head rather large and truncated in front. Dorsal tentacula slightly conical, wrinkled, fawn-coloured, with pale tips. Oral tentacula rather shorter than the dorsal ones and of the same colour. Branchiæ somewhat clavate, long, with obtuse terminations, very pale fawn-coloured, with three darker bands of the same colour; set in six or seven distant rows down the sides, largest in front, four to seven in each row. Length $\frac{3}{10}$ths of an inch.

On a coralline from deep water, Cullercoats; one specimen only found.

This species differs from the last in the shape of the head and branchiæ.

E. pallida.

Body transparent white with a tinge of yellow, spotted with opake white and bright rose-colour on the back and head. Dorsal tentacula slender, slightly conical, obtuse, transparent white with a band of rose-colour. Oral tentacula short, thickish. Branchiæ large, ovate, inflated and terminating in a slender white point, transparent, sprinkled with opake white; placed in a crowded manner down each side of the back, of various sizes, smallest near the foot, and very large and much inflated towards the back. Foot milk-white, broad and rounded in front, and not much produced behind. Length $\frac{1}{4}$ of an inch.

Among the rocks at low-water mark on the north side of Cullercoats sands; very rare.

Remarkable on account of its large central branchiæ, which have a leaf-like outline.

E. minuta.

Body minute, pellucid, of a yellowish white. Dorsal tentacula long, slender, transparent. Oral tentacula very short. Branchiæ few, clavate, orange, with white apices of various sizes arranged irregularly down the back, forming about two imperfect clusters, two or three papillæ in each cluster being larger than the rest. Foot broad and rounded in front, the angles expanded into curved points. Length not quite $\frac{2}{10}$ths of an inch.

One specimen found at Whitley under a stone at the lowest spring tide.

E. nana.

Body yellowish, rather depressed. Dorsal tentacula linear, smooth, approximating. Oral tentacula shorter than the dorsal ones, linear, transparent. Head produced at the sides beyond their insertion. Branchiæ subclavate, rose-coloured, inclining to orange, the central mass of a minute granular appearance; apices white, disposed in seven or eight close-set rows of seven or eight each down the sides, leaving a broad space on the back. Foot transparent white, shortish, rounded in front and produced into obtuse angles at the sides. Length $\frac{4}{10}$ths of inch.

Under stones near low-water mark at Cullercoats and Whitley, rather rare.

Newcastle, January 20, 1842.

V.—*Insectorum novorum Centuria, auctore* J. O. Westwood, F.L.S., &c.

Decadis quartæ, ex ordine Lepidopterorum et genere Papilionis, Synopsis.

Papilio *Boötes*, W. Alis nigris valdè elongatis; posticis spathulato-caudatis, harum disco plagâ mediâ albâ venâ nigrâ in duas partes divisâ, maculâ ad angulum analem, lunulis tribus submarginalibus rufis; incisionibus pallidè marginatis, caudâque bimaculatâ; alis subtùs similibus at pallidioribus; omnibus plagâ magnâ basali rufâ; maculis lunulisque rufis majoribus, capite, collo et corpore infrà rufo. Expans. alar. unc. 5.

Hab. Sylhet in the East Indies. Allied to *P. Philoxenus*.

Papilio *Astorion*, W. Alis elongatis angustis, posticis subsinuatis ecaudatis; omnibus cyaneo-nigris immaculatis; anticarum dimidio apicali subtùs obscurè griseo-nigricanti venis strigisque intermediis nigris; capite anticè cum lateribus colli thoracis et abdominis coccineis. Expans. alar. unc. $4\frac{3}{4}$. [*Hab.* Sylhet.

Papilio *Chara*, W. Alis anticis latis apice rotundatis, anticis basi nigris apice sensìm infuscatis anguloque anali albido, venis strigisque intermediis nigris, alis posticis cyaneo-nigris margine sinuatis ecaudatis; capite anticè et lateribus colli, thoracis et abdominis coccineis. An femina præcedentis? Expans. alar. unc. $5\frac{1}{4}$. [*Hab.* Sylhet *.

Papilio *Castor*, W. Alis latis anticis apice subacutis posticis sinuatis ecaudatis; omnibus suprà fuscis, anticis venis strigisque intermediis nigris; margine punctis minutis albis, posticis maculâ magnâ discoidali (versus angulum externum extensâ) albâ, in 5 partes irregulares divisâ, sinubus albo marginatis; anticis subtùs maculâ parvâ ad apicem areæ discoidalis, serie submarginali punctorum (apicem haud attingenti) punctisque marginalibus albis; posticis fasciâ pone medium e maculis 7 albis magnitudine variis, serieque submarginali lunularum parvarum sinubusque albo marginatis, corpore albo punctato. Expans. alar. unc. $4\frac{3}{4}$. [*Hab.* Sylhet.

Papilio *Pollux*, W. Alis latis posticis sinuatis ecaudatis; omnibus suprà fuscis, puncto ad apicem areæ discoidalis, serie submarginali et marginali punctorum ad apicem extensis albidis; plagisque duabus versus angulum internum; posticis fasciâ latâ albidâ pone medium, serie lunularum submarginali, sinubusque albo marginatis; alis subtùs similiter coloratis at fulvo pulverosis, lunulisque submarginalibus posticarum majoribus; corpore albo punctato. Expans. alar. unc. $4\frac{3}{4}$ — $5\frac{1}{2}$. Variat magnitudine macularum. [*Hab.* Sylhet †.

Papilio *Arcturus*, W. Alis nigris viridi-atomosis, posticis obtusè dentatis et latè caudatis; anticis strigâ interruptâ macularum ex atomis viridibus formatâ, ex angulo postico ad partem dimidiam alarum ductâ et cum margine subparallelâ; posticis suprà

* This species stands in the cabinet of the British Museum with a *manuscript* name attached, which I have not adopted, on the principle that in a *national* museum no name ought to be attached to a species until it has been published. The opposite practice implies a right to appropriate what is *public* property. The case is altogether different in a *private* collection.

[Others of our correspondents maintain, on the contrary, that, by the rule generally acknowledged, according to the custom of Cuvier, Temminck, Lichtenstein and others,—a name attached to a specimen in a *public* or *national* collection is regarded as published, and is in fact quite as much so as if published in a book. But see at p. 481. vol. viii. some observations of Mr. Stutchbury, on species named in museums and catalogues, and not described:—also the remarks of M. Petit, p. 474.—Ed.]

† I am indebted to the Rev. J. Stainforth for an opportunity of figuring and describing this and the four preceding species. They have subsequently passed into the collection of Mr. E. Doubleday. *P. Astorion* is also in the cabinet of the Entomological Society.

plagâ magnitudine mediocri versus angulum externum lætè cæruleâ strigâque ejusdem coloris ex ejus apice ad marginem alarum extensâ; lunulis tribus sanguineis maculâque ocellari (medio nigro) et lineâ transversâ sanguineis ad angulum ani, illâ strigâ curvatâ viridi-atomosâ coronatâ; alis subtùs ferè ut in *P. Paride* coloratis. Expans. alar. unc. 5.

Hab. Himalayan Mountains. Mus. Parry, &c.

Papilio *Canopus*, W. Alis latis; posticis sinuatis et breviter caudatis, omnibus suprà fuscis, anticis fasciâ e maculis 9 albidis submarginalibus punctisque marginalibus, posticis fasciâ pone medium e maculis 7 sinubusque marginalibus albidis, lunulâ cæruleâ (interdum puncto fulvo adjecto) ad angulum ani. Subtùs alis concoloribus, posticis verò maculis transversis ex atomis cæruleis pone fasciam centralem maculisque vel arcubus pallidis submarginalibus. Expans. alar. unc. 3½—4.

Hab. Melville Island. Allied to *P. Pammon.* Mus. Hope.

Papilio *Agamedes*, W. Alis anticis subdiaphanis griseo-nigricantibus basi obscurioribus, fasciâ latâ albâ e margine interno ad medium alæ extensâ, inde versus costam per medium areæ discoidalis extensâ punctisque submarginalibus albis; posticis ecaudatis, fuscis, fasciâ latâ albâ, e medio ferè ad basin extensâ, posticè dentatâ punctisque albis duplici serie ordinatis. Alis posticis subtùs pone fasciam pallidè fuscis nigro lineatis et albo maculatis; basi aurantiis nigro bimaculatis. Expans. alar. unc. 3.

Hab. Ashantee, tropical Africa. Closely allied to *P. Adamaster*, Bdv. Mus. Hope.

Papilio *Trophonius*, W. Alis anticis fuscis, fasciâ parvâ obliquâ mediâ punctisque 7 vel 8 albis plagâque luteâ versus marginem internum in masculo, quæ in fœminâ maculam magnam communem fulvam et partem majorem alæ posticæ occupat, in mare verò luteâ et ultra medium alarum posticarum haud extensâ; maculis submarginalibus albis per paria dispositis, alis posticis ecaudatis; alis subtùs apice luteo-fuscis, maculis ut in paginâ superiore. Expans. alar. unc. 4¼.

Hab. Tropical Western Africa. Brit. Mus. and Westw.

Papilio *Thersander*, Fabr. Alis suprà fuscis, anticis fasciâ latâ pone medium, anticè et posticè angulatâ albâ, punctis tribus versus angulum analem, strigâque abbreviatâ ferè ad apicem albis; posticis caudatis, dimidio externo nigricanti, fasciâ mediâ obliquâ, marginibus integris, lunulis duabus punctisque submarginalibus albis; alis subtùs pallidioribus fasciâ posticarum multo angustiori, lunulis punctisque submarginalibus obsoletis. Expans. alar. ferè 4 unc.

Hab. Gold Coast, Africa. Brit. Mus. and Mus. Bristol Soc.

Obs. Deceived by Donovan's figures of *P. Thersander* (Nat. Rep. iii. pl. 75, which are stated to have been copied from Jones's unpublished Icones, from which Fabricius described the insect), I had introduced it into this Decade as a distinct species; as it is quite unlike Donovan's figures, which (if not fictitious) seem to represent one of the *Nymphalidæ*. Having however this day (Feb. 12, 1842) had an opportunity of examining the six volumes of Jones's Icones, I find not only that the species is identical with the insect figured by Jones, but that there are no figures contained therein agreeing with those published by Donovan. I have not however struck the species out of my Decade, because, having been entirely omitted by Boisduval, this recovery of a lost species is as important as the description of an entirely new one.

N.B. Figures and detailed descriptions of the above Decade are prepared, and will be published hereafter.

VI.—*Description of two new species of Mammalia discovered in Australia by* Captain George Grey, *Governor of South Australia.* By J. E. Gray, Esq., F.R.S., &c.

To the Editors of the Annals of Natural History.

Gentlemen,

Capt. George Grey has just sent to the British Museum specimens of two new species of Australian animals belonging to two genera which have not before been accurately described; I therefore have sent you the accompanying short account of them and the extract from Capt. Grey's letter, which states where they were taken, and the kind of country they inhabit; accompanying these skins was a specimen of a new species of *Pedionomus* allied to *P. torquatus.*

Capt. Grey observes in his letter that he has discovered a new species of *Dasyurus,* an animal allied to the *Hydromus* of Geoffroy, but which he thinks is likely to form a new genus, and two new species of *Phascogale.*

In his voyage out he has found a third species of *Prion,* and a new species of *Puffinus.*

He further remarks, that he is collecting the skeletons of the different animals; and, among other interesting facts, he has observed that the sternum of the *Podargus* does not resemble that of the *Caprimulgidæ,* but much more closely that of the owls. I shall now proceed to describe the mammalia.

Of the first, Capt. Grey observes,—"The most interesting of these specimens, I think, is a representative of the family *Insectivora,* not I believe before found in Australia. This animal, from its general appearance and habits, would appear to be a true *Sorex*; it inhabits the low scrubby and heathy-looking bushes near King George's Sound, and can only be got at by setting the scrub on fire. I have a second species of this animal, which differs from the one I have forwarded in being larger and somewhat differently marked; it is however possible that this may be only a variety and not a distinct species. I have yet only obtained three of these animals."

The animal referred to above would not only have proved a new species, but a hitherto undescribed genus, if it had arrived two weeks sooner; for at the last meeting of the Zoological Society, M. Paul Gervais, one of the assistants in the zoological collection of the Garden of Plants at Paris, on my recommendation, described the genus to which it appears to belong, judging from the figures of the skull and teeth which alone he had with him, under the name of *Tarsipes*, being doubtful if it belonged to the family of *Didelphidæ* or *Lemuridæ*. The account of this genus has not yet been published; but as on my showing M. Gervais the specimens, he observed that it evidently belonged to his genus, though it appeared to be a second species of it, I shall in courtesy use the generic name he has given.

Tarsipes, *Gervais MSS.* *Didelphidæ*, Sect. *Phalangistina*.

Head elongate, tapering, slender. Ears large, hairy. Body mouse-like. Tail elongate, cylindrical, tapering to a fine point, covered with close-set, short, bristly hair, covering rings of squarish scales. Legs short. Toes five, free, callous beneath, dilated at the tips, and with very small acute claws; the inner and outer front toes subequal; the three middle ones larger, nearly equal. The thumb of the hind-feet elongate; the index finger short, only reaching to the first joint; the two outer fingers larger and nearly equal. Scrotum very large, pendent, hairy. The cutting teeth, upper very small; the lower very long, lying down horizontally and projecting in front, subulate, transparent. The canines and grinders very small.

This animal has a resemblance to some of the smaller Lemurs in the form of the claws, in the shortness of the index finger, and in the position and form of the lower cutting teeth. It is much more nearly allied to the *Phalangistæ*, and is easily known from them by the length and slenderness of the lower cutting teeth and the rudimentary nature of the other teeth.

Tarsipes *Spenseræ*.

Blackish gray; back with a longitudinal black streak to the base of the tail and a brown stripe on each side; beneath pale bay, darker on the sides, where it unites to the gray of the sides, and especially over the outside of the limbs. Face blackish gray; forehead dusky brown; cheeks pale brownish. Ears rounded, with scattered short brown hairs; whiskers black.

Inhab. the scrub, King George's Sound.

Length of the body, $3\frac{1}{2}$ inches; of tail, 3; of hind-feet, $\frac{5}{8}$; of head, $1\frac{1}{4}$.

I have named this species after the maiden name of the lady of Capt. Grey, who for many years resided in the north part of New Holland with her father Capt. Spenser, and who has shown during her voyage to and from Australia a great taste for, and paid great attention to, natural history.

Chæropus, *Ogilby*. *Didelphidæ*, Sect. *Peramelina*.

Nose elongate, tapering, slender; muzzle bald, callous; whiskers rigid; eyes moderate; ears large, slightly hairy, thin. Cutting teeth $\frac{4-4}{3-3}$, close, nearly uniform; upper conical, lower truncated, hinder one notched externally. Canines $\frac{1-1}{1-1}$, conical; compressed, upper simple, far from the cutting; lower with a notch in the front edge and near to the hinder cutting teeth. False grinders $\frac{3-3}{3-3}$, upper front compressed like the canines; two others three-lobed, broader, the last approaching the grinders in form; the lower compressed, three-lobed. Grinders $\frac{4-4}{4-4}$, each formed of two triangles united by their wider outer edge of the upper broader; and the inner edge of the higher narrower lobes of the lower teeth, the end of the broad side of the triangle are two-lobed. Legs and feet very slender, weak; the front feet elongate, with two equal toes, each armed with a conical claw; the bone on which the claw is supported is bifid at the top; the sole of the feet callous and convex; the hind-feet elongate, with four toes; the sole compressed; heels hairy; the outer toes very small, armed with a nearly sessile conical claw, placed nearly in the middle of the outer side between the heel and the end of the toe; middle toe very large, elongate, armed with a tapering compressed claw, and with a large callous pad beneath; the two inner toes equal, small, compressed, united together nearly to the claws placed before the outer toes a little before the joint of the first joint of the middle toes, which has a rounded pad beneath it; the claws of these toes are compressed, concave beneath and sharp-edged. Tail elongate, hairy, with a small terminal pencil.

This genus is at once known from *Perameles*, to which, in other respects, it is very nearly allied by the conformation of its feet. The genus was established by Mr. Ogilby in the Proceedings of the Zoological Society, 1828, on a drawing brought home by Sir T. L. Mitchell, who had left the animal at the Sidney Museum. A copy of this drawing is published in Mitchell's 'Eastern Australia,' vol. ii. 131. t. 27.

Sir Thomas Mitchell's specimen was without any tail; hence Mr. Ogilby named it *Chæropus ecaudatus*; but I strongly suspect, when the animal is rediscovered, it will be found to have a tail, like the one here described; for the tail appears, as in *Perameles*, to be easily destroyed in skinning, as in the specimen under examination the tail is only attached to the skin by a very narrow piece.

There are no smaller toes behind the two large front ones, which Mr. Ogilby (Ann. Nat. Hist., vii. 231) considers probable to exist; and the hind-feet, as may be seen by the description, are not "perfectly similar to those of *Perameles*;" and from these discrepancies I should have been induced to consider the animal under consideration a distinct genus from that described by Mr. Ogilby, if it had not very accurately agreed with Sir Thomas Mitchell's copy of his figure.

Mr. Gould, who examined the specimens in the Australian Museum at Sidney, informs me that he believes it is very different from the one here described, and has longer legs.

CHÆROPUS *castanotis.*

Brownish gray, beneath white, sides brownish. Head gray, with intermingled black hairs; whiskers black, rigid. The ears two-thirds the length of the head, broad, thin, rather coriaceous, covered at the base and internally with short, close-set, rufous hairs, naked and blackish at the tip externally. Fur soft, lead-coloured, with longer black-tipped hairs on the back, and rufous-tipped hairs on the sides; outer side of the thighs and legs covered with soft hair; the feet covered with short, close-pressed hair, rufous from the heel to the base of the middle toes, and the rest brownish white. Tail with white adpressed hairs, with a central black stripe along the upper surface, becoming paler and ending in a ridge of elongated brownish white hairs over the tip. Inhab. the scrub near the Murray: the Hon. Capt. G. Grey. Length of body and head, 10 inches; of tail, $3\frac{1}{4}$; ears, $1\frac{3}{4}$; of head, $3\frac{1}{4}$; of hind foot, $2\frac{1}{2}$; from the tip of the nose to the eye, $1\frac{1}{2}$.

Capt. Grey, in a letter dated July 15, 1841, observes, "A man I have out collecting had obtained a specimen of a marsupial animal with cloven feet, which, as far as I can understand the description, is nearly allied to the *Chæropus ecaudatus* of Mr. Ogilby, and yet differs from it in several particulars." And further, "since writing the above, my collector has come in from the Murray, and I have sent home the animal resembling *Chæropus ecaudatus* of Mitchell, but which differs from it in several particulars; amongst others, it has a tail and a very handsome one. It inhabits the scrub near the Murray river."

British Museum, Feb. 4, 1842.

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. 8. *Revisio Populorum.* Auctore EDUARDO SPACH. (Ann. des Sc. Nat. t. xv. p. 28.) [Extracts so far as relating to the British species.]

Sectio I. LEUCE, Reichb.

Rami ramulique cylindrici; novelli (præsertim surculi radicales) tomentosi, v. velutini, v. pubescentes. Folia ramularia sæpissimè latitudine longitudinem æquantia v. subæquantia, petiolo longo, gracili, plano-compresso. Flores masculi 4-8-andri. Stigmatum laciniæ angustæ, divaricatæ. Amenta fructifera densa. Squamæ bracteales pilosæ v. sericeo-lanatæ, palmatifidæ (unicâ specie exceptâ).

A. *Squamæ bracteales integerrimæ vel nonnisi apice subincisæ; masculorum lanatæ; fœminearum sparsè pilosæ, caducæ. Amenta fœminea masculis multò graciliora. Discus floris fœminei cupuliformis, ovario multò brevior. Stylus brevissimus, indivisus. Stigmata 2, flava, bipartita (laciniis linearibus, æquilongis), basi confluentia, crucis peltatæ obliquæ figuram simulantia.*

POPULUS ALBA, Linn.—Eng. Bot. t. 1618. Guimp. et Hayn. Deutsch. Holz. tab. 202.—*Populus major*, Mill.—*Populus nivea*, Willd. Arb. Gemmis haud viscosis, junioribus ramulisque tomentosis. Foliis subtùs niveo-tomentosis (ramularibus adultis sæpè glabrescentibus), suprà lucidis, viridibus; ramularibus ovatis v. ovato-oblongis, v. subrotundis, obtusis, sinuato-angulatis, v. profundè crenatis, v. sinuato-dentatis, basi rotundatis v. subcordatis; turionalibus ovatis, v. ovato-lanceolatis, v. palmati- (3- v. 5-) lobis, eroso-denticulatis, basi acutis, v. rotundatis, v. cordatis.

B. *Squamæ bracteales omnes profundè palmatifidæ, longè sericeo-pilosæ. Amenta fœminea sub anthesi amentis masculis haud tenuiora. Discus fœmineus cyathiformis, ovarium totum induens. Stylus bifurcatus. Stigmata distincta, purpurea, obliquè peltata, subflabelliformia, irregulariter 3- v. 4-fida.*

a. Turionum folia palmatinervia, sæpè 3- v. 5-loba.

POPULUS CANESCENS, Smith, Eng. Bot. t. 1619.—Guimp. et Hayn. Deutsch. Holz. tab. 201.—*Populus alba*, Willd. Arb. (multorumque auctorum). Gemmis pulverulentis v. tomentosis, haud viscosis. Foliis suprà viridibus, subtùs albido- v. cinereo-tomentosis: ramularibus ovatis v. subrotundis, obtusis, sinuato-angulatis, v. profundè crenatis, basi rotundatis v. cordatis, demum glabrescentibus; turionalibus nunc ovatis v. triangularibus plùs minúsve angulosis, nunc palmatis, 3- v. 5-lobis, denticulatis, acuminatis, basi (plerumque profundè) cordatis.—Perperàm sanè a multis cum *Populo albo* confusa; vix autem a sequente specificè distinguenda.

b. Folia nunquam palmata.

POPULUS TREMULA, Linn.—Eng. Bot. tab. 1909.—Guimp. et Hayn. Deutsch. Holz. tab. 203.—*Populus villosus, Reichb.* Fl. Germ. Excurs.—Gemmis glabris, viscosis. Foliis ramularibus suborbicularibus v. ovato-subrotundis, obtusis, v. subacuminatis, sinuato- v. eroso-dentatis v. crenatis, discoloribus (suprà viridibus, vix aut ne vix lucidis, subtùs viridi-glaucis): novellis glabris v. pubescentibus, adultis sæpissimè glabris. Foliis turionalibus cordatis v. ovatis, v. triangularibus, acuminatis, sinuato-dentatis v. crenatis: novellis utrinque velutinis, adultioribus suprà glabrescentibus, subtùs incano-tomentosis.—Folia turionum *Populi ca-*

nescentis foliis turionalibus indivisis planè similia; nec raro occurrunt individua *Populi tremulæ* quorum folia ramularia ab illis *Populi canescentis* vix aut ne vix dignoscerentur. Foliorum dimensione autem *Populus tremula* simul ac *Populus canescens* mirè variant.

Sectio III. Aigeiros, Reichb.

Gemmæ (simul ac folia novella) viscosæ, plerumque glabræ, nunquam tomentosæ. Rami et surculi cylindrici v. acutanguli. Folia latitudine longitudinem æquantia v. subæquantia, utrinque subconcoloria (viridia), nunquam lobata nec angulata; petiolo longo, gracili, plano-compresso. Squamæ bracteales glabræ, fimbriato-ciliatæ. Flores masculi 8–30-andri. Stylus bifurcatus. Stigmata 2, reniformia, v. suborbicularia, obliquè peltata, flava, reflexa, margine crenata. Amenta fructifera laxa, moniliformia.

a. Rami et turiones cylindrici v. obsoletè angulati.

POPULUS NIGRA, Linn.—Blackw. Herb. tab. 248. Eng. Bot. t. 1910. Guimp. et Hayn. tab. 204. Ramis patulis. Foliis ovatis v. deltoideis, v. rhomboideis, cuspidato-acuminatis, crenatis v. serratis, glaberrimis, plerumque latitudine sublongioribus. Stipulis ovatis, acuminatis. Stigmatibus suborbicularibus, apice bilobis.

Var. β. PYRAMIDALIS.—*Populus pyramidalis*, Rozier in Dict. d'Agric.—*Populus dilatata*, Ait. Hort. Kew.—*Populus italica*, Mœnch.—*Populus fastigiata*, Pers.—*Populus pannonica* et *Populus polonica*, Hortulan. Ramis arrectis. Foliis plerùmque longitudine latioribus.

POPULUS HUDSONICA, Mich. fil. Arb. iii. tab. 10. fig. 1.—*Populus betulæfolia*, Pursh, Flor. Amer. Sept. Ramis patentibus. Foliis ovatis v. deltoideis, v. rhomboideis, cuspidato-acuminatis, crenatis, v. serratis, subtùs petioloque puberulis. Stipulis lineari-subulatis. Amenta nobis haud innotuere. An varietas *Populi nigræ*?

No. 9. *Revisio Betulacearum.* Auctore Eduardo Spach. [So far as regards our British genera and species.] (Ann. des Sc. Nat. n. s. t. xv. p. 182.)

Conspectus Generum.

I. BETULEÆ.

Amenti fœminei squamæ trifloræ, biappendiculatæ (rarissimè 1-floræ, inappendiculatæ). Squamæ strobilinæ trilobæ (raró integerrimæ v. basi bi-auriculatæ), subcoriaceæ v. chartaceæ, basi incrassatæ, supernè attenuatæ, maturitate cum nuculis, v. paulò tardius, deciduæ. Strobili plerumque cylindracei, elongati, sessiles, v. pedunculati.

BETULA, Tourn.—Flores masculi 3–6-andri, perianthio imperfecto, e squamulis 5–8, sejunctis, inordinatis, inæqualibus (3 superioribus majoribus, subcucullatis; cæteris sæpissimè minimis). Filamenta apice bifurca: crure utroque antheram dimidiatam gerente; antheræ thecæ basi affixæ, ex toto sejunctæ. Squamæ strobilinæ sursùm imbricatæ, adpressæ, simul cum samaris deciduæ. Samara alâ pellucidâ cincta; specie unicâ nucula aptera, margine incrassata.—Floratio vernalis, foliorum evolutione coætanea. Amenta mascula e gemmis aphyllis, lateralibus v. lateralibus terminalibusque, solitaria v. gemina, hieme nuda. Amenta fœminea e gemmis lateralibus, 3–5-phyllis, solitaria, hieme perulis obtecta. Folia haud persistentia. Samaræ plerisque per maturationem squamis strobilinis obtectæ.

II. ALNEÆ.

Amenti fœminei squamæ bifloræ, 4-appendiculatæ. Squamæ strobilinæ cuneiformes, breviter 5-lobæ (v. lobo medio obsoleto quasi 4-lobæ), lignosæ, supernè incrassatæ, horizontales, per maturationem arctè superimpositæ (subcohærentes), demùm invicem secedentes, nunquam deciduæ.—Strobili subglobosi v. ovoidei, breves, pedunculati. Samaræ per maturationem obtectæ.

Flores masculi 4-andri (rarissimè 5- v. 6-andri), in quâvis squamâ terni, perianthio regulari, rotato, 4- (rarò 5- v. 6-) partito. Antheræ medio affixæ, thecis medio connatis, basin et apicem versus sejunctis. Samara alâ chartaceâ opacâ cincta; specie unicâ nucula aptera, margine incrassata.

ALNUS, Tourn.—Amenta utriusque sexûs e gemmis aphyllis prodeuntia, hieme nuda, sub anthesi paniculam nudam ramulum præteriti anni terminantem sistentia; speciebus paucis amenta utriusque sexûs in ramulis novellis axillaria terminaliaque, perulis omninò orbata. Amenta mascula racemosa, sæpissimè terminalia. Amenta fœminea e quâvis gemmâ v. axillâ aut solitariâ, aut racemosâ.—Floratio (specierum gemmis floralibus aphyllis gaudentium) hiemalis, foliorum evolutione præcocior. Folia haud persistentia.

BETULA, Tourn.

Amenta mascula solitaria v. gemina, sessilia, hieme nuda, e gemmis aphyllis, terminalibus, v. lateralibus terminalibusque; squamæ 1-floræ, 2-appendiculatæ. Flores 3–6-andri. Perianthium squamulis 5–8, sejunctis, inæqualibus, quorum 3 superiores, majores, subcucullatæ, squamæ ejusque appendicibus antepositæ; cæteræ minores v. rudimentariæ, inordinatæ. Stamina (squamulis perianthinis nunc isomera, nunc pauciora) singula squamulæ perianthinæ suprà basin inserta. Filamenta brevia, bifurcata; crure utroque antheræ thecam gerente. Antheræ thecis ellipticis v. oblongis, basi v. paulò suprà basin affixis, ex toto sejunctis.

Amenta fœminea e gemmis 3–5-phyllis, lateralibus, solitaria (rarissimè gemina), gracilia, per hiemem perulata; squamæ trifloræ (speciebus nonnullis unifloræ!), 2-appendiculatæ (speciebus paucis exappendiculatæ). Strobili cylindracei v. ovales, compacti: squamis subcoriaceis, appressis, sursùm imbricatis, trilobis (speciebus paucis integerrimis), basi incrassatis, maturitate deciduis. Samaræ alâ membranaceâ translucidâ cinctæ (exceptâ specie unicâ, cui samara, v. potius nucula, aptera, margine incrassata), plerumque squamis strobilinis obtectæ.

Arbores v. frutices. Rami teretes v. obsoletè angulati. Gemmæ perulatæ. Folia serrata, v. crenata, v. nonnunquàm (variatione) pinnatifida, haud persistentia, petiolata (plerùmque brevè): floralia gemina v. subrosulata; turionalia floralibus majora et sæpè formâ alienâ, haud raro angulata. Floratio vernalis, foliorum evolutione coætanea. Amenta e gemmis perulatis orta: mascula jam exeunte æstate præteritâ evoluta, propter perulas fugaces mox nuda, sub anthesi pendula v. nutantia: squamis ciliolatis, plerumque basi et apice plùs minúsve acuminatis. Fœminea sub anthesi erecta v. resupinata. Strobili erecti v. penduli, rachi gracili v. ferè filiformi. Ramuli fructiferi maturatione peractâ haud emortui.

Sectio I. Pterocaryon, Spach.

Samaræ alâ membranaceâ cinctæ.

* *Strobili pedunculati, penduli; squamis semper trilobis, tricarpis, samaras latè alatas per maturationem obtegentibus.*

B. ALBA, Linn.—Trunco arboreo: epidermide niveâ (rariùs fuscâ aut aureo-fuscâ). Ramulis novellis resinoso-verruculosis, demùm ramisque sæpiùs pendulis. Foliis biserratis, v. inæqualiter serratis, v. grossè crenato-dentatis, cuspidato-acuminatis, v. acutis, punctatis, basin versus integerrimis, obliquè truncatis v. cuneatis, v. rotundatis, v. cordatis; turionalibus cordato-ovatis, angulatis; novellis viscosis; adultis suprà saturatè, subtùs pallidè viridibus. Strobilis cylindraceis, elongatis, crassis: squamarum lobis dissimilibus, sæpè invicem incumbentibus: lateralibus suborbicularibus, v. obliquè ovatis, v. semi-orbicularibus, v. subcultratis, obtusis, nunc terminali parallelis, nunc divaricatis, nunc deflexis; lobo terminali ovato, v. ovato-oblongo, v. oblongo, v. deltoideo, obtuso, v. acutiusculo, nunc abbreviato, nunc plùs minúsve elongato. Samarâ obcordato- v. obreniformi-bilobâ: alis loculamento (obovato v. oblongo-obovato) longioribus; duplò triplóve (rariùs parùm) latioribus.

—— *α. vulgaris.*—*Betula alba,* auctor. plur.—*Betula verrucosa,* Ehrh. —*Betula pendula,* Hoffm.—Foliis floralibus rhomboideis, v. deltoideis, v. ovatis, v. cordatis, acuminatis, longè petiolatis, ramulisque annotinis glaberrimis. Pedunculis fructiferis petiolis plerumque brevioribus.—Surculorum folia sæpissimè pubescentia v. hirta.

—— *β. populifolia.*—*Betula populifolia,* Willd.—Mich. fil.! Arb. ii. p. 139, cum fig. (forma grandifolia).—Wats. Dendr. Brit. tab. 151! (forma foliis minoribus).—*Betula acuminata,* Ehrh. Beytr. —*Betula lenta,* Duroi (non Linn.).—*Betula cuspidata,* Schrad.! ined.—Foliis longiùs cuspidato-acuminatis; cæterum var. *vulgari* omninò similis, simulque inter stirpes Europæas passim occurrens. (V. v. c. et s. sp.)

——*γ. Dalecarlica.*—*Betula alba Dalecarlica,* Linn.—*Betula hybrida,* Blom. in Act. Holm. 1786, p. 168, tab. 6. fig. B. (non

Bechst.).—*Betula laciniata,* Wahlenb.—Foliis plùs minúsve pinnatisectis. (V. v. c.)

—— δ. *pubescens.*—*Betula alba pubescens,* Linn.—*Betula pubescens,* Ehrh. Beytr.—Guimp. et Hayn. Deutsch. Holz. tab. 146 !—*Betula odorata,* Bechst. Forst. bot. p. 273.—*Betula hybrida,* Bechst. l. c. p. 277.—*Betula aurata,* Borkh.—*Betula carpathica,* Waldst. et Kit.—*Betula glutinosa,* Wallroth.—*Betula alba,* Horn. Flor. Dan. tab. 1467.—*Betula pontica,* Desfont.! Hort. Par. Wats. Dendr. Brit. tab. 94 !—*Betula intermedia,* Thomas !—*Betula torfacea,* Schleicher.—*Betula ætnensis,* Rafin.—*Betula harcynica,* Wender.—*Betula nigra,* Murrith (nec alior.).—*Betula macrostachys,* Schrad. ! MSS.—*Betula davurica,* Pallas, (ex parte ?) Flor. Ross. I. tab. 39*.—Foliis floralibus ovatis, v. cordatis, v. deltoideis, v. rhomboideis, acuminatis, v. acutis, nunc longius, nunc brevius petiolatis, subtùs (ad nervorum axillas saltem) pubescentibus ; petiolo pubescente v. glabriusculo, pedunculo fructifero nunc breviore, nunc longiore. Ramulis novellis sæpiùs pubescentibus v. villosis.—In Europæ præsertìm turfosis v. uliginosis. (V. v. c. et s. sp.)

—— ε. *urticæfolia.*—*Betula urticæfolia,* Hortul.—Foliis floralibus deltoideis, v. rhomboideis, cuspidato-acuminatis, inciso-serratis dentatisve, subtùs petiolo ramulisque novellis pubescentibus.—Colitur in hortis.

—— ζ. *papyrifera.*—*Betula papyrifera,* Mich. ! Flor. Bor. Amer.—*Betula papyracea,* Willd.—Wats. Dendr. Brit. tab. 152 !—*Betula nigra,* Duham. ed. nov. II. tab. 51 ! (exclus. syn.) et *Betula excelsa,* id. l. c. tab. 52 ! (exclus. syn.).—*Betula grandis,* Schrad. ! MSS.—Foliis floralibus ovatis, v. cordato-ovatis, v. ovato-oblongis, v. ovalibus, v. subrhomboideis, cuspidato-acuminatis, petiolo (sæpiùs villoso v. pubescente) 2—6° longioribus, subtùs ad nervos (v. saltem ad eorum axillas) pubescentibus v. tomentosis. Pedunculis strobiliferis petiolis sæpè æquilongis v. sublongioribus.—Varietas in Americâ boreali quam in hemisphærio cisatlantico vulgatior, foliis (plerumque brevè petiolatis) strobilisque amplioribus insignis. Occurrunt tamen formæ *Betulæ albæ pubescentes* nostratium, a stirpibus Americanis *Betulæ albæ papyriferæ* nullo modo distinguendæ. Squamæ strobilinæ pari modo ac in cæteris *Betulæ albæ* varietatibus ludunt ; pro specie genuinâ igitur, permultis comparatis speciminibus, tam spontaneis quam cultis, haud assumendam esse censemus.—Folia turionalia sæpè semipedalia, 3–4-pollices lata. Strobili subbipollicares. Rami novelli hirsuti v. subtomentosi. (V. v. c. et s. sp.)

* Ex icone l. c. saltem discrimen nullum patet; *Betula davurica,* Ledeb. (Flor. Alt. iv. p. 245) ex cl. auctoris descriptione ab homonymâ Pallasianâ specie aliena videtur ; vidimus etiam specimina (fructibus orbata) a cl. Fischer nomine *Betulæ davuricæ* inscripta, vix cum descriptione Ledebourianâ, nec magis cum icone Pallasianâ quadrantia. In hortis sub nomine *Betulæ davuricæ,* nonnisi varietates *Betulæ albæ* invenimus.

** *Strobili erecti, pedunculati: squamis parvulis, semper trilobis, tricarpis, samaras angustissimè alatas per maturationem haud obtegentibus.*

B. NANA, Linn. (non Pallas; nec Ledeb.; nec Mich.; nec Hook. Flor. Bor. Amer.).—Flor. Dan. tab. 91.—Engl. Bot. tab. 2326.—Guimp. et Hayn. Deutsch. Holz. tab. 148.—Fruticosa; ramis divaricatis v. decumbentibus, virgatis: novellis tomentosis v. puberulis, impunctatis, v. minutè punctulatis. Foliis (sæpiùs parvulis) orbicularibus, v. suborbicularibus, v. flabelliformibus, v. obovatis, crenatis, obtusissimis, subcoriaceis, punctulatis, subsessilibus, glabris, subtùs reticulatis, basi cuneatâ, v. rotundatâ, v. subcordatâ. Strobilis ovalibus v. oblongo-cylindraceis; squamis cuneiformibus, ad medium v. minus profundè partitis: lobis oblongis, obtusis, subæquilongis, nunc parallelis, nunc plùs minúsve divergentibus. Samarâ ovatâ v. suborbiculari, marginatâ.—Europæ regiones boreales et alpinæ. Sibiria? America borealis? (V. v. c. et s. sp.) ex Alpibus et Europâ borealiori: stirpes quas vidimus Americanas et Sibiricas, pro *Betulâ nanâ* ab auctoribus variis collectas, aut ad *B. rotundifoliam*, Spach, aut ad *B. Michauxii*, Spach. referendæ sunt.

ALNUS, Tourn.

Amenta utriusque sexûs e gemmis aphyllis prodeuntia, hieme nuda, jam æstate præteritâ evoluta, sub anthesi paniculam nudam, ramulum præteriti anni terminantem sistentia; speciebus paucis amenta utriusque sexûs in ramis novellis axillaria terminaliaque, perulis omninò orbata. *Amenta mascula* sæpissimè subterminalia, racemosa (2–5 e quâvis gemmâ v. axillâ), squamis stipitatis, trifloris, quadri-appendiculatis. Flores 4-andri (v. raro 5- v. 6-andri). Perianthium regulare, rotaceum, 4-partitum (raro 5- v. 6-partitum). Stamina supra basin perianthii segmentorum inserta; filamenta brevia, filiformia, indivisa; antheræ elliptico- v. oblongo-didymæ, medio dorso affixæ, thecis medio connatis, cæterum sejunctis.—*Amenta fœminea* brevia, cylindracea, crassiuscula, masculis sæpissimè infra-posita, in quâvis gemmâ axillâve aut solitaria, aut racemosa (3–7), squamis, 2-floris, 4-appendiculatis. Strobili ovales v. subglobosi, breves: squamis lignosis, nervosis, cuneiformibus, supernè incrassatis, breviter 5-lobis (aut lobi terminali brevissimo, quasi 4-lobis), horizontalibus, arctè superimpositis, pro disseminatione invicem secedentibus, haud deciduis. Samaræ squamis strobilinis obtectæ, alâ chartaceâ opacâ (intùs suberosâ) cinctæ; specie unicâ apteræ, margine incrassato, lato, suberoso cinctæ.

Arbores v. frutices, ramis junioribus angulosis. Gemmæ perulatæ, stipitatæ. Folia erosa, v. denticulata, v. serrata, v. variatione pinnatifida, haud persistentia, omnia sparsa: turionalia sæpissimè angulosa v. sinuato-lobata. Floratio specierum gemmis floralibus aphyllis gaudentium foliorum evolutione præcocior. Ramorum pars fructifera demùm lateralis, peractâ maturatione emortua. Amenta mascula sessilia v. subsessilia, pendula, elongata, decidua. Amenta fœminea erecta v. adscendentia, pedunculata. Strobili crassi, compacti, erecti, pedunculo anguloso, rachique crasso sublignoso.

Sectio II. Gymnothyrsus, Spach.

Floratio subhyemalis, foliorum evolutione præcocior. Amenta e gemmis aphyllis prodeuntia, jam exeunte æstate præteritâ evoluta, propterque perulas mox deciduas nuda, sub anthesi paniculam aphyllam, ramulum præteriti anni terminantem sistentia; fœminea semper masculis infrà posita.

* *Amenta fœminea racemosa (in quâvis gemmâ). Folia brevè petiolata, sæpius (turionalia saltem) angulosa.*

A. GLUTINOSA, Gærtn. Fruct.—Guimp. et Hayn. Deutsch. Holz. tab. 180.—Hook. Fl. Lond. tab. 59.—*Betula Alnus*, Linn.—Engl. Bot. tab. 1508.—*Betula glutinosa*, Hoffm. Fl. Germ.—*Alnus communis*, Duham. ed. nov. II. tab. 64.—*Alnus vulgaris*, Rich.—Foliis inæqualiter denticulatis, v. serrulatis, v. crenatis, viscosis, lucidis, subtùs punctulatis, ad nervorum axillas tomentosis (rarò glaberrimis), sæpius obtusis. Samarâ obovatâ v. suborbiculari, alis supernè ampliatis, loculamento subdimidio angustioribus.

—— *α. vulgaris.*—*Alnus glutinosa* auctorum.—*Betula emarginata*, Hoffm. Germ.—*Alnus emarginata*, Kroch. Siles.—*Alnus glutinosa emarginata*, Willd.—*Alnus nigra*, Gilib.—*Alnus macrocarpa*, Lodd. Cat.!—Foliis obovatis, v. obovato-ellipticis, obtusissimis, plerumque emarginatis, basi cuneatis v. rotundatis.

—— *β. subrotunda.*—*Alnus subrotunda*, Desfont. Cat. Hort. Par.!—*Alnus denticulata*, C. A. Meyer! Enum. Plant. Caucas.—Foliis obovatis v. obovato-subrotundis, obtusissimis, haud emarginatis, basi cuneatis.

—— *γ. acutifolia.*—*Alnus oblongata*, Willd.—*Betula oblongata*, Hort. Kew. ed. 1.—*Alnus barbata*, C. A. Meyer! Enum. Plant. Caucas.—Foliis ovalibus, v. obovatis, acutis, v. subacuminatis, basi cuneatis.

—— *δ. pinnatifida.*—*Alnus glutinosa laciniata*, Willd.—Foliis oblongis, profundè pinnatifidis: segmentis semi-lanceolatis, v. subfalcatis, acutis, integerrimis.

—— *ε. quercifolia.*—*Alnus glutinosa quercifolia*, Willd.—Foliis oblongis, obtusis, sinuato-lobatis, lobis rotundatis.

—— *ζ. oxyacanthæfolia.*—*Alnus oxyacanthifolia*, Lodd. Cat.!—Foliis lyrato-pinnatifidis, v. sinuato-lobatis, oblongis, v. obovatis; lobis rotundatis, v. obovatis, crenatis.

VIII.—*Description of a new species of Ichneumon* (Herpestes) *discovered in Spain.* By J. E. Gray, F.R.S., &c.

To the Editors of the Annals of Natural History.

Gentlemen,

Capt. S. J. Widdrington of Carlton having lately sent to the British Museum, along with a fine specimen of *Felis Pardina* of Oken, an *Herpestes* which was found with the lynx in the Sierra Morena in Spain, I have been induced to send you for publication a short description of it, as this genus has never been recorded as found in Europe, and as the species on examination proves to be distinct from the species which is found in North Africa. From the attention which Capt. Widdrington (late Capt. Cooke) has paid to the animals of Spain, I have been induced to name this species added by his exertions to the fauna of Europe in remembrance of him,

HERPESTES WIDDRINGTONII, *Andulasian Ichneumon.*

Fur black and white, grisled; side of the nose, feet, and the end of the tail blackish; the hair of the back is long, black, with three broad white rings and a very fine brownish tip; under fur soft, bay-coloured, half as long as the hairs, most seen on the middle of the back; the hairs of the face are short, adpressed; the throat and belly are nakedish; the ears short, rounded, covered with short, soft, fine ringed hairs.

Inhab. Sierra Morena.

Length of body and head, 22 inches; of tail, 20.

This species is most nearly allied to *Herpestes Ichneumon*; but it differs from that species in the hairs being much shorter and having only three rings, while the hairs of the back of *H. Ichneumon* are white with seven broad black rings, leaving a long white base and only narrow rings between the black ones above.

British Museum, Feb. 17, 1812. I am, Gentlemen, yours very truly,
J. E. GRAY.

BIBLIOGRAPHICAL NOTICES.

Histoire Physiologique des Plantes d'Europe, ou exposition des Phénomènes qu'elles présentent dans les diverses périodes de leur développement. Par J. P. Vaucher, Prof. à l'Académie de Genève. 4 vols. 8vo. Paris, 1841.

WE have now the pleasure of calling the attention of our readers to a work of the highest value to the student of botany, the production of an author long favourably known to botanists, although his name may be comparatively new to the younger votaries of science, owing to the distant intervals at which his works have appeared. The most celebrated of his former works is his 'Histoire des Conferves d'eau douce,' published in 1803; and we may also mention as a well-known production, although not of equal value with the above, his 'Monographie des Orobanches.' Neither of these however appears to us to make even a moderate approach to the value of the work now before us, which the author states to be the result of the "travail d'une grande partie de ma vie *." It consists of four thick octavo

* The venerable author received the first copies on his death-bed,—blessed Heaven that he had been favoured with this last satisfaction,—and employed his little remaining strength in sending some copies to his friends.

volumes closely printed, and containing, under the classification proposed by the lamented DeCandolle, a full description of the external structure of each natural order, and all the genera of European plants. Under the order are given its characters, peculiarities, anomalies and affinities, the mode in which it is divided into suborders or sections, and the opinions concerning it that have been held by those writers who have more peculiarly made it an object of study. Each genus is then taken separately, its distinctive characters pointed out, its several sectional divisions examined in detail, and the more remarkable European species commented upon. Then follows a statement of the mode in which each organ has been observed to vary in the several species, and the points from which the specific characters are derived, with observations as may appear requisite.

At the conclusion of this work the author states that he considers it to have been now proved, that the nectariferous fluid which is secreted by manifest organs in many plants, and which he believes to exist in all (its origin in numerous instances being a gland under the germen), is the agent by means of which fecundation is effected. He believes that this fluid spreads itself over the stigma, and in some cases over the whole interior of the flower, at the time when the pollen is ripe and the pistil is in a fit state to receive its influence; that the pollen grains fall upon it and are ruptured by its agency, and give out their contents (émanations) upon the stigma. He also states that the extrorse or introrse opening of the anthers is regulated by the position of the nectaries, so that the pollen may fall upon them and be conveyed, by some mode which we do not perceive that he has explained, to the stigma. This idea certainly appears to be well deserving of the attention of botanists, but we are not prepared to subscribe fully to it without more observation. In conclusion we beg to recommend this work most strongly to our readers.

Transactions of the Berwickshire Naturalists' Club.

In a former number (vol. v. p. 129) we noticed with cordial approbation the pleasing and useful proceedings of this Society, to which we not merely wish prosperity, but trust that it may serve as a model for similar associations in every part of the country. We have just been favoured with a copy of the proceedings of the Club for 1841, containing the address of Dr. Francis Douglas at the anniversary held at Kelso, Sept. 15, in which an account is given of the preceding anniversary at Holy Island, then selected as the scene of one of the periodical excursions of the members. Here we are informed—"The walk of the Club was directed towards the Coves, where an hour or two was busily devoted in searching out and noting the various marine animals which lurk beneath the flat stones in '*Coveshaven.*' The Coves are excavated in a very picturesque sandstone cliff, of about 200 yards in length, and 35 feet in height: three of them are of considerable size and interest; their walls are covered with a dense coat of the *Polysiphonia stricta*, which gives them the appearance of being papered with a rich scarlet cloth. In former times they were the resort of numerous flocks of seals, which took, in those cool recesses, their repose without fear of surprise; but they have now forsaken their ancient haunts, expelled by the too frequent visits of lovers of the picturesque, or of poaching, and by the revels of pleasure parties. A few rarities were found in the Haven, of which the following may be specified:—Of Algæ, the only one worth notice is *Zonaria deusta*, which spreads like a lichen over the rocks in great profusion. The *Millepora lichenoides*, the *Melobesiæ*, and *Corallina officinalis*, occurred in every pool; and it was easy to demonstrate by the different-staged specimens there, that these productions were merely different states of one species. The *Halisarca* of Dujardin, perhaps the lowest of animal organizations, was noticed in much abundance and perfection; and we could easily imagine, that, by the addition of siliceous spicula immersed and crossed in its texture, it might become the *Halichondria panicea* of Fleming, which grew alongside of it in several varieties.—Of the calcareous sponges, there were met with *Grantia coriacea, botryoides, foliacea*, and a singular variety of *G. ciliata*.—Of Zoophytes, *Coryne squamata, Laomedea gelatinosa, Sertularia pumila, Lepralia coccinea, Actinea mesembryanthemum*, abounded, and in especial perfection and beauty.—Of the Echinodermata, no other species than *Echinus esculentus, Ophiura fragilis* and *neglecta*, occurred. The *Echinus* was generally hidden by broken pieces of sea-weed, with which it covered its shell.—Of the *Mollusca tunicata* there were many species remarkable for their beauty; but we can only specify the *Ascidia rustica, Phallusia intestinalis*, and *Aplidium ficus*, for of the others the names could not with certainty be determined. The calcareous stones were often found perforated with *Pholas crispata*, and one stone was found by Captain Mitford with many of the shells still living hidden in their excavations. In one of these holes a good specimen of *Venus perforans* was found; and the *Saxicava rugosa* was not uncommon. A great number of specimens of *Lamellaria tentaculata* of Montagu were taken, showing that the species is liable to considerable variation in colour, and in the degree of roughness of the mantle.—Several very minute individuals of the *Doris tuberculata* were taken up unnoticed, until after our return home, and it is remarkable that in these, some of which were an eighth of an inch in length, there was no appearance of branchiæ. Another member of the family *Doridæ* occurred, which is without exception the most beautiful naked gasteropode we have seen; its name remains for future investigation.

"Passing from the Haven, the party next crossed over a formation of limestone, consisting of three beds, from three to four feet each in thickness, which, at the point to the eastward of the north sands, assume a singularly undulated appearance. Mr. Skafe has given a very brief description of these, and a figure, illustrative of their undulations, in Raine's History of North Durham, p. 172. Thence we walked to the Snook, to the spot where Mr. Donaldson Selby is boring for coal. Here the party separated, one division walking towards the village in as direct a line as possible, that they might have leisure to examine the Priory, Church, and Castle; another set, bent on the murder of rabbits and partridges, wandered over the links and fields in many a devious track; while a third set wandered leisurely round by the loch in search of rarities in any class or kingdom of animality, but they were as little successful as their murderous or sporting colleagues. At dinner the party were reunited, and afterwards, as is our wont, the Secretary read the address of the President, who was prevented from attending by absence from home. On the nomination of Mr. Selby, Dr. F. Douglas was elected President for the ensuing year. A notice of the occurrence of the *Halichœrus gryphus* on the coast, by Dr. Douglas, was next read, on which Mr. Selby was requested to report at the next meeting. Dr. Johnston was appointed Secretary for the year."

At the Spring Meeting at Ayton, May 5, the excursion was along the course of the river Eye and the ravine of the Aleburn: and on that of June 16 at Wooler, Wooler Common was traversed, with the adjacent moors, and the course of the Coldgate-Burn. At the Meeting of the 28th of July, at Bank House, the course of the Eye was explored, and the moors between that river and the Whitadder.

LINNÆA BOREALIS.

"After dinner, Dr. Johnston communicated to the Club that he had received the interesting notice of the discovery of *Linnæa borealis* in Berwickshire, specimens of which were laid on the table. It was discovered seven years ago by Mr. Dunn, gardener, at Mellerstain; but for the notice the Club is indebted to Mr. Hislop, teacher in the Normal Schools of Glasgow. 'The *Linnæa* occupies a space of about 150 yards in a fir-wood near Lightfield Farm, Mellerstain.' It was, when Mr. Hislop visited the spot, in the middle of July, just going out of flower; but several specimens in that state were gathered. The time of flowering is stated in our British Floras to be in May and June, but this period would appear to be too early for our district; 'and as a pilgrimage to the habitat of a plant which commemorates the immortal name of Linnæus,' says our worthy Secretary, 'seems to be almost a sacred duty on the part of our Club, I would respectfully suggest the propriety of fixing our next year's June meeting at the village nighest to it.'"

Dr. Douglas records "one very interesting addition to the flora of Berwickshire, very recently made by Mr. Marshall, gardener at Cheek-Law, near Dunse, who has drawn from its lurking-place in Dulaw Dean the *Herniaria glabra*, a small procumbent plant, not only new to Berwickshire, but to the Scottish Flora, and equally remarkable for its occurrence in one solitary spot in England.

"The fact," he adds, "that two very interesting additions to the phænogamic flora of the district have been made during the last year, is an additional incentive, were any such wanting, for continued exertion, which will doubtless not go unrewarded."

To the account of the proceedings the following papers are annexed:—Report on the Ornithology of Berwickshire, and district within the limits of the Berwickshire Naturalists' Club. By P. J.

Selby, Esq. of Twizell-House;—and Part II. of a Descriptive Catalogue of the Gasteropodous Mollusca of Berwickshire. By George Johnston, M.D., F.R.C.S.E.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

July 13, 1841.—Professor Owen, Vice-President, in the Chair.

The following letter, addressed to Mr. Waterhouse, from James Brooke, Esq., was read:—

"Singapore, 25th March, 1841.

"My dear Sir,—I am happy to announce the departure of five live Orang Utans by the ship Martin Luther, Captain Swan, and I trust they will reach you alive. In case they die, I have directed Captain Swan to put them into spirit, that you may still have an opportunity of seeing them. The whole of the five are from Borneo: one large female adult from Sambas; two, with slight cheek callosities, from Pontiana; a small male, without any sign of callosities, from Pontiana likewise; and the smallest of all, a very young male with callosities, from Sadung. I will shortly forward a fine collection of skulls and skeletons from the north-west coast of Borneo, either shot by myself or brought by the natives, and I beg you will do me the favour to present the live Orangs and this collection to the Zoological Society. I have made many inquiries and gained some information regarding these animals, and I can, beyond a doubt, prove the existence of two, if not three distinct species in Borneo.

"First, I will re-state the native account; secondly, give you my own observations; and thirdly, enter into a brief detail of the specimens hereafter to be forwarded.

"1st. The natives of the north-west coast of Borneo are all positive as to the existence of two distinct species, which I formerly gave you by the names of the *Mias Pappan* and *Mias Rambi;* but I have since received information from a few natives of intelligence that there are three sorts, and what is vulgarly called the *Mias Rambi* is in reality the *Mias Kassar*, the *Rambi* being a distinct and third species. The *Mias Pappan* is the *Simia Wurmbii* of Mr. Owen, having callosities on the sides of the face: the natives treat with derision the idea of the *Mias Kassar* or *Simia Morio* being the female of the *Mias Pappan* or *Simia Wurmbii,* and I consider the fact can be established so clearly that I will not trouble you with their statements: both Malays and Dyaks are positive that the female of the *Mias Pappan* has cheek-callosities, the same as the male; and if on inquiry it prove to be so, the existence of three distinct species in Borneo will be established. The existence of the *Mias Rambi* is vouched by a few natives only, but they were men of intelligence and well acquainted with the animals in the wild state. They represent the *Mias Rambi* to be as tall as the *Pappan,* or even taller, but not so stout, with longer hair, a smaller face, and no callosities either on the male or female, and they always insisted that it *was not* the female of the *Pappan.*

"The *Mias Kassar* or *Simia Morio* is the same colour as the *Mias Pappan,* but altogether smaller, and devoid of callosities either on the male or female adults.

"By the native statements, therefore, we find three distinct species, viz. the *Mias Pappan* or *Simia Wurmbii,* the *Mias Kassar* or *Simia Morio,* and the *Mias Rambi,* which is either the *Simia Abelii* or a fourth species. The existence of the Sumatran Orang in Borneo is by no means impossible, and I have already compared so many of the native statements that I place more confidence in them than I did formerly, more especially as their account is in a great measure borne out by the skulls in my possession. I had an opportunity of seeing the *Mias Pappan* and the *Mias Kassar* in their native woods, and killing one of the former and several of the latter species. The distribution of these animals is worthy of notice, as they are found both at Pontiana and Sambas in considerable numbers, and at Sadung on the north-west coast, but are unknown in the intermediate country which includes the rivers of Sarawak and Samarahan. I confess myself at a loss to account for their absence on the Sarawak and Samarahan rivers, which abound with fruit, and have forests similar and contiguous to the Sadung Linga and other rivers. The distance from Samarahan to Sadung does not exceed twenty-five miles, and though pretty abundant on the latter, they are unknown on the former river. From Sadung, proceeding to the northward and eastward, they are found for about 100 miles, but beyond that distance do not inhabit the forests. The *Mias Pappan* and *Mias Kassar* inhabit the same woods, but I never met them on the same day; both species, according to the natives, are equally common, but from my own experience the *Mias Kassar* is the most plentiful. The *Mias Rambi* is represented as unfrequent and rarely to be met with. The *Pappan* is justly named *Satyrus* from the ugly face and disgusting callosities. The adult male I killed was seated lazily on a tree, and when approached only took the trouble to interpose the trunk between us, peeping at me and dodging as I dodged. I hit him on the wrist and he was afterwards despatched. I send you his proportions, enormous relative to his height, and until I came to actual measurement my impression was that he was nearly six feet in stature. The following is an extract from my journal relating to him, noted down directly after he was killed.

"'Great was our triumph as we gazed on the huge animal dead at our feet, and proud were we of having shot the first Orang we had seen, and shot him in his native woods, in a Borneo forest, hitherto untrodden by European feet. The animal was adult, having four incisors, two canines and ten molars in each jaw, but by his general appearance he was not old. We were struck by the length of his arms, the enormous neck, and the expanse of face, which altogether gave the impression of great height, whereas it was only great power. The hair was long, reddish and thin; the face remarkably broad and fleshy, and on each side, in the place of a man's whiskers, were the callosities or rather fleshy protuberances, which I was so desirous to see, and which were nearly two inches in thickness. The ears were small and well-shaped, the nose quite flat, mouth prominent, lips thick, teeth large and discoloured, eyes small and roundish, face and hands black, the latter being very powerful.

"'The following are the dimensions :—

	Ft.	In.
Height from head to heel	4	1
Length of foot	1	0
Ditto hand	0	$10\frac{1}{2}$
Length of arm from shoulder-blade to finger end..	3	$5\frac{3}{4}$
Shoulder-blade to elbow	1	6
Elbow to wrist	1	$1\frac{1}{2}$
Hip to heel	1	9
Head to *Os coccygis*	2	$5\frac{1}{2}$
Across the shoulders	1	$5\frac{1}{2}$
Circumference of neck	2	4
Ditto below the ribs	3	$3\frac{1}{4}$
Ditto under the arms	3	0
From forehead to chin	0	$9\frac{3}{4}$
Across the face, below the eyes, including callosities	1	1
From ear to ear across the top of head	0	$9\frac{1}{2}$
From ear to ear behind the head	0	$9\frac{3}{4}$

"'The natives asserted the animal to be a small one, but I am sceptical of their ever attaining the growth of a tall man, though I bear in mind that full-grown animals will probably differ as much in height as man.'

"Some days after this, and about thirty miles distant, I was fortunate enough to kill two adult females (one with her young), and a male nearly adult, all the *Mias Kassar*. The young male was not measured, owing to my having waded up to my neck in pursuit of him, and thereby destroyed my paper and lost my measure ; but he certainly did not exceed three feet, whilst the two females were about 3ft. 1in. and 3ft. 2in. in height. The male was just cutting his two posterior molars : the colour of all resembled that of the *Mias Pappan*, but the difference between the two animals was apparent even to our seamen. The *Kassar* has no callosities either on the male or female, whereas the young *Pappans* despatched by the Martin Luther (one of them *not a year old*, with two first molars) show them prominently. The great difference between the *Kassar* and the *Pappan* in size would prove at once the distinction of the two species, the *Kassar* being a small slight animal, by no means formidable in his appearance, with hands and feet *proportioned* to the body, and they do not approach the gigantic extremities of the *Pappan* either in size or power ; and, in short, a moderately powerful man would readily overpower one, when he would not stand the shadow of a chance with the *Pappan*. Besides these decisive differences, may be mentioned the appearance of the face, which in the *Mias Kassar* is more prominent in the lower part, and the eyes exteriorly larger, in proportion to the size of the animal, than in the *Pappan*. The colour of the skin in the adult *Pappans* is black, whilst the *Kassar*, in his face and hands, has the dirty colour common to the young of both species. If further evidence was wanted, the skulls will fully prove the distinction of species, for the skulls of two adult animals compared will show a difference *in size alone* which must preclude all supposition of their being one species. Mr. Owen's remarks are, however, so conclusive, that I need not dwell on this point; and with a suite of skulls, male and female, from the adult to the infant, of the *Mias Kassar*, which I shall have the pleasure to forward, there can remain, I should think, little further room for discussion. I may mention, however, that two young animals I had in my possession alive, one a *Kassar*, the other a *Pappan*, fully bore out these remarks by their proportionate size. The *Pappan*, with two molars, showed the callosities distinctly, and was as tall and far stouter than the *Kassar* with three molars, whilst the *Kassar* had no vestige of the callosities. Their mode of progression likewise was different, as the *Kassar* doubled his fists and dragged his hind quarters after him, whilst the *Pappan* supported himself on the open hands sideways placed on the ground, and moved one leg before the other in the erect sitting attitude; but this was only observed in the two young ones, and cannot be considered as certainly applicable to all.

"On the habits of the Orangs, as far as I have been able to observe them, I may remark, that they are as dull and as slothful as can well be conceived, and on no occasion when pursuing them did they move so fast as to preclude my keeping pace with them easily through a moderately clear forest; and even when obstructions below (such as wading up to the neck) allowed them to get away some distance, they were sure to stop and allow us to come up. I never observed the slightest attempt at defence, and the wood, which sometimes rattled about our ears, was broken by their weight, and not thrown, as some persons represent. If pushed to extremity, however, the *Pappan* could not be otherwise than formidable; and one unfortunate man, who with a party was trying to catch a large one alive, lost two of his fingers, besides being severely bitten on the face, whilst the animal finally beat off his pursuers and escaped. When they wish to catch an adult they cut down a circle of trees round the one on which he is seated, and then fell that also, and close before he can recover himself, and endeavour to bind him.

"In a small work entitled 'The Menageries,' published in 1838, there is a good account of the Bornean Orang, with a brief extract from Mr. Owen's valuable paper on the *Simia Morio*; but, after dwelling on the lazy and apathetic disposition of the animal, it states in the same page that they can make their way amid the branches of the trees with *surprising agility*, whereas they are the slowest and least active of all the monkey tribe, and their motions are surprisingly awkward and uncouth. The natives on the north-west coast entertain no dread, and always represent the Orangs as harmless and inoffensive animals; and from what I saw, they would never attack a man unless brought to the ground. The rude *hut* which they are stated to build in the trees would be more properly called a seat or nest, for it has no roof or cover of any sort. The facility with which they form this seat is curious, and I had an opportunity of seeing a wounded female weave the branches together, and seat herself within a minute; she afterwards received our fire without moving, and expired in her lofty abode, whence it cost us much trouble to dislodge her. I have seen some individuals with nails on the posterior thumbs, but generally speaking they are devoid of them: of the five animals sent home, two have the nails and three are devoid of them; one has the nail well-formed, and in the other it is merely rudimentary. The length of my letter precludes my dwelling on many particulars, which, as I have not seen the recent publications on the subject, might be mere repetitions, and I will only mention, as briefly as I can, the skulls of these animals in my possession. From my late sad experience I am induced to this, that some brief record may be preserved from shipwreck. These skulls may be divided into three distinct sorts. The first presents two ridges, one rising from each frontal bone, which joining on the top of the head, form an elevated crest, which runs backward to the cerebral portion of the skull.

"The second variety is the *Simia Morio*, and nothing need be added to Mr. Owen's account, save that it presents no ridge whatever beyond the frontal part of the head. No. 9 in the collection is the skull of an adult male: No. 2 the male, nearly adult, killed by myself: Nos. 11 and 3 adult females, killed by myself: No. 12 a young male, with three molars, killed by myself: No. 21 a young male, died aboard, with three molars: No. 19, young male, died aboard, with two molars. There are many other skulls of the *Simia Morio* which exactly coincide with this suite, and this suite so remarkably coincides through the different stages of age, one with another, that no doubt can exist of the *Simia Morio* being a distinct species. The different character of the skull, its small size and small teeth, put the matter beyond doubt, and completely establish Mr. Owen's acute and triumphant argument, drawn from a single specimen.

"The third distinction of the skulls is, that the ridges rising from the frontal bones do not meet, but converge towards the top of the head, and again diverge towards the posterior portion of the skull. These ridges are less elevated than in the first-mentioned skulls, but the size of the adult skulls is equal, and both present specimens of aged animals. For a long time I was inclined to think the skulls with the double ridge were the females of the animals with the single and more prominent ridge, but No. 1 (already described as killed by myself) will show that the double ridge belongs to an adult, and not young male animal, and that it belongs to the *Simia Wurmbii* with the huge callosities. The distinction therefore cannot be a distinction of sex, unless we suppose the skulls with the greater development of the single ridge to belong to the female, which is improbable in the highest degree. The skulls with the double and less elevated ridges belong, as proved by No. 1, to the *Simia Wurmbii*; and I am of opinion the single and higher ridge must be referred to another and distinct species, unless we can account for this difference on the score of age. This, I conceive, will be found impossible, as Nos. 7 and 20 are specimens similar to No. 1, with the double and less elevated ridges *decidedly old*, and Nos. 4 and 5 are specimens of the single high ridge, likewise *decidedly old*.

"These three characters in the skulls coincide with the native statements of there being three distinct species in Borneo, and this third Borneon species *may* probably be found to be the *Simia Abelii* or Sumatran Orang. This probability is strengthened by the adult female on her way home: her colour is dark brown, with black face and hands; and in colour of hair, *contour*, and expression, she differs from the male Orangs, with the callosities, to a degree that makes me doubt her being the female of the same species. I offer you these remarks for fear of accident; but should the specimens, living and dead, arrive in safety, they will give a fresh impetus to the inquiry, and on my next return to Borneo, I shall, in all probability, be able to set the question at rest, whether there be *two* or *three* species in that country. Believe me, my dear Sir, with best wishes, to remain, "Yours very truly,

"J. BROOKE."

Mr. Charlesworth exhibited to the Meeting a collection of skins of Mammalia and Birds, which he had obtained on the table-land of Mexico, and which he begged to present to the Society. Among the Mammals were adult specimens of the *Bassaris astuta*, Licht., of which animal a young individual had been procured by Messrs. Thompson and Charlesworth at Real del Monte, and forwarded, under the care of the Society's Corresponding Member, Lieut. Smith, as a present to the Menagerie.

The Bassaris, Mr. Charlesworth observed, is known in Mexico by the name 'Cacomistle'; it is abundant in the city itself, and indeed Mr. Charlesworth believes it is not to be met with at a distance from the abodes of man. Its habits are nocturnal, and it selects for its dwelling outhouses or uninhabited buildings, whence it sallies forth at night and commits great ravages in hen-roosts and pigeon-houses, and on this account every attempt is made by the Mexicans to exterminate it. The number of young which the Bassaris produces does not exceed three or four at a birth.

A skin of the *Ascomys Mexicanus*, Licht., or 'Tusa,' as it is called by the natives, was also exhibited by Mr. Charlesworth; and he drew attention to a curious fact in the economy of this Rodent, viz. that the cheek-pouches with which it is provided, and which open externally, are used for the purpose of conveying the soil from its subterranean retreats to the surface of the ground, where the mould is deposited in heaps, similar in appearance to those formed by the common Mole.

The skulls of these two animals were on the table; and Mr. Waterhouse observed, that that of *Bassaris astuta* presented all the characters of the skulls of the *Paradoxuri*, whilst the skull of *Ascomys Mexicanus* did not appear to him to offer any characters by which it might be distinguished (excepting as a *species*) from the crania of different species of *Geomys* which he had examined; and as the same remarks would apply to the dentition, he thought it would be desirable to expunge one of these genera from our catalogues.

The following paper, entitled "Descriptions of several new species of *Chitones*, brought by H. Cuming, Esq., from the Philippine Islands," by G. B. Sowerby, Esq., jun., was next read.

Chiton Spiniger. *Ch. Spiniger*, Mag. Nat. Hist. 1840, p. 287; Con. Illus., f. 68. *Ch. testâ depressâ, ovato-elongatâ, omninò granulatâ; valvis reclinantibus, terminalibus rotundatis; margine lato, spinis sub-arcuatis numerosis instructo.*

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

The description is here repeated, for the purpose of noticing two remarkable varieties brought by Mr. Cuming from the Philippines.

In the first variety the spines are comparatively short, and being coated in patches by calcareous matter, give to the margin an appearance of being banded with black and white. The valves are more rounded, and in some instances more coarsely granulated than in the specimens originally described. Found under stones at low water in Cagayan, province of Misamis, island Mindinão.

In the second variety the valves are more elevated. Found under stones at low water, in the island Siquijor.

The larger variety tends to connect the species with the variable *Ch. piceus*, from which it differs in the narrowness of the valves, the spinose margin, and the purplish flesh tint of the inside, which are the same in all the varieties.

Chiton alatus. *Ch. testâ elongatâ, subdepressâ, griseo-virescente, fusco-virescente maculatâ; valvis anticè coarctatis, primâ et ultimâ asperis; areis dorsalibus rotundatis, granoso-striatis; margine squamoso-granulato.*

Hab. ad insulam Siquijor et Zebu.

More depressed, having the marginal granulations coarser and the lateral areas more expanded than *Ch. limaciformis*.

Found under stones at low water.

Chiton truncatus. *Ch. testâ ovali, minutissimè asperâ, roseâ aut pallidè fulvâ, griseo-virescente maculatâ, sulcis subdistantibus leviter undatâ; areis lateralibus elevatis, expansis; valvâ posticâ conicâ, anticè subcomplanatâ, posticè truncatâ; margine lævi.*

Long. 1·50; lat. ·80.

Hab. ad insulam Siquijor, Philippinarum.

Differing from *Ch. crenulatus*, *Grayi*, &c., chiefly in the conical shape and sudden termination of the last valve. The species is subject to great variations, both in the colour and in the strength of the undulating lines. Found under stones at low water.

Var. *testâ sublævi.*

Hab. ad insulam Samar (Catbalonga).

Chiton incisus. *Ch. testâ elongatâ, griseâ, fusco-maculatâ; valvis angustis, subdisjunctis, elongatis, longitudinaliter undato-striatis, primâ sexfariam costatâ, medianis utrinque unicostatis; areis centralibus latis, ultimâ subconicâ, utrinque trifariam costatâ; fis-*

surâ triangulari posticè incisâ; margine lato, fasciculis minutissimis numerosis instructo, posticè inciso.

Long. 2·60; lat. 1 poll.

Hab. ad insulam Zebu (Daleguete).

It is to be regretted that no specimens of this very remarkable species should have been preserved with the soft parts; it being probable that the fissure in the last valve and in the posterior part of the margin is accompanied by some anatomical peculiarity in the animal sufficient to establish its claim to generic distinction.

Found under stones at low water.

Chiton coarctatus. *Ch. testâ elongatâ, posticè coarctatâ, subtunicatâ; valvis reniformibus, subdisjunctis, carinatis, asperis; carinâ dorsali lævi; margine lævi.*

Long. 1; lat. ·50 poll.

Hab. ad insulam Bohol, Philippinarum.

From the peculiar shape of the valves, and the comparative smallness of the portion which remains uncovered, the observer would be led to look for the small tufts of hair found in the margins of some similarly-shaped species. All the specimens, however, have the margins perfectly smooth.

Found under stones at low water.

Aug. 10.—William Yarrell, Esq., Vice-President, in the Chair.

A letter from the Earl of Derby was read. This letter is dated August 7, 1841, and announces the arrival of a pair of the African Musk Deer (*Moschus aquaticus*, Ogilby); one of them (a female) is alive, and in good health, in his Lordship's menagerie. Having two skeletons of this animal, his Lordship has directed one of them to be forwarded as a present to the Society.

A letter from Dr. Cox, dated Naples, March 28, 1841, was read; it refers to some engravings of a deformed fœtus which this gentleman had sent for exhibition at one of the Society's scientific meetings.

A letter from the Society's corresponding member Dr. Poey was read. In this letter, which is dated Havannah, June 26, 1841, Dr. Poey informs the Society that he has forwarded for the Menagerie a living Raccoon, and he moreover makes some observations upon its habits.

A letter from Edward Blyth, Esq., was next read. This letter is addressed to the Curator, and is written by Mr. Blyth on his passage to India; the writer relates some facts respecting various Mammals which have been communicated to him by his fellow-travellers. Lieut. Beagin, upon being shown some drawings of species of Gibbons, at once, in a figure of the *Hylobates leucogenys*, Ogilby, recognised an animal which he had met with, and examined, in the Malabar jungles. "Lieut. Beagin," observes Mr. Blyth, "has frequently seen this species in the Malabar ghauts, generally in groups of eight or ten, among which were brown individuals." "They appear to be unknown on the Coromandel side, but extend eastward to the Neilgherries; inhabiting upland jungles, chiefly at about 2000 feet above the sea-level."

"The same gentleman is well acquainted with the *Semnopithecus Johnii*, which I observe is incidentally noticed in Harkness's work on the Aborigines of the Neilgherry hills, p. 61. This species is common enough in the depths of the forest, but never approaches the houses like the *Entellus*."

Mr. Blyth is also informed by Lieut. Beagin of the existence of a true Ibex, upon the Neilgherries, with long and knotty horns, curved backwards, and having a considerable beard, in which characters it differs from the Himalayan Ibex. "It keeps to the loftiest and most inaccessible crags, like the other Ibices. He has seen it repeatedly, in troops of a dozen or more individuals, and often endeavoured to obtain a specimen, but without success."

"The *Kemas hylocrius*, Ogilby, or 'Jungle Sheep,' (identified from one of my drawings,) is very generally, it appears, found in the hilly jungles of Peninsular India, keeping to the thick cover, and always met with solitarily, or in pairs. It is a very timid and shy animal, and when frightened utters a bleat like that of the domestic Sheep. Both sexes possess horns, those of the female being smaller; and indeed this sex is rudely figured in one of General Hardwicke's drawings in the British Museum, as the 'Warry-a-too' of the Chatagon Hills; besides which, this is probably the species indicated as the wild Sheep of Tenasserim of Capt.Low." [*Annals*, vol. iii. p. 258.]

"I shall now call your attention to some animals of North Africa, very good descriptions of many of which, obligingly furnished to me by Mr. Crowther (of the Queen's 63rd regiment), I have easily recognised as referring to known species; but there are several which are certainly new to naturalists, and among them two very fine Bovine animals, which the Society would do well to write about to their correspondents in that quarter. As Mr. Crowther described to me the Bubalis and the White Oryx, which are often designated 'wild cattle,' it must not be supposed that those animals are alluded to, as indeed is clear enough from the somewhat elaborate descriptions, and from the roughly-drawn sketches of both animals, *from memory*, which I enclose to assist those descriptions. These sketches will, at any rate, give some idea of the sort of animal, and go far to prove their distinctness from any which we are acquainted with.

"The 'Sherif al Wady' (or *River-chief*) stands six feet and upwards at its elevated withers. General form Bisontine; the carcass somewhat narrow, with flakes or rolls of fat on the sides of the neck; the limbs fine-boned and rather long, being terminated by comparatively small neat hoofs; the succentorial rather long; tail short, with its tuft of frizzled hair not reaching to the houghs. Head, it would seem, much like that of ordinary cattle, with small pointed ears, generally borne pendent, and naked of hair internally and towards the tip, which are delicate pinkish flesh-colour; eyes small and dark; the horns thick, cylindrical, smooth till towards their base, where they are a little rugose, and directed almost vertically upwards from the sides of the forehead; their colour dark, and length about a foot and a half. The character of the coat approaches that of Highland cattle in Britain, but is smoother toward the under parts, with curly hair on the forehead; some pendent hair (as shown in the drawing) from the site of the dew-lap (which latter is wanting), of the dark colour of the body, and a long but scanty white tuft hanging from the prepuce, as in Fallow Deer. General colour blackish brown, with a white belly; the centre of the hump pale ash-colour, or even whitish, with radiating black hair surrounding this, four or five inches long. The cow is smaller and of a redder colour. The individual described was brought with two others, another male and a female, from the central region of Mount Atlas, and was presented by the Emperor of Morocco, in the year 1834, to the late Sir Peter Schousboe, who gave it to Mr. Crowther, in whose possession it lived for four months at Tangiers, when it was shot. It became tolerably tame, and its voice was a booming low, though, when irritated, it would roar in a different tone. The flesh proved to be rather coarse-grained, but that stripped from the sides of the dorsal apophyses, or hump, was excellent, and had the flavour of tongue. The skin was attempted to be preserved, but was destroyed by the rats. It was considered to be rather a rare animal. Should the above indications of it be confirmed, as I have no doubt they will, I propose that the species be denominated *Bos Atlantinus*. It is not improbably the *Empolunga* of Purchas.

"The other wild Bovine species is much commoner, and has also much of the Bison in its general contour. Size that of Devon cattle, and colour red, with a flowing blackish nuchal mane; (hence this animal is probably the *Wadan* of Capt. Lyon, if not also the *Pacasse, Empacasse*, or *Pegasus* of different authors). Its horns are very long and spreading in both sexes, but more so in the female, wherein they are also more slender; they are cylindrical, a little rugose towards the base, and directed out and up; head not much unlike that of common cattle, with no curly hair on the forehead; the ears of moderate size, and broad; and tail, with its tuft, reaching below the hock; the hoofs are very black, and the secondary, or succentorial, short. There is little difference between the male and female in general aspect, but the calf is born of a whitish colour. The voice of this species much resembles that of common cattle, but is considerably more powerful. Its beef is excellent. They are occasionally seen solitarily, but more commonly in large herds, sometimes consisting of several hundreds; at the rutting season in particular, which is about July, they are very fierce, and apt to attack without provocation; they feed in the night, and by day pass much of their time standing knee and belly deep in water, like our tame cattle in summer; their coat has a wavy surface. This species is found about Rabat, and near Salee, on the Barbary coast. I have heard before of such an animal, and it appears to be tolerably common.

"Upon questioning Mr. Crowther respecting the Bear of Mount Atlas, which has been suspected to be the *Syriacus*, he knew it well, and it proves to be a very different animal. An adult female was inferior in size to the American Black Bear, but more robustly formed, the face much shorter and broader, though the muzzle was pointed, and both its toes and claws were remarkably short (for a Bear), the latter being also particularly stout. Hair black, or rather of a brownish black, and shaggy, about four or five inches long; but, on the under parts, of an orange rufous colour: the muzzle black. This individual was killed at the foot of the Tetuan mountains, about twenty-five miles from that of the Atlas. It is considered a rare species in that part, and feeds on roots, acorns, and fruits. Does not climb with facility; and is stated to be very different-looking from any other Bear. The skin, like that of the 'Sherif al Wady,' was attempted to be preserved, but unfortunately met with the same fate."

Dr. Lhotsky then read his paper "On Animal Tuition and Animal Hygiene."

In the first part of this paper the author makes some observations on the food of animals, and especially with reference to the quality and quantity given to animals in menageries. He next proceeds with remarks upon their abode, dens, cages, &c., the importance of cleanliness, and upon their tuition.

August 24.—R. C. Griffith, Esq., in the Chair.

Mr. Westwood read his paper entitled "Descriptions of some Coleopterous Insects from Tropical Africa belonging to the Section *Heteromera*."

The insects comprised in this paper are of extreme rarity, and are the giants of the family *Tenebrionidæ*, constituting the genus *Chiroscelis* and other allied groups; some of them, however, appear to lead to *Lagria* in their metallic colouring, &c.

CHIROSCELIS, Lamarck.

Sp. 1. Chiroscelis bifenestra, *Lam.*, Ann. du Muséum, iii. p. 260.

Sp. 2. Chiroscelis digitata, *Fabricius* (Tenebrio d., Syst. El. i. p. 145). Considered by the author as most probably distinct from the preceding, both in size and locality.

Sp. 3. Chiroscelis bifenestrella, *W.* *Nigra, nitida, capite minus rugoso, mandibulis minus dentatis, maculis duabus ventralibus ♀ minutis rotundatis, margine antico pronoti haud puncto notato, tibiis quatuor posticis ferè rectis; intermediis ad apicem magis dilatatis.*

Long. corp. vix lin. 14.

Hab. Guinea. Mus. Westw. Commun. D. Raddon.

Sp. 4. Chiroscelis Passaloides, *W.* *Nigra, nitida, vertice trituberculato, tibiis latissimis planis, anticis serratis, posticis intus versus apicem dente armatis.*

Long. corp. lin. $19\frac{1}{2}$–$20\frac{3}{4}$.

Hab. Guinea. Mus. Westw. Commun. D. Raddon.

PRIOSCELIS, Hope, Col Man. iii. p. 128.

Divis. 1. *Clypeus anticè haud emarginatus, margine antico in medio 1-tuberculato. Maxillarum lobus internus apice corneo bifido. Prothorax suboctogonus. Elytra ad humeros acutè angulata.*

Sp. 1. Prioscelis Fabricii, *Hope, l.c.*

Long. corp. lin. 20.

Hab. Sierra Leone. Mus. Hope.

Divis. 2. *Clypeus antice emarginatus, margine antico haud tuberculato. Maxillarum lobus internus apice corneo integro. Prothorax subquadratus magis transversus. Elytra humeris rotundatis.* (Iphius, Dej. Cat.)

Sp. 2. Prioscelis serrata, *Fabricius* (Tenebrio s.).

Sp. 3. Prioscelis Raddoni, *W. P. antennis brevibus articulo ultimo quadrato; tibiis anticis curvatis, apice dilatatis; posticis intus serrulatis extus ad apicem subitò dilatatis, prothorace transverso-quadrato, punctis duobus minutis distantibus versus marginem posticum.*

Long. corp. lin. 14.

Hab. in Guinea. Mus. Westw. Commun. D. Raddon.

Sp. 4. Prioscelis crassicornis, *W. P. atra glabra, antennis longioribus crassioribus femoribus omnibus ante apicem internè bidentatis, tibiis compressis.*

Long. corp. lin. 13.

Hab. in Guinea. Mus. Westw. Commun. D. Raddon.

Pycnocerus, Hope, MSS.

(Pachylocerus, Hope, Col. Man. iii. p. 186.)

Sp. 1. P. Westermanni, *Hope, l. c.* (An Ten. sulcatus, *Fabric.*?)

Sp. 2. P. costatus, *Silbermann* (Odontopus c., Rev. Ent. Col., No. 4.).

Odontopus, Silberm.

Sp. 1. O. cupreus, *Fabric.* (Tenebrio cu.). O. violaceus, *Silb. var.*?

Sp. 2. O. tristis, *W. O. chalybeo-ater, capite et prothorace opacis, tenuissime punctatis, hujus marginibus lateralibus crenulatis, elytris subviridibus magis nitidis valdè et irregulariter punctatis, sutura lineisque tribus tenuibus longitudinalibus lævibus, femoribus simplicibus, tibiis anticis apicem versus intus dente instructis, tibiis posticis curvatis, intus sinuatis.*

Long. corp. lin. 12½.

Hab. Senegallia ? Mus. Westw.

Sp. 3. O cyaneus, *Fabricius* (Tenebrio cy.).

Sp. 4. ? O. speciosus, *Dejean* (Pezodontus sp.).

Metallonotus, Gray.

Sp. 1. M. denticollis, *Gray*, in Griff. An. K., Ins. Pl. LXXX. f. 4.

Præugena, Laporte, Hist. n. An. Art.

Sp. 1. Pr. rubripes, *Laporte.*

Sp. 2. Pr. carbonaria, *Klug*, in Erman's Reise.

Sp. 3. Pr. marginata, *Fabricius* (Helops m.).

Various observations were added by the author relative to the synonymy and generic position of the species above described, and of other tropical African species described by Fabricius, Silbermann, Laporte, &c., and long generic and specific characters were given of the majority, accompanied by numerous illustrations of the generic and structural details.

MICROSCOPICAL SOCIETY.

At a meeting of the Microscopical Society held January 26th, 1842, Richard Owen, Esq., F.R.S., President, in the Chair, a paper was read by Mr. John Quekett, "On the Presence in the Northern Seas of Infusorial Animals analogous to those occurring in a Fossil state at Richmond in America." After alluding to the great discoveries of Professor Ehrenberg in this department of science, the author proceeded to mention a stratum of animalcules twenty feet thick, recently detected by Professor Rogers, underlying the city of Richmond in Virginia; it contains remarkable specimens of *Navicula, Actinocycli, Gallionella*, &c., but the most extraordinary form is a circular disc with markings very similar to those on the engine-turned back of a watch. On examining the sandy matter which had been washed from some zoophytes brought home by the Northern Expedition under Capt. Parry in 1822, the author has detected more than six animalcules in it precisely analogous to those occurring as fossils in the Richmond sand, and amongst these the circular disc above described; these last occur in the fossil state singly, very rarely in pairs, and some doubts have arisen as to what they really were; but from the investigations of the author they are found to be a species of bivalve, and many may be seen enclosing animal matter between their valves. Other bivalves fully as large as these are to be seen without markings on their surfaces, and some very minute specimens were attached to portions of sea-weed by a small stem or pedicel. The paper was accompanied with diagrams and with the animalcules, both recent and fossil, for examination.

Feb. 16th.—Professor Lindley, President, in the Chair. A paper was read by H. H. White, Esq., of Clapham, on fossil *Xanthidia*. After stating that these Infusoria, which are of a yellow colour and found imbedded in the substance of chalk flints, formed a genus of the tenth family of the class Polygastrica called *Bacillaria*, the author then proceeded to describe twelve species, which were distinguished from each other principally by the number and form of their tentacula, which project from the external investment or lorica of the animal; each species was separately described, and the author concluded with some observations on the mode in which they became silicified, and on the formation of flints generally. The paper was accompanied with specimens and illustrative diagrams.

ROYAL SOCIETY OF EDINBURGH.

February 7th, 1842.—Sir Thomas Brisbane, Bart., in the Chair.

The concluding part of Dr. J. H. Bennet's paper on Parasitic Fungi growing on living animals was read, and as portions of it bear directly on natural history, we shall briefly allude to these. Fungi of this description have previously been noted as occurring in the stickleback and common carp, but we are not aware that any particular description has yet been supplied of these fungi. Dr. Bennet had an opportunity of examining them upon the gold carp, *Cyprinus auratus*, having been persistent before death. To the eye they presented the appearance of a white cottony or flocculent matter attached to the animal. Under the microscope it presented two distinct structures, which were severally cellular and non-cellular. The former consisted of long tubes divided into elongated cells by distinct partitions. At the proximal end of several of these cells was a transparent vesicle about ·01 of a millimetre in diameter, which the author considered to be a nucleus. Some of the cells were filled with a granular matter; others however were empty, the granules having escaped through a rupture of the tube or of the cellular walls. Besides these there were long filaments about ·06 of a millimetre in diameter, which apparently sprung from the sides of the cellular tubes. They were uniform in size throughout their whole length, and were formed of an external delicate diaphanous sheath, and an internal more solid transparent matter. This vegetable structure sprung from a finely granular amorphous mass. Fungi of a similar kind were also found in the lungs of a man who died of pulmonary consumption, and from whose lungs they were also copiously discharged in the expectoration during life. The vegetable structure in this instance consisted of tubes, jointed at regular intervals, and giving off branches generally dichotomous. They varied in diameter from ·01 to ·02 of a millimetre, and appeared to spring without any root from an amorphous, soft, finely granular mass. They gave off at their extremities numerous oval, round or oblong corpuscles, arranged in bead-like rows, which were considered reproductive sporules. The same appearances were found in the soft cheesy matter lining some of the tubercular cavities after death. The author had likewise an opportunity of examining the mycodermatous vegetations which constitute in man that disease of the skin named *Porrigo Lupinosa*, and gave a particular account of them as seen under the microscope. He also supplied a bibliographical account of all that had been previously done in this obscure and interesting subject, and concluded by remarking, 1st. That these vegetations are not the cause, but the result of disease in animals; 2nd. That they grow upon the inorganic matters effused into the different textures, which are probably of an albuminous or tubercular nature; 3rd. That they only occur in animals or in parts of animals, previously weakened by circumstances inducing imperfect nourishment; and 4th. That the indications for treatment are, 1st, to invigorate the system, and 2nd, to apply locally, if possible, such applications as tend to destroy vegetable life.

BOTANICAL SOCIETY OF EDINBURGH.

December 9, 1841.—Professor Balfour (of Glasgow), and subsequently Professor Graham, in the Chair.

Communications were read—

1. On the groups *Triandræ* and *Fragiles* of the genus *Salix*, by the Rev. J. E. Leefe, Audley End, Essex.

"Whoever would study the willows with success, must see them growing at different seasons of the year; for fragments gathered at one season only serve to perplex and confuse the botanist. Another source of confusion is the practice of collecting specimens without numbering *them* and the *tree*, trusting subsequently for identification to the memory alone, whereby a most unpleasant feeling of uncertainty is produced. The changes in the form of the leaves, and in the relative proportion of some of the parts of fructification at different periods of growth, are often so surprising, that without a mark of recognition, I should frequently have doubted whether my specimens had been all collected from the same tree. Again, it is a common practice to select for preservation the largest and most vigorous-looking specimens, in consequence of which an erroneous idea of the *average character* is very apt to be produced. If an unusually luxuriant specimen be chosen, it should have a corresponding label. Were those whose residence is fixed for a great part of the year to give their attention regularly to this interesting tribe, and above all, to set aside a portion of ground in their gardens for the cultivation of the most intricate species, much of the uncertainty which at present deters botanists from the study of the *Salices* would probably disappear; but the hasty collection of fragments in flower, and above all, the un-identified addition of leaves, serve only to perpetuate mistakes. If I might take the liberty of recommending to others a practice which I have myself profitably followed, I should advise that the specimens of every *Salix* in a herbarium (excepting, of course, species about which there can be no mistake) should be such as to present one or more regular series illustrative of the *progressive* development of the catkins, each set being taken from the same tree at intervals during the flowering season,—and that at least two specimens of the leaves, gathered at different periods, should be preserved, so as to show the form of the stipules, and the progressive alteration in the foliage;—also, that thin sections of a catkin of each species, perpendicular to the axis, should be gummed down, by which means the form of the ovarium and any other particular respecting it—the length and pubescence of its stalk, the nectary, the character of the axis, and the number of ovaria in a given length of the spiral, could easily be seen without mutilating the other specimens. The exact date also of each specimen should be registered, whereby many ambiguities would be removed. The willows, though numerous here (Audley End, Essex,), are not cultivated to such a profit as they might be. *Salix Russelliana*, though plentiful, is confounded with *S. fragilis*; nor is the bark held in any esteem. The cærulean variety of *S. alba* has, however, been sold to advantage to the makers of bonnet-shapes, as it is reputed not to stain. To show the quick return which the arborescent willows would afford, I may mention that a tree of *S. alba* var. *cærulea*, planted in 1815, at the end of nineteen years measured in circumference, at one foot from the ground, seven feet eight inches; and in October 1841, at twenty-six years of age, its circumference was ten feet three-quarters of an inch, and its height seventy-seven feet."

The author then proceeds to give a particular description of each species in the above groups—remarking of *S. decipiens*, that though it appears to be of little use for economical purposes, "it forms a handsome bush or small tree, remarkable at a short distance for the bright hue of its leaves;"—of *S. fragilis* and *S. Russelliana*, "that they both form large trees, but do not appear to grow so fast, or to attain so large a size, as *S. alba*."

2. On three newly proposed species of British *Jungermanniæ*, by Dr. Taylor, Dunkerron. Communicated by Mr. William Gourlie, jun.

This paper, though valuable to the botanist, is of too technical a kind for even an abstract of it to be given here. One remark by the writer may be inserted, and it would be well if the rule, which he justly commends, were followed with regard to many other groups of plants, till, by repeated observations, they have become sufficiently known. He says—"It was with great propriety that the distinguished author of 'British Jungermanniæ' placed certain specimens, then newly discovered, which had been found in small quantities and in limited localities, as *varieties* of the species which they most nearly approached, leaving to future and more extended observation the task of raising them to a higher rank, if supported by competent distinctions."

3. Remarks on the Flora of Shetland, with a full catalogue of plants observed in these islands, by Mr. Thomas Edmonston, jun.

Mr. Edmonston observed, that the botany of Shetland had never been adequately investigated. Dr. Neill, who spent ten days or a fortnight there in 1804, was the first to enter upon this field, and he was followed by Dr. Gilbert M'Nab, who spent a few weeks there in 1837. Mr. Edmonston (a native of Shetland) has devoted the last four years to this agreeable pursuit, and in that time has visited the whole district. Two years ago he transmitted to London a list of the plants which had then been observed by him, and this list, though incomplete, and in some instances inaccurate, made its appearance lately in the 'Magazine of Natural History,' without any previous intimation, so that he had no opportunity of correcting it.

The Orkney Islands, which are numerous, stretch about seventy miles from S.E. to N.W. Their zoological formation is altogether primitive, the most abundant rocks being gneiss, granite, and limestone, which are very generally covered by large tracts of peat moss, and often destitute of all vegetation excepting the commonest bog-plants. Unst is the most northerly island, and is also the most diversified in its formation; gneiss, mica-slate, chlorite-slate, and serpentine being all found on it. Its vegetation is equally varied, some of the species being peculiar to it in Britain, and others being rare elsewhere. The most interesting of these, viz. *Arenaria norvegica* and *Lathyrus maritimus*, were discovered by Mr. Edmonston, when he was little more than twelve years of age. Ronas Hill, which attains an elevation of about 1500 feet, is the highest land in Shetland, and it is only upon it that the botanist meets with anything like alpine vegetation. The largest island, usually called the mainland, presents little of interest; but is, for the most part, a succession of dreary peat moors, occasionally enlivened by *Scilla verna* and *Pinguicula vulgaris*; nor are the other islands generally more productive, though sometimes a fertile spot occurs.

"The general character of Shetland vegetation," says Mr. Edmonston, "seems to be sub-alpine or nearly so, for we find plants belonging properly to that region in every situation, such as *Thalictrum alpinum*, *Draba incana*, &c., which grow down almost to the sea-level."

The list of species which accompanied this paper comprehends 395 in all, viz. 286 phanerogamic and 109 cryptogamic; the latter consisting of 22 Ferns, 65 Mosses, and 22 Hepaticæ.

4. Account of a Botanical Excursion in Norway, by Dr. John Shaw.

The circumstance that most struck Dr. Shaw in this tour was the almost total absence of *Calluna vulgaris*, which *covers* our Scottish moors, but which in Norway is so far from being common, that throughout an extent of 600 miles he "could scarcely find a specimen of it." He also remarks on the extreme wildness and sterility of some tracts, as contrasted with the fertility and luxuriance of vegetation in others. The species which he observed were in general the same as those which grow in Scotland; those not indigenous here being in about the proportion of one to five; but several plants which are extremely rare in this country, such as *Menziesia cærulea*, *Pyrola uniflora*, and *Linnæa borealis*, &c., he found abundant in many places. He was also particularly gratified by the beauty and luxuriance of *Trollius europæus*, of which he observed "myriads, with their corollas like half-pounds of butter, gracefully waving their heads, almost in the frozen region."

The heat of the July sun he describes as most oppressive, and the swarms of gnats as tormenting beyond endurance.

January 13th, 1842, Professor Christison in the Chair.

The following papers were read:—

1. Notes on preserving the Colour of certain Vegetables by immersing them in hot water, by Mr. Evans.—It is well known to every one who has had any experience in the drying of specimens, that, while many plants are easily preserved by the ordinary means of placing them between layers of absorbent paper, and subjecting them to certain degrees of pressure, there are others that cannot be so readily dried; and some are even so constant in their tendency to turn black in drying, that this feature has been deemed characteristic of them. The use of hot water, as a means of accelerating the process of desiccation in certain vegetables, has been long known to botanists; but Mr. E. is not aware of its having been employed, to any extent at least, as a means of preserving their colours. To Mr. Peter Henderson, one of the gardeners at Melville Castle, the chief merit of this application is due, he having, last summer, succeeded by it in preserving *Lathræa squamaria* and some other plants which ordinarily become black in drying, particularly *Asperula odorata*, *Melampyrum pratense*, *Agraphis nutans*, *Rhinathus Crista galli*, and several *Orchideæ*. During the summer and autumn, Mr. Evans tried the same method, and found that, besides the greater beauty of the specimens thus treated, they could be dried in nearly one-half of the time usually required; as also that, from the power of hot water in destroying rigidity,

they were much more easily arranged on the drying-paper. Mr. Evans observed, that while he and his friend, in pursuing this method, were guided almost entirely by the nature of the plants subjected to the process, they considered from twenty to thirty seconds a medium time to keep "*Orchideæ*" and other plants of a robust and fleshy nature in the water, which was always kept boiling; while a mere dip was found sufficient for those of more delicate structure. He is, however, of opinion that the success of their method is not to be entirely attributed either to the temperature of the water used, or the exact time the plants are kept in it, but depends much on the frequent changing, for some time, of the paper in which they are afterwards placed; as unless this is strictly attended to, the specimens will be speedily destroyed by the great quantity of water with which they are at first surrounded. It has been recommended, as a means of freeing the plants from external moisture, before placing them in the drying-paper, to press them gently between cloths; and this he considers beneficial for plants of a robust nature, but rather injurious to the more delicate ones,—to these he merely gives a gentle shake, but changes the paper sooner about them than the others. Mr. Evans concluded by observing that, besides the utility of this method for retaining the colour of the leaves of such plants as naturally become *black* in drying, it will be found serviceable in preserving the *blue* colour of the corollas of *Campanulas* and some other plants, which rather incline to turn *white*.

The specimens exhibited by Mr. Evans in illustration of his success were most beautiful, the colour being in almost all of them perfectly retained; and to show that it was their previous immersion in *hot* water which had effected this object, he had purposely kept some portions of them out of the water, and in such instances *only* the immersed parts had retained their natural colour.

2. Notice relative to certain Species found in the Parish of Alvah, Banffshire, with a List of Plants observed in that Parish, by the Rev. A. Dodds. Communicated by Mr. W. A. Stables.—The chief interest of this paper arose from the contrast which it presented between the south and north parts of Scotland in regard to the occurrence and comparative frequency of several species; the recent occurrence of some which have now become generally disseminated, to the farmer's great annoyance, such as *Senecio Jacobæa*, and the gradual disappearance of others which were formerly common, as *Arctium Lappa*, &c.

3. Description, with Drawing, of a Vegetable found on the Gills and Fins of a Goldfish, by Mr. Goodsir.—In this interesting paper Mr. Goodsir gave a minute description of the parasite, explaining practically its form, structure, and mode of fructification, &c.; but the fish having died during its conveyance to town, and putrefaction having commenced before he saw it, his observations were necessarily imperfect on some points which he had felt anxious to illustrate. Professor Christison stated, that above a year ago he had noticed a similar parasite on a goldfish, which was entirely covered with it as

with a soft down, but the animal's health did not seem at all affected, and he believed it was still alive; nor was the affection communicated to other fishes which were put for some time in the same vessel with it. Mr. Bennet also stated the result of some microscopical observations made by him on Mr. Goodsir's fish, chiefly with reference to the condition of the animal under the invasion of its vegetable foe.

4. Remarks on the affinities subsisting among *Viola lutea, arvensis,* and *tricolor,* by Alexander Seton, Esq., of Mounie.—Mr. Seton says, that not having been able to discover any definite or permanent distinction between the plants which had been termed *V. lutea* and *tricolor,* his attention was directed to their comparative appearance and habits in native situations; and having found all gradations of form, colour, and habits between the extreme characters of the perennial plant called *lutea* and the annual called *tricolor,* he had come to the conclusion that they are originally from the same stock or species. As to the form of the stipules, and the different degrees of ramification or divarication in the stem, which Smith, Hooker, and other writers have adopted as distinguishing marks, they are so varying as to be totally unsuitable for that purpose. On the other hand, the *Viola,* which has been by some termed *V. arvensis,* but has for the most part been considered as a variety of *V. tricolor,* is so different, and so constant in its general character, that he is inclined to consider it a separate species, though in most particulars extremely similar. It is completely annual, and he has never found it with that multiplicity of stems arising from a spreading root and radicating at their base, which are usual with the two others when they have remained for any length of time undisturbed. It is also taller and more succulent in the herbage than *V. tricolor,* even when the latter is in a rich and congenial soil; and it maintains its characteristics when propagated by the seeds, without those gradations of variety which obliterate distinctions of species; for having observed it growing in corn-fields and by way-sides along with *V. tricolor,* not only in this kingdom, but also in France, Italy, and Germany, (in all of which countries both species are common,) he uniformly found it retaining its own peculiarities, unblended with those of its congener. But though the habits and general appearance of the plants are considerably different, yet their various parts are so much alike, that he is unable to find any other descriptive distinction than the proportion between the calyx and corolla. Mr. Seton also notices some remarkable variations in form and habit, obviously arising from soil or locality, in several other plants, such as *Trifolium pratense, Plantago lanceolata,* &c.

5. Notice respecting some late Additions to the Flora of Jersey, by Joseph Dickson, Corresponding Secretary.—The chief interest of this paper consisted, as in the case of No. 2, in the contrast afforded with the vegetation of other parts of Britain; and the author promised to take an early opportunity of extending his observations on this subject.

MISCELLANEOUS.

ON THE PARTIALITY OF SLUGS FOR FUNGI. BY C. RECLUZ, APOTHECARY AT VAUGIRARD.

It is well known in a general way that slugs commit great havoc in gardens, meadows, &c. ; but no one to our knowledge has noticed their taste for some species of Fungi*.

The bites and perforations which are seen on these agamous vegetables are generally attributed to insects, because they are sometimes met with upon gnawed fungi ; it is however to slugs that we must principally attribute this havoc. The *Limax rufus* and *Limax agrestis*, Lamk., are the mollusks in the environs of Paris which have furnished the subject of this notice.

Among the species of fungi attacked by the slugs above mentioned, we remarked not only the *Boletus edulis* but also the *Agaricus muscarius*, a very poisonous mushroom, and the *Agaricus phalloides*, a species still more formidable from the rapidity of its deadly effect. The gray and lemon-coloured varieties of this *Agaricus* are, amongst the species we have mentioned, those which they seem to like best, and on which we see most traces of their voracity ; whilst they very seldom touch the *Boletus luridus*, a species equally doubtful, and the fragments of which, when exposed to the air, after having been recently detached, take insensibly tints more or less dark till they are the colour of starch dyed with iodine. May there not be a peculiar principle in this one which keeps these animals away from it ? We shall endeavour to investigate this hereafter.

We have also remarked that these slugs make a hole in the stalk of the above-mentioned fungi, gnaw their substance vertically, and continue their work by devouring all the interior of the pileus, so that the exterior surface alone remains untouched. It is not uncommon to find two slugs of the same, or of different species, together in one fungus. We have not yet observed any other species of this genus, nor if any other mollusk live upon these vegetables ; and for this reason we have thought it useful to make these observations public, as a contribution to the history of these animals as well as to that of fungi.—*Revue Zoologique*, 1841, No. 10, p. 307.

UNIVERSITY OF GLASGOW.—BOTANY.

Dr. Balfour, the successor of Sir W. J. Hooker in the Chair of Botany in the University of Glasgow, delivered the introductory lecture to the course, on Tuesday evening, January 4th, in presence of a crowded audience. The lecture embraced a review of the study of natural history, its advantages, uses, and attractions, and was imbued with a spirit of ardour and enthusiasm which the lecturer is evidently well calculated to infuse into his students. We augur

* Slugs appear to like those fungi best which are of a firm and crisp substance. They are so fond of some species that it is difficult to procure a good specimen. They attack *Discomycetes* as well as *Hymenomycetes*.—Ed.

great good to the study of botany under the auspices of so enthusiastic and successful a naturalist as Professor Balfour, and from the elevating spirit in which the introductory lecture bids us to hope the subject will be treated. A profusion of splendid illustrations, preparations, and living specimens adorned the lecture-room. The lecture was listened to by the intelligent audience with profound interest.—*Glasgow Guardian.*

BUST OF PROFESSOR JAMESON.

After the public meeting of the Wernerian Natural History Society, held this day, Dr. Charles Anderson stated, that he took the opportunity of the President being absent to mention to the Society, that it had occurred to Mr. Falconar of Carlowrie, to himself, and some other members, that it would be extremely desirable to have a Bust of Professor Jameson, on a suitable granite pedestal, placed in the Museum which he had laboured so devotedly and successfully to render worthy of this University and of the metropolis of Scotland; that it was proposed to defray the expense by a private subscription; and that he entertained no doubt that a marble bust, executed in the best style of the art, could be obtained for a sum within the amount which would be readily subscribed. He trusted that the proposal would be approved of, and suggested that the members of the Society should take the lead in promoting it, but that other friends and pupils of the Professor should be invited to join and embrace this opportunity of contributing to this testimonial of esteem.

On the motion of Dr. Robert Hamilton, seconded by Mr. James Wilson, the Meeting unanimously and cordially approved of the proposal; and appointed the following gentlemen a committee, with power to add to their number, and with instructions to take immediate steps for forwarding the measure, viz. The Right Hon. Lord Greenock, David Falconar, Esq., Sir William Newbigging, Dr. Traill, William Copland, Esq., Dr. Charles Anderson, and Dr. Neill.—Dr. Traill, Convener and Treasurer.

College, 8th January 1842.

M. AUGUSTE DE SAINT HILAIRE ON THE EPOCHS OF VEGETATION IN DIFFERENT COUNTRIES.

[Read at the Academy of Sciences, Nov. 2, 1841.]

Wishing to compare the vegetation of the tropics with that of the northern countries, during the end of the summer and the beginning of autumn I travelled through Norway and visited the Scandinavian chain of mountains. Although my course was extremely rapid, it has helped to rectify the ideas which I had formed concerning the distribution of plants in these countries, and of the influence exercised there by climate. As I arrived in Paris only two days ago, I am not able to submit my observations to the Academy, which moreover, if I am permitted to live a little longer, will find a place in a work of some extent. I shall at present confine myself to pointing out briefly the comparative epochs of vegetation* in different countries.

In a treatise which I read before the Academy several years ago, and which perhaps has not been without its use to botanical geography, I said that, after leaving the peach-trees at Brest without flowers and without leaves on the 1st of April, I had found them in full flower at Lisbon eight days later, and that this was also the case with the *Cercis*, with several species of *Lathyrus*, of *Vicia*, of *Ophrys*, and of *Juncus*, &c.; that on the 25th, at Madeira, I had found the fruit of the peach already set, and the wheat in ear; that on the 29th, at Teneriffe, they were getting in the harvest, and the peaches were perfectly ripe.

In the journey which I have just completed, I took vegetation, so to speak, in a contrary direction. As a term of comparison I shall make choice of the oat, because it is this cereal which is cultivated furthest to the north. The 10th of August they finished getting in the crop about Orleans. The 23rd they were finishing between Beauvais and St. Omer; the 31st between Hamburgh and Lubeck; on the 2nd of September cherries were still selling in the market of Copenhagen; the 6th September the oat-harvest was finishing round about Christiania, and, from the 10th to the 18th September, I saw it continually going on between this town and Trondhjem. It would naturally be supposed that in returning to Christiania I should find it quite over, but having taken another route, I saw it constantly going on between Trondhjem and Christiania, just as I had seen it between Christiania and Trondhjem. Those who know how powerful the influence of secondary causes is in mountainous countries, will not be surprised at this seeming singularity. Thus in the Hedemarken, a very humid plain, where the seed is sown very late, it is not surprising that the harvest should be late; nor is it more so that the corn is cut earlier on that side of the great lake Mjosen which is exposed to the south, than on that which is exposed to the north.

I have also been struck by some other considerations. We know that in northern countries the shortness of the summers is compensated by the length of the days, and that vegetation, which is not suspended by long nights, goes through its phases in a space of time much less considerable than with us. At Christiania, on the 10th of September, I had left it nearly in the same state in which it is in France during the last week of the same month. At Roeraas, one of the highest points of the Scandinavian chain, where the mercury freezes every year, and where the *Betula nana* grows in abundance, it presented the same appearance on the 14th of September that it it has in the middle of France at the beginning of November. On

* A series of regular observations on the relations of the phænomena of the animal and vegetable kingdoms to atmospheric influences and the periodicity of the seasons, has been commenced by the Belgian naturalists (see 'Bulletin de l'Acad. de Bruxelles,' 1841, p. 154), at the suggestion of M. Quetelet, who invited the aid of British observers, at the last meeting of the British Association at Plymouth.—Ed.

the banks of the Guldelf, it was towards the 20th of September in the condition in which it is seen with us during the last weeks of October; lastly, in Dovrefjeld, at a height of 3000 feet above the level of the sea, it looked on the 22nd of September such as it appears in Sologne towards the middle of December*.—*Ann. des Sc. Naturelles*, Dec. 1841.

ZOOLOGICAL WORKS PUBLISHED UNDER GOVERNMENT PATRONAGE.

In no one particular do we find the great distinction between England and the continental nations more strikingly illustrated than in the publication of works of science, and particularly upon Natural History. In England all our finest works have been produced either at the cost of individuals, whose purse-strings have been opened with a liberal hand by their zeal for the science—witness Mr. Lambert's magnificent work on the genus *Pinus*, the Lepidoptera of Georgia of Abbot and Smith, the Exotic Insects of Drury, the Malacostraca Podophthalma of Dr. Leach †—or by the spirited exertions of publishers, as in the case of the translation of the Animal Kingdom by Griffith, the splendid works on Ornithology by Mr. Gould, or the works on British Entomology by Messrs. Curtis and Stephens. With very few exceptions Government has afforded no assistance to the publication of such works. On the continent, however, the case is entirely reversed, the finest works having been produced under the auspices of the respective governments of the countries in which they have been published.

That the direction unquestionably given to the public mind in such countries by the course of public education, must have a material effect in producing such a result, is unquestionable; nor can we expect that the case will be altered here until physical science in general, including Natural History as a necessary branch, is fostered by the State for her own sake, independent of the shop-keeping spirit of the country, and is insisted upon as a branch of public education as material as the Classics, Mathematics, &c. ‡

* For particulars of the vegetation of Norway, botanists will do well to consult the catalogue of plants which Mr. Blytt, Professor of Botany at Christiania, has collected on his journeys, a very rare work, a copy of which was sent to the persons who were engaged in the expedition of the 'Recherche.'

[† To these add Dr. Sibthorpe's Flora Græca.—Ed.]

‡ Since the publication of the last number of this work I have had the pleasure of visiting Oxford, in company with Professor Burmeister; but how can I explain the mingled feelings I experienced at being compelled to answer his question, "Who is the Professor of Zoology here?" by informing him that there was no such Professorship in this, the most magnificent University in the world—in more forcible language than was employed by Mr. MacLeay upon this very subject twenty years ago?

"Unfortunately in those classic scenes, which derive no small portion of their fame from a Ray and a Lister, the existence of zoology as a science is in these days scarcely suspected. Well may the foreigner, who beholds our learned establishments so splendidly endowed, note, among the most remarkable circumstances attending them, that in none whatever should there be a zoological chair. It is not for me to enter into the causes of this, else it

It may indeed be urged, that the taste for such pursuits in the minds of persons in authority may have in some degree contributed to such a result, but it appears to me that it is quite independent of such consideration. How, in fact, were it not so, can we account for the non-publication of such works in this country, when it is well known that the Royal family are and have long been interested in these pursuits? the Princess Charlotte, for instance, having possessed a cabinet of exotic insects, and her present Majesty as well as her Consort being understood to have a strong predilection for natural history.

It will be sufficient to prove the correctness of these observations, to mention a few of the works published under the direction of continental states, which throw into deep shade all that the Government of this country has ever aided in producing.

The great work on Egypt, undertaken by the direction of Napoleon, would alone be a "monumentum ære perennius." Its magnificent plates (of which those of the Annulose animals are perhaps the most elaborate, and which cost the eyesight of the inimitable Savigny) are on a par with all the undertakings of the gigantic-minded emperor. More recently, under the auspices of the present king and his government, we have the Expédition scientifique de Morée, the Voyage de la Coquille, those of the Astrolabe, of D'Orbigny, and others, each of which surpasses any of the Government natural history works of this country.

were desirable to know why plants should have been deemed worthy of attention, while animals have been utterly neglected. I can only acknowledge with regret that such has been the case. If it be said that lectures on natural affinities are included in some course of comparative anatomy, I am truly glad to hear it; but if it be urged that the knowledge of comparative anatomy implies that of the animal kingdom, I deny it totally, since comparative anatomy is only the instrument of zoology; and while no man can be versed in natural affinities without some acquaintance with comparative anatomy, examples may easily be specified of comparative anatomists who know nothing of natural history. *A Professorship of Natural History is necessarily charged with duties that give ample employment in Paris to thirteen professors with their numerous assistants.* [Since this was written another professorship has been established for the investigation of the Annulose animals in particular.] I have ventured to give this humiliating picture of the state of zoological instruction in Great Britain, because there are persons who affect surprise that in that science which relates to the animated works of God, France should be the predecessor over a nation comparatively more religious."—*Horæ Entomologicæ*, p. 457.

Entertaining as I do the opinion, that other and far higher considerations are involved in the study of zoology than the elucidation of natural affinities, I cannot discover the slighest shadow of reason why zoology should be neglected where botany, geology, and comparative anatomy are introduced. The very notion of such an arrangement is ridiculous, even in the truly English *cui bono* view of the question.

If the establishment of such a professorship rests with the Universities, and does not depend upon private endowment, it behoves the zoologists of the country to bring the subject in a proper manner before the Senatus Academicus.

In Prussia may be mentioned the splendid Symbolæ Physicæ of Ehrenberg and Hemprich, the insects of which were edited by Dr. Klug; and in Russia, the Oryctographie du Gouvernement de Moscou, the Entomology of the Trans-Caucasian Regions, and of the Embassy to North China.

It is not, however, in these great states alone that we find this fostering care of science, for the national works undertaken by the Dutch are not behind the majority of those mentioned above. The Fauna Japonica of Siebold, assisted by Temminck, Schlegel and De Haan, "jussu et auspiciis superiorum qui summum in Indiâ Batavâ imperium tenent," would do honour to any country. And we have now the commencement of a similar work on the Natural History of the Dutch Settlements in India, in large folio; the third part of which is devoted to a complete illustration of the Indian species of the modern genus *Papilio*, occupying nine plates, with descriptions by De Haan. The title of the work is as follows: 'Verhandelingen over de Natuurlijke Geschiedenis der Nederlandsche Overzeesche Bezittingen door de laden der Natuurkundige Commissie in Oost-Indie en andere Schrijvens.'—Leiden, 1840.

In addition to illustrations of numerous previously-described species, of which various beautiful varieties are represented, one plate is devoted to an elaborate series of anatomical details of the genera composing the modern family *Papilionidæ*, in which we find the characters afforded by the variations in the male organs of generation, and the veining of the wings, to be extensively employed. There is also a considerable number of new species figured, one of which is closely allied to the splendid *Priamus*, which it even exceeds in beauty.

Having illustrated in the present number of this work two new additional species of *Papilio* from the same quarter of the globe, I thought it a fit opportunity to notice this new work, which adds fresh fame to the name of its talented author, whilst the circumstances under which it has appeared naturally led to the foregoing remarks.—*From the third number of the 'Arcana Entomologica.' By J. O. Westwood, F.L.S., &c.*

[We may here with much propriety refer to the service which has just been rendered to science by the legislative assembly of Massachusetts in voting funds for a Zoological survey of the State territory.—Ed.]

NOTE ON PHOSPHORESCENCE.

It appears to me that a general rule might be laid down with respect to the phosphorescence of marine animals, which, if it holds good in experience (which has as yet taught nothing which I am aware of to subvert its accuracy), at once determines to a great extent, without further trouble or investigation, what are the animals possessed of luminous properties. I believe that it will be found that all the transparent and gelatinous inhabitants of the deep are capable of emitting a phosphorescent light as well as many others, which, it must be admitted, are not transparent and gelatinous in their structure.—Arthur Hassall.

Cheshunt, Herts, Jan. 3, 1842.

CYGNUS GUINEENSIS.

At a meeting of the Cambridge Ray Club, held on the 9th of February, Dr. Paget exhibited a recent specimen of the *Cygnus guineensis* (Jenyns) killed upon Coldham's common, near Cambridge: it is intended to be placed in the museum of the Cambridge Philosophical Society.—Charles C. Babington.

NORFOLK BIRDS.

J. H. Gurney, Esq., of Norwich, informs us that the following rare birds have come under his notice during the last six months :—

A Blue-throated Redstart, in nearly full plumage, picked up dead on the beach at Yarmouth in October last.

A specimen of the Buff-breasted Sandpiper, shot near the same spot a few days afterwards.

A specimen of the Richard's Pipit, which, as far as I know, is new to Norfolk, shot at Yarmouth in November.

A specimen of the Gosshawk, shot about a week since at Colton, near this place, in full adult plumage.

METEOROLOGICAL OBSERVATIONS FOR JAN. 1842.

Chiswick.—January 1. Very fine. 2. Slightly overcast: sleet. 3. Clear. 4. Overcast: clear: slight snow at night. 5. Frosty: overcast. 6. Frosty: clear and fine. 7. Snow-flakes: cloudy and frosty: snow at night. 8. Sharp frost: overcast. 9. Frosty: snowing. 10. Frosty throughout with dry cold haze. 11. Drizzly. 12. Frosty: slightly overcast. 13. Snowing. 14. Cloudy and fine. 15. Frosty: fine: severe frost at night. 16. Overcast. 17. Clear. 18. Hoar-frost. 19. Foggy. 20. Hazy. 21. Foggy. 22. Hazy. 23. Clear: snowing: clear and frosty. 24. Frosty: very fine. 25. Drizzly: fine: clear. 26. Boisterous with rain. 27, 28. Clear and fine. 29. Sleet. 30. Overcast and fine. 31. Hazy: heavy rain at night.

Boston.—Jan. 1. Cloudy. 2. Fine. 3. Cloudy: snow early A.M. 4. Fine: snow early A.M. 5. Snow: rain A.M. and P.M. 6. Cloudy. 7. Fine. 8—11. Cloudy. 12. Snow. 13. Cloudy. 14. Snow. 15. Cloudy. 16. Cloudy: rain A.M. 17. Cloudy. 18. Fine. 19—21. Cloudy. 22. Cloudy: snow P.M. 23. Fine. 24. Fine: heavy snow at night. 25. Snow. 26. Cloudy: stormy with rain A.M.: rain P.M.: stormy night. 27. Cloudy. 28. Fine. 29. Cloudy. 30. Fine. 31. Cloudy.

Sandwick Manse, Orkney.—Jan. 1, 2. Foggy. 3. Cloudy. 4. Cloudy: clear and frosty. 5. Clear and frosty: aurora borealis. 6. Clear and frosty. 7. Frosty. 8. Clear: rain. 9, 10. Cloudy: drizzling. 11. Clear: frost. 12. Clear: cloudy. 13. Cloudy. 14. Cloudy: clear: frost. 15. Frost: aurora borealis. 16. Cloudy: dropping. 17. Clear: aurora borealis. 18. Damp. aurora borealis. 19. Cloudy. 20. Cloudy: clear. 21. Clear: cloudy. 22. Rain. 23. Snow-showers. 24. Snow lying: sleet. 25. Clear. 26. Rain. 27, 28. Sleet-showers. 29. Sleet-showers: fine: frosty. 30. Rain: clear. 31. Cloudy: clear.

Applegarth Manse, Dumfries-shire.—Jan. 1, 2. Fog and rain. 3—5. Frost and clear. 6, 7. Frost but cloudy. 8—10. Dull and cloudy, with frost. 11. Clear frost. 12. Frost, but threatening change. 13. Fall of snow: frost P.M. 14. Snow continuing: frost. 15. Clear frost: snow lying. 16. Thaw: snow and sleet. 17. Frost again: snow lying. 18. Frost: fog. 19. Thaw: rain: snow melting. 20. Thaw, but no rain. 21. Frost, pretty severe. 22. Rain, hail and sleet. 23. Snow: clear frost. 24. Snow-drift: frost. 25. Frost: clear: snow lying. 26. Snow: wind: sleet: stormy. 27. Clear frost: one shower. 28. Partial thaw. 29. Frost: clear. 30. Frost A.M.: thaw and rain P.M. 31. Thaw with slight rain.

Sun shone out 16 days. Rain fell 7 days. Snow 6 days. Frost 21 days. Hail and sleet 2 days. Fog 3 days.

Meteorological Observations made at the Apartments of the Royal Society, LONDON, *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; *by* Mr. Dunbar, *at Applegarth Manse*, DUMFRIES-SHIRE; *and at Sandwick Manse*, ORKNEY.

Days of Month. 1842. Jan.	Barometer. London: Roy. Soc. 9 a.m.	Barometer. Chiswick. Max.	Barometer. Chiswick. Min.	Barometer. Boston. 8½ a.m.	Barometer. Dumfries-shire. 9 a.m.	Barometer. Dumfries-shire. 9 p.m.	Barometer. Orkney, Sandwick. 9½ a.m.	Barometer. Orkney, Sandwick. 8½ p.m.	Thermometer. London: R.S. Fahr. 9 a.m.	Thermometer. London: R.S. Self-reg. Mx.	Thermometer. London: R.S. Self-reg. Mm.	Thermometer. Chiswick. Max.	Thermometer. Chiswick. Min.	Thermometer. Boston. 8½ a.m.	Thermometer. Dumf.-shire. Max.	Thermometer. Dumf.-shire. Min.	Thermometer. Orkney, Sandwick. 9½ a.m.	Thermometer. Orkney, Sandwick. 8½ p.m.
1.	30·230	30·197	30·171	29·75	29·97	30·01	30·09	30·14	36·3	42·0	35·0	38	27	35	45	42	41	41
2.	30·192	30·170	30·053	29·84	30·05	30·05	30·18	30·20	34·7	40·7	33·3	37	25	31·5	45	41	41	41
☾ 3.	30·022	30·013	29·947	29·75	29·99	29·95	30·17	30·15	34·2	38·8	33·0	37	22	33	36	31½	38	37½
4.	29·944	30·005	29·929	29·66	30·00	30·10	30·24	30·30	30·3	34·5	28·2	34	29	31	36	29	35	36½
5.	30·050	30·051	30·008	29·66	30·09	30·07	30·21	30·21	32·7	31·0	30·6	36	30	33	37½	28½	36	30
6.	30·180	30·311	30·168	29·85	30·15	30·30	30·30	30·40	31·7	37·3	32·9	37	23	31	36	31	29	35
7.	30·490	30·450	30·445	30·16	30·37	30·41	30·39	30·34	29·5	37·7	29·6	35	28	26	35	26	32	36½
8.	30·496	30·410	30·316	30·16	30·35	30·23	30·20	30·10	31·2	35·2	29·5	31	28	31·5	35	29	34	39½
9.	30·238	30·233	30·140	30·00	30·14	30·07	30·05	30·05	29·2	34·0	28·8	30	27	29·5	34½	32	42	40
10.	30·128	30·125	30·027	29·82	29·97	29·84	29·94	29·81	30·3	31·0	28·8	31	25	29	32	27½	39	36
● 11.	30·002	30·007	29·981	29·65	29·85	29·87	29·93	29·98	33·8	34·5	30·4	34	30	30	34	27½	39	35
12.	30·066	30·050	29·989	29·72	29·80	29·73	29·88	29·87	33·7	36·2	32·8	36	21	32	37	23	39	40
13.	29·872	29·878	29·961	29·57	29·53	29·50	29·68	29·64	33·0	38·0	33·0	33	29	32	35½	31	39	39
14.	29·514	29·704	29·558	29·31	29·50	29·57	29·67	29·84	36·7	37·3	30·2	36	22	32	35	29	37	32
15.	29·948	29·953	29·919	29·53	29·78	29·70	29·96	29·76	34·2	37·7	32·5	39	20	33	32	30½	31	36
16.	29·782	29·900	29·681	29·48	29·45	29·58	29·62	29·71	37·7	38·2	33·0	42	31	33	36	13½	37	37½
17.	30·072	30·207	30·042	29·63	29·90	30·10	29·98	30·15	36·7	42·4	31·3	43	22	38	38	30	41	41
18.	30·380	30·399	30·353	30·00	30·19	30·21	30·13	30·19	30·6	42·6	30·3	33	31	29	35	19½	42	42
☽ 19.	30·480	30·452	30·197	30·15	30·20	30·09	29·98	29·94	33·7	38·2	30·0	33	27	29	40½	32	45½	48
20.	30·174	30·098	30·028	29·92	29·95	29·88	29·93	29·86	33·4	34·6	29·3	33	32	27	40	34	43	40½
21.	30·044	30·024	30·009	29·79	29·89	29·80	29·83	29·66	34·3	35·3	33·2	35	30	32	35	24	39	40
22.	29·880	29·881	29·285	29·28	29·42	29·14	29·32	29·25	34·3	35·3	33·8	38	29	33	36½	29	38	37
23.	29·240	29·581	29·220	28·88	29·16	29·52	29·43	29·64	32·4	38·8	32·3	38	18	31	35	30	33	32
24.	29·846	29·853	29·634	29·60	29·61	29·20	29·62	29·18	28·7	36·2	27·3	36	23	16·5	33½	20	34½	33
25.	29·348	29·745	29·327	29·14	29·22	29·48	29·20	29·43	35·3	35·6	29·3	46	35	32	38	31	36½	35
○ 26.	29·446	29·518	29·175	29·19	28·85	28·77	29·18	29·07	39·3	41·8	33·0	43	21	32	38½	32	38	37
27.	29·678	29·794	29·638	29·20	29·30	29·50	29·25	29·42	38·4	44·6	37·6	45	31	38	52	26	39	38
28.	29·850	29·907	29·831	29·48	29·59	29·70	29·50	29·71	36·4	44·2	36·0	45	23	34	41	32	39	35
29.	29·990	30·075	29·921	29·60	29·85	30·05	29·97	30·09	36·0	42·3	33·2	45	36	34	39	33	38	33
30.	30·262	30·219	29·906	29·90	30·05	29·90	29·90	29·91	36·7	41·7	35·6	43	32	30	40	27	41	41
31.	30·134	30·124	29·930	29·75	29·78	29·78	29·90	29·72	40·7	41·2	36·5	47	30	36	42	35½	39	37
Mean.	29·999	30·043	29·896	29·65	29·80	29·81	29·860	29·862	34·2	38·1	32·0	37·80	27·10	31·6	37·5	29·2	37·90	37·48

Days of Month. 1842. Jan.	Wind. London: R.S. 9 a.m.	Wind. Chiswick. 1 p.m.	Wind. Boston.	Wind. Dumfries-shire.	Wind. Orkney, Sandwick.	Rain. London: R.S. 9 a.m.	Rain. Chiswick.	Rain. Boston.	Rain. Dumfries-shire.	Rain. Orkney, Sandwick.	Dew-point. Lond. R.S. 9 a.m.
1.	se.	se.	sw.	sw.	se.	......	......	......	......	·03	34
2.	n.	nw.	calm	e.	se.	......	......	......	......	·01	33
☾ 3.	n.	nw.	calm	e.	se.	......	......	......	......	......	32
4.	n.	n.	calm	e.	calm	......	......	......	......	......	28
5.	w.	n.	calm	e.	calm	......	......	......	......	......	30
6.	nw.	ne.	nw.	se.	calm	......	·01	·39	......	......	36
7.	n.	ne.	calm	wsw.	calm	......	......	......	......	......	29
8.	n.	e.	calm	se.	se.	......	......	......	......	......	26
9.	n.	ne.	calm	s.	s.	......	......	......	......	1 2	25
10.	n.	se.	calm	sse.	se.	......	......	......	......	·10	23
● 11.	s.	s.	calm	w.	nw.	......	·10	......	......	·11	30
12.	s.	s.	calm	e.	s.	·075	......	......	......	......	30
13.	sse.	s.	se.	e.	se.	......	·28	......	......	......	32
14.	s.	sw.	calm	e.	se.	·091	......	......	......	......	34
15.	s.	sw.	calm	e.	calm	......	·02	......	......	·16	32
16.	sse.	s.	calm	se.	se.	·022	·02	......	......	......	34
17.	sw.	nw.	w.	nnw.	nw.	......	......	·93	0·78	·12	31
18.	w.	nw.	calm	nw.	ssw.	......	......	......	......	......	32
☽ 19.	w.	sw.	calm	sse.	s.	......	......	......	......	·04	33
20.	s.	ne.	calm	se.	se.	......	......	......	......	......	33
21.	n.	e.	calm	e & s.	s.	......	......	......	......	......	33
22.	e.	se.	calm	se.	s.	......	......	......	......	·39	32
23.	w.	nw.	calm	ene.	se.	·119	·12	......	......	·42	32
24.	w.	w.	w.	e.	se.	......	·12	......	1·16	·07	27
25.	w.	nw.	calm	e.	s.	·091	·10	......	......	·32	32
○ 26.	se.	s.	se.	e.	e.	·041	·14	......	......	......	33
27.	s var.	w.	w.	nw.	nw.	·133	......	1·08	......	·72	34
28.	w.	nw.	calm	wnw.	nw.	......	......	......	......	·15	35
29.	w.	sw.	calm	nw.	w.	......	·03	......	0·32	·29	35
30.	nw.	w.	calm	s.	s.	......	......	......	......	......	35
31.	s.	sw.	calm	se.	calm	......	·12	......	......	·23	37
Mean.						Sum. ·572		2·40	2·26	3·28	Mean. 32

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 56. APRIL 1842.

IX.—*Contributions to Structural Botany.* By W. Hughes Willshire, M.D., M.B.S., Lecturer on Botany at Charing Cross Hospital.

1.—Specimens of *Ulva calophylla*, Spreng., having lately been transmitted to the Botanical Society of London, I have had an opportunity of fully examining this curious alga, and it appears to me worthy of some remark, both as regards its structure and its relative affinities. Under the microscope several forms of the plant may be seen, and which to me appear to be permanent, at least whatever form perfects its quaternary granules I think should be looked upon as a perfect plant: this may either exist as a cylindrical cellular filament continuing of the same diameter throughout its whole length, except close to its fixed extremity, where it becomes slightly attenuated and rounded, and is more or less conical at the opposed one; it undergoes no alteration or change of form, but two rows of quaternate granules are produced in the cellular cylinder;—it may be observed as a flattened strap or band of a breadth equal to four or five diameters of the filament or even more, becoming considerably attenuated towards its fixed extremity, and is more or less constricted at distant intervals, a membranous band being seen at the points of constriction; —lastly, it may be seen as a very broad flattened frond, rather suddenly constricted into a delicate cylindrical stipes. With respect to these different conditions, I would observe, that the first or cylindrical one is not necessarily to be regarded as an imperfect condition of the others, or as one that must necessarily, at an after period of the life of the plant, pass or become metamorphosed into them. Except in the earliest stages of the life of the plant, in whatever condition of age or form it may be observed, it will be found that the margins of the band or strap, and the circumference of the cylinder, are brightly transparent; that the flattened frond is traversed longitudinally by transparent lines, varying in number according to the breadth of the strap, and between which are placed green-coloured granules; these latter, however, varying in number, colour and size according to the age and figure of the plant. Whatever form the plant may assume in advanced periods of growth, in its earliest which I have been able to detect, it exists as a very delicate cylindrical filament (this is quite distinct however from the form before alluded to) divided at intervals by transverse septa, and presenting therefore a cellular structure. These cells I shall denominate primary cells; in some of the cells a little point or nucleus is seen, the rest of the cell being bright and transparent, whilst the other cells are filled with a thin green-coloured matter. This point or nucleus I regard as the first stage of the green granular sporular matter, which in the other cells is distinctly seen as having arrived at its second stage. The further development of the plant appears to ensue from self-division of the primary cellule, such division taking place both in a longitudinal and transverse direction; the granular matter being divided with the cells, and the law being that each primary cell shall form four cells, and each of these four cells four granular masses, so that sixteen granular masses are the result. Thus the primary cell becomes divided transversely, and hence two granular masses are formed; a single row only of granules however running down the length of the frond. In the further development these secondary cells become divided longitudinally, so that four tertiary cells result from the primary one, in each of which is contained a granular mass which separates into two portions. From the wall of separation formed in the longitudinal division being stronger and broader than that of the transverse, and from its withstanding more perfectly the pressure of the internal coloured matter, a transparent band or line is observed to run down the frond between the inner surfaces of the tertiary cells.

Whilst self-division of the cells has been going on, the frond gradually increases in breadth until the tertiary division becomes complete, at which it ceases, all further growth being terminal, if the plant is to continue to exist in the cylindrical or linear form; the green matter however undergoes a change to which we shall allude directly. It will be remarked, that in the form we have just alluded to, although we have two rows of cells running down the frond, only one series of primary cellules has been developed, and upon this fact appears to depend the preservation of the cylindrical figure; if more series than one are developed, their lateral pressure against the walls of the cylinder causes the latter to become extended laterally, and hence ensues the flattened riband shape or strap-like form; and according to the number of series of primary cells, so is the breadth of the frond. The same process of division takes place with each series of primary cellules, so that supposing four series to have been developed, there will be seen eight rows of tertiary cells. In those plants assuming the flattened and laterally extended form, the markings of the different series are very and beautifully evident, they being divided from each other by bright longitudinal bands, and which are much more evident than the transparent lines separating the tertiary cells from each other; in fact, the latter are almost disregarded by attention being attracted so strongly to the former, which I would therefore denominate the *serial bands*, the others the *cellular lines*. Very often the cellular lines are completely obliterated as *transparent* ones by the pressure of the granules in the opposed cells, a *dark* line resulting from the close approximation of the edges of the granules. It is the *serial bands* to which specific distinction has been attached. When the series of primary cellules increase suddenly in number, a transverse cellular band is seen running across the frond where its increase of breadth commences; and even in fronds preserving the same serial conditions throughout their length, these transverse bands are to be seen at places where there is evident constriction. The tertiary division of the cells being complete, the green granular matter contained in each of the four cells resulting from this division becomes separated into four portions, each portion or mass apparently being enveloped by a cellular covering, thus resembling somewhat four agglomerated granules of pollen. As far as I have been able to discern, the quatenary division of the granular matter does not result from a further division of the tertiary cell, but from a plastic power exclusively its own. When the granules are observed moving about after their separation from the frond, they are sometimes noticed adhering in fours, as they do in the cells; at other times they separate very soon from each other, each little one moving about by itself, and marked with a dark central spot. The general colour of the granules is certainly that of a bright green; but others, and which are the largest, and generally those which have only undergone a binary division, are of a much deeper and more olive-green hue. It is very evident that the plant is quite destitute of colour, independent of that which it receives from the granular or sporidial matter; to me, also, that the youngest condition of the plant is cylindrical and cellular, in fact *confervoid*; and also that this condition may remain, and yet the plant perfect quaternary granules. In the metamorphosis of it to the flattened form, the interserial spaces and margins become thick and much developed, presenting quite a homogeneous appearance, the frond often having constrictions at distant intervals, and which appear to me to be merely forms of very elongated, flattened, metamorphosed, confervoid cells. In the flat fronds it is rather difficult to discern the walls of the cells without attentive observation; but with care, and a due regard being paid to the transmission of light from the mirror of the microscope, an eye accustomed to the appearances vegetable structures present will soon detect them. The termination of the frond is rounded, or more or less sharply conical, the length variable from a line to nearly half an inch, the breadth depending upon the number of serial cells primarily developed, and the whole plant often twisted, waved or curled.

In the second volume of Sir J. W. Hooker's 'Flora' our present plant is arranged under the genus *Ulva*, with the remark appended, that "although arranged by Captain Carmichael among the *Bangiæ*, it is but justice to his memory to state that he remarked in a note that this plant and *Bangia velutina* of Lyngbye were more nearly allied to the *Ulvæ* than to the gelatinous *Bangiæ* of the second division."

Mr. Harvey, in his late work, also arranges it in the same genus (*Ulva*). To me it does not appear to have its natural location in this genus; it is true that the plant is wanting in some of the characteristics of the *satisfactorily* determined *Bangiæ*, as stated by Captain Carmichael, and also that the flattened forms of it do simulate to a considerable extent the characters of the genus *Ulva*. I look upon it as certainly *confervoid* in its earliest state, and always so in certain of its perfect and adult conditions; but that it also becomes metamorphosed into a form which closely approximates to that of the family *Ulvaceæ*. The genus *Bangia* has already been supposed a group of the *Confervæ* by some botanists, and which has certainly a connexion with our present plant, but yet not sufficient to admit of its reception. It appears, under all considerations, by no means unwarrantable that this plant shall form the type of a new family intermediate between *Confervæ* and *Ulvaceæ*, a family osculant of these two, connecting the family *Confervæ* to *Ulvaceæ* by the genus *Bangia* however rather than by that of *Ulva*.

2.—Two or three years ago it was stated by Dutrochet, that in the nodi of *Viscum album* no true woody matter existed; that the vascular connexion of the internodial spaces was therefore broken up, or was only maintained by a layer of *cellular tissue* or *pith*: this doctrine was admitted, and *Viscum* was supposed to form another illustration of what have been called *articulated stems*. Some time after Decaisne published a small work on the woody structure of this plant, in which he contradicted the statement of Dutrochet, and maintained that the vascular or woody portions of the internodial spaces were continuous, and the state of articulation was solely dependent upon the non-continuity of the vessels of the bark. Dutrochet again averred before the French Academy that his views were right. Here I believe the matter has rested. I have taken some pains to satisfy myself which of these theories is correct. I have examined portions of the plant both young and old, and at all portions of the nodal places, and I fully concur with Decaisne in stating that the true woody and vascular structure of *Viscum* is perfectly continuous through the nodi; that there is no transverse and separating layer of cellular tissue or pith in this portion of the plant, but that the connexion of the inner layers of the *bark* is broken up at the nodi. *Viscum album* has not an articulated stem, in the proper sense of the word then. The vascular structure of *Viscum album* is by no means so entirely composed of those peculiarly marked and rather elongated cells as is generally drawn and stated. Kieser's representations are often copied, but they only represent a part of the vascular apparatus; no doubt a great portion of the woody matter is composed of cells quite different from those met with in the wood of Exogens; but if the young wood or first-formed bundles be examined, plenty of very long annular ducts—and (to me) spiral ducts, with the fibre unrollable, however, as far as I have been able to detect—will be found. I may also remark, that the long pleurenchymatous cells surrounding the first-formed vascular bundles are carried along with the latter to the centre of the plant, around the pith of which they may be found,—a circumstance somewhat analogous to that stated by Decaisne to take place in *Menispermaceæ*.

3.—There are very few plants, in the anatomy of whose pleurenchymatous and vascular structure a stronger support for *some* of the views of Schleiden on the origin of *spiral structure*, &c. can, I think, be seen, than in *Tilia europæa*. The anatomy of the tissues of this plant appears to me to prove that primary membrane is homogeneous and structureless, but that the secondary formations of tissue ensuing within cells composed of such primary membrane are in their form and nature *fibrous*, and in their direction *spiral*. Out of such secondary structure the origin of all tissue presenting a fibrous appearance, and the least tendency to a spiral direction in any period of its growth or development, is to be looked for. In this plant, as also in many others of the families *Asclepiadaceæ* and *Apocyneæ*, it appears evident, that in the development of the primary fibrous layers, two fibres having opposite directions are formed; but whether such is always the law of evolution, and taking place in every plant, is, I think, not sufficiently proved. In *Tilia* especially this law, however, can be seen operating, in the formation of the spiral fibres on the wall of the cells of the pleurenchyma. That the *continuous* spiral development is the base of all forms of annular reticulated and dotted vessels I think certain, and the various metamorphoses which arise from such base are to be sought for in the peculiar after-growth of the primary structureless membrane upon which the secondary fibrous layers were originally deposited. Very often, as may be seen in *Tilia*, this membrane becomes entirely absorbed, the coils of the secondary spire brought close together; and this happening during the development of the fibres, the spiral continuity ceases to exist; the molecules from which the fibres are formed hence pass into a series of more or less broad, flat, and continuous bands; and vessels formed of such fibres, totally destitute of primary membrane, are to be found in the plant just referred to. In fact, much of the tissue of *Tilia* represents many stages and states of evolution of the secondary fibrous layers in connexion with peculiar after-growth of the primary structure upon which they have been deposited. I have observed *compound* spiral vessels in the petiole of *Tilia pubescens*.

4.—On the under surface of the leaf of *Adelia nereifolia* may be found a very beautiful and peculiar form of scale; it consists of two circular layers of cellular membrane, the one layer of much smaller diameter than the other, puckered and plaited, and of a saucer-shaped form; it is fixed by its centre, which apparently is connected with a *gland* having coloured contents. From this form of scale, through that met with on *Eleagnus conferta*, I think transitional states may be seen, to the stellate hairs of many of the *Euphorbiaceæ* and *Malvaceæ*; in fact, upon the peculiar adhesions taking place between the cells depends the appearance of the stellate hair or the scale of *Adelia* and *Eleagnus*. The occurrence both of stellate hairs and this form of scale in *Euphorbiaceæ*, shows the structural differences between the two not to be great in their origin.

[To be continued.]

X.—*On the Separation of the Pomegranate as a distinct Natural Order from* Myrtaceæ. By Robert Wight, M.D., F.L.S., &c.*

The most eminent botanists of the present day being divided in opinion as to the propriety or otherwise of separating the

* From the Madras Journal of Literature and Science, No. xxix. p. 254.

Pomegranate as a distinct natural order from *Myrtaceæ*, I have recently been induced to examine this question, bringing to my aid the lights thrown on carpellary arrangement by my recent investigations of *Cucurbitaceæ*. (Annals, viii. 260.)

The result of this examination has led me to the conviction, not only that *Granateæ* is a distinct order, but that the pomegranate, if my views are correct, is, so far as our information yet extends, the most remarkable fruit in the system of plants. But, without further preface, I shall at once proceed with the subject, introducing it by presenting a series of extracts from the leading disputants on either side. The whole controversy turns on a simple question of fact, namely, What is the structure of the ovary and fruit of *Punica*? To these points therefore I shall, to save room, limit my extracts. The first of these, taking them in chronological order, is from Mr. D. Don's paper, 'Edin. New Philosoph. Journal' for July 1826. The second is from DeCandolle's 'Prod.,' iii. p. 3. The third is from Dr. Lindley's 'Natural System of Botany,' ed. 1st, p. 64, and repeated in the second edition, p. 43. The last is from Mr. Arnott's article Botany, 'Encycl. Brit.,' ed. 7, p. 110, under *Myrtaceæ*. These extracts, by placing the question before the reader in all its bearings, will enable him at once to judge how far I have succeeded in setting the question at rest.

" *Bacca* pomiformis, limbo tubulosa dentato calycino, nunc contracto, coronata: *cortex* crassissimus, extùs cuticulâ lævi rubicundâ punctatâ lucidâ vestitus, intus spongioso-carnosus, albus, dein, maturâ baccâ, fissurâ irregulariter rumpens. *Placenta* cortici baccæ substantiâ simillima, at magis carnosa et succulenta baccam omnino replens, in loculis numerosis polyspermis inæqualibus reticulatim atque interruptè excavata. *Dissepimenta vera* nulla: *spuria* tamen adsunt, quæ e substantiâ placentæ orta, valdè sunt fragilia, et crassitie variâ."—*Don* (*l. c.*).

"The real structure of the fruit of the pomegranate appears to have been overlooked by all authors I have consulted on the subject, and even the distinguished Gærtner has fallen into error both in his description and figure. It is in reality a fleshy receptacle, formed by the tube of the calyx into a unilocular berry, filled with a spongy placenta, which is hollowed out into a number of irregular cells in which the seeds are placed; the dissepiments being nothing more than thin portions of the placenta. If we could conceive the fruit of *Rosa* to be filled up with an interrupted pulpy matter, it would be exactly of the same structure as the pomegranate."—*Don* (*l. c.*).

" Fructus magnus, sphæricus, calycis limbo subtubuloso coronatus, ejusdem tubo corticatus, indehiscens, diaphragmate horizontali inæqualiter bicameratus; camerâ superiore 5—9-loculari, camerâ inferiore minore 3-loculari, septis utriusque membranaceis loculos separantibus; placentæ cameræ superioris carnosæ a parietibus ad centrum tendentes, in inferiore processus irregulares ab ipso fundo."—*DeC.* (*l. c.*).

"The fruit of the pomegranate is described by Gærtner and De Candolle as being divided into two unequal divisions by a horizontal diaphragm, the upper half of which consists of from five to nine cells, and the lower of three; the cells of both being separated by membranous dissepiments; the placenta of the upper half proceeding from the back to the centre, and of the lower irregularly from their bottom: and by Mr. Don as a fleshy receptacle formed by the tube of the calyx into a unilocular berry, filled with a spongy placenta, which is hollowed out into a number of irregular cells. In fact, if a pomegranate is examined, it will be found to agree more or less perfectly with both these descriptions. But it is clear that a fruit as thus described is at variance with all the known laws upon which compound fruits are formed. Nothing, however, is more common than that the primitive construction of fruits is obscured by the additions, or suppressions, or alterations, which its parts undergo during their progress to maturity. Hence it is always desirable to obtain a clear idea of the structure of the ovarium of all fruits which do not obviously agree with the ordinary laws of carpological composition. Now a section of the ovarium of the pomegranate in various directions, if made about the time of the expansion of the flowers before impregnation takes place, shows that it is in fact composed of two rows of carpella, of which three or four surround the axis, and are placed in the bottom of the tube of the calyx, and a number, varying from five to ten, surround these, and adhere to the upper part of the tube of the calyx. The placentæ of these carpella contract an irregular kind of adhesion with the back and front of their cells, and thus give the position ultimately acquired by the seeds that anomalous appearance which it assumes in the ripe fruit. If this view of the structure of the pomegranate be correct, its peculiarity consists in this, that, in an order the carpella of which occupy but a single row around the axis, it possesses carpella in two rows, the one placed above the other, in consequence of the contraction of the tube of the calyx, from which they arise. Now there are many instances of a similar anomaly among genera of the same order, and they exist even among species of the same genus. Examples of the latter are, *Nicotiana multivalvis* and *Nolana paradoxa*, and of the former, *Malope* among *Malvaceæ*; polycarpous *Ranunculaceæ* as compared with *Nigella*, and polycarpous *Rosaceæ* as compared with *Spiræa*. In *Prunus* I have seen a monstrous flower producing a number of carpella around the central one, and also, in consequence of the situation, upon the calyx above it; and finally, in the 'Revue Encyclopédique' (43. 762), a permanent variety of the apple is described, which is exactly to *Pomeæ* what *Punica* is to *Myrtaceæ*. This plant has regularly fourteen styles and fourteen cells, arranged in two horizontal parallel planes, namely, five in the middle and nine on the outside, smaller and nearer the top; a circumstance which is evidently to be explained by the presence of an outer series of carpella, and not upon the extravagant hypothesis of M. Tillette de Clermont, who fancies that it is due to the cohesion of three flowers." —*Lindley* (*l. c.*).

"To the *Myrteæ* we, with Mr. Lindley, unite the *Granateæ*, because *Punica* or the pomegranate only differs by having its two verticels of carpels developed instead of one, and perhaps in a truly wild state the upper or adventitious one may occasionally disappear. The inner series (or those at the bottom of the fruit) have their placentæ in the axis; but the outer series, forced to the top of the fruit by the contraction of the mouth of the tube of the calyx, having their placentæ in the ovary at the back of the inner carpels, exhibit them in the ripe fruit in a horizontal position on the upper surface of the lower cells."—*Arnott* (*l. c.*) *et Prod. Fl. Peninsulæ,* i. p. 327.

Premising that the whole controversy turns on these questions,—1st, what is the true structure of a pomegranate; and 2nd, whether the difference between it and *Myrtus* is sufficient to separate these genera as distinct orders;—I shall now proceed to examine these conflicting statements, and endeavour to ascertain on which side the balance preponderates, and whether, indeed, there is not room for an explanation different from any of those yet proposed.

Mr. Don's description of this fruit, on the strength of which he first proposed to remove this genus from *Myrtaceæ*, the order with which it was previously associated, as a distinct family, appears to me untenable. He, as I understand, considers the fruit a one-celled receptacle, the centre of which is filled with a spongy placenta, round the surface of which there are a number of irregular cells occupied by clusters of ovules; but he does not tell us how the central placenta got there, neither does he account for the ovules being attached to the parietes of the cell, and not to the central placenta.

DeCandolle gives a more correct description of it when he says, that it consists of two chambers, the under three-celled, the upper from five- to nine-celled, with the placentas of the upper cells reaching from the parietes to the centre, while those of the lower division proceed irregularly from the bottom of the fruit. He does not, however, assign this peculiar structure as his principal reason for viewing the order as distinct from *Myrtaceæ*, but has recourse to others, in my estimation, of minor importance.

Lindley conceives that there are two rows of carpels, three or four of which surround the axis at the bottom, while the remainder surround these, and, occupying the upper part of the fruit, adhere to that part of the tube of the calyx. The placentas of these upper carpels, he conceives, contract an irregular kind of adhesion with the back and front of their cells. The meaning of this is far from being clear to me; but if it means that he considers the placentas of the upper as well as the lower row to proceed from the axis towards the circumference, to which last they contract accidental adhesions, then he takes an erroneous view; and if the examples quoted in illustration support this view, they are not in point as regards the structure of *Punica*.

Mr. Arnott, like Lindley, views the fruit as consisting of two rows of carpels, an outer and inner, the former of which he thinks may be adventitious. To understand his theory, we must first suppose the tube of the calyx spread out as a flat surface and covered with two circles of carpels, the inner next the axis, and the other occupying a larger circle beyond, and that the margin of the calyx then contracts so as to turn the outer series over the inner. According to this supposition, the attachment or base of the placentas of the outer series should be in the circumference and the apex in the centre, while that of the inner should be in the opposite direction, that is, have the base in the centre and the apex towards the circumference; an explanation which is in accordance with what we find, except in so far as it does not account for the horizontal partition between the two series: nor can I exactly understand on what ground we are warranted in assuming that the outer series is adventitious and the result of cultivation, as it has everywhere been found so constant in all circumstances. But be that as it may, this theory certainly accounts for the crossing of the placentas in the two rows which we so invariably find; whether correctly or not, cannot be determined until we get fruit with a single row of carpels, which has not yet been found.

These explanations, which I venture to propose, of rather obscure descriptions, did not occur to myself until after I had formed a new theory of my own, the result of a very careful examination of the ovary in all stages from the earliest up to the period of impregnation. At these early stages, when the whole flower had not yet attained half an inch in length, probably a fortnight or more before expansion, I invariably find two rows of carpels, one inferior of four or five, and one superior of five, six or more. In the lower series the placentas are ranged round the axis, with their base in the centre, and the apex, which is free, towards the circumference. In the upper, the attachment, or base of the placentas, is in the circumference, and the apex, also at first free, directed towards the centre. Between the two rows a diaphragm is always interposed. The apex of the upper placentas is, occasionally, afterwards prolonged and contracts adhesions to the axis.

In the accompanying figures I have attempted to represent these views. As the fruit advances in size considerable derangement of this structure progressively occurs, which is apt to mask and confuse the appearances now described.

Having previously ascertained the occasional existence of inversion in the position of carpels, my first idea was, that such an inversion took place in the upper row. This view, which, equally with the preceding, accounts for the crossing of the placentas, I feel inclined to adhere to, though I confess not without some hesitation, because it implies a complexity of arrangement rarely met with in the inimitably simple and beautiful operations of nature; but I think it as difficult to imagine the nearly equally complex and inconceivable operation of the folding-in of one set of carpels over the other, which Drs. Lindley and Arnott's explanation demands: while my explanation has the advantage of at the same time accounting for the double chamber which the ovary presents from its earliest stages, and renders unnecessary the doctrine of an adventitious verticel of carpels, which for the present is mere assumption.

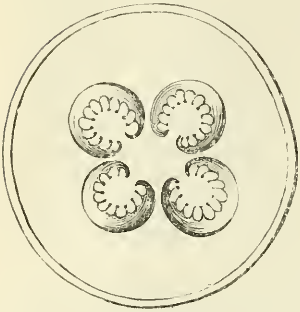
With these explanations, I leave the question of structure to consider the one pending on its determination, viz. whether or not *Granateæ* ought to be preserved as a distinct order, or be re-united to *Myrtaceæ*.

On this point, so far as the unvarying evidence derived from cultivated plants is entitled to carry weight on a disputed point —and which I presume it must do until we find that evidence invalidated by the examination of others growing in a truly wild state—we must unquestionably, I conceive, adopt the views of those who urge the separation, because the complex structure above described, being constant here and unknown among the true *Myrtaceæ*, we have no right, in the total absence of direct confirmatory evidence, to assume that a part is adventitious merely because it is at variance with our ideas of what should be, especially while we have, in addition, difference of habit in the formation of the seed and their pulpy envelope, in further confirmation of the correctness of these views.

To the views of DeCandolle more importance must necessarily be attached, as the reasons he assigns are more satisfactory, though I do not think he has attached sufficient value to the very peculiar "œconomy of the fruit," while he has given too much to others of much less note, such as the want of pellucid dots, the absence of the marginal nerve of the leaves, and the pulpy covering of the seed; thereby throwing into the shade the true essential character of the order, which unquestionably lies in the double row of carpels, with the upper placentas parietal and crossing the lower axillary ones, which, if I have rightly accounted for, constitute this a truly curious and unique fruit; and which, whether or not my theory of its construction be correct, is yet so very different from that of every true *Myrtacea*, as to leave no doubt of its forming the type of a distinct order.

Fig. 1.

a.



b.

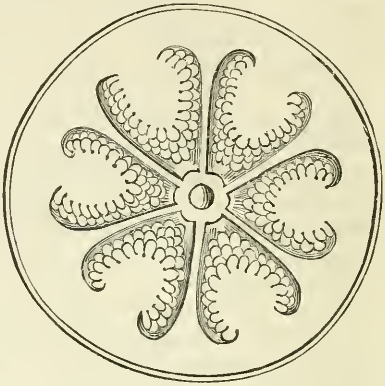
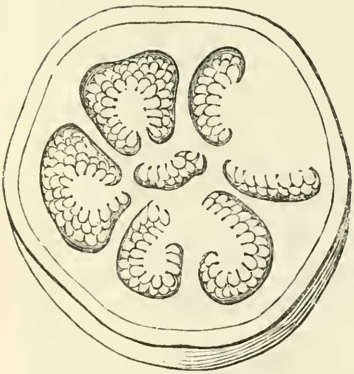
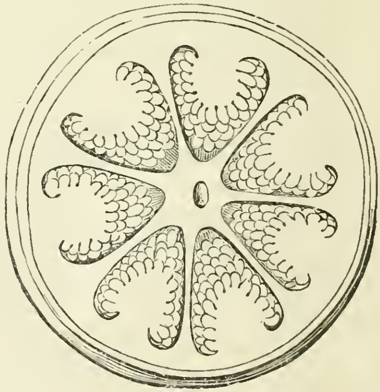


Fig. 2.

a.



b.



EXPLANATION OF THE FIGURES.

Fig. 1.—*a.* Section showing the lower series of carpels in the ovary of the Pomegranate many days before the expansion of the flower.

b. Section showing the upper series of carpels. These two figures are taken from opposite sides of the same slice.

Fig. 2.—*a.* Section showing the lower series of carpels in an ovary some days after the expansion of the flower. At this time considerable derangement has taken place, apparently caused by the rapid expansion, in a confined space, of the ovules after impregnation.

b. Upper series in the same ovary, and, as in the former instance, taken from the opposite sides of the same slice. Here the derangement so obvious in the lower section has not taken place.

XI.—*A Critical Examination of Mohl's Views of the General Structure of the Pollen Granule.* By Arthur Hill Hassall, Esq., M.R.C.S.L., Corresponding Member of the Dublin Natural History Society.

Mohl considers the external membrane of the pollen granule to be the secreting organ of the oily liquid found upon all pollen, but more abundantly upon such as is either cellular or spinous, and that it is this liquid which determines the colour as well as the viscosity of the pollen.

In the remarks I have already published upon the pollen granule*, I have suggested the probability that this viscid fluid, which differs so much from the fovilla in appearance, is derived from the cell in which the pollen is originally developed; and this suggestion appears to gather some degree of confirmation from the fact of its being met with in greater quantity upon pollen which has just escaped from the anther.

This external membrane Mohl states to vary considerably in intimate structure according to the plants in which it is examined, being either cellular or granular, and but rarely, if ever, perfectly homogeneous. "The cellular structure," he observes, "without being rare, occurs but in a small number of plants. It is met with as frequently among Monocotyledons as among Dicotyledons. It is not a character of a family; on the contrary, this structure is observed in genera of the same family, or in species of a genus, while allied plants present another." My opinion upon this point is, that it most frequently, if not invariably, is to be relied on as affording a character of at least generic importance, and that it is not uncommonly of higher value, running through several contiguous genera. The cellules are more or less regularly six- or seven-sided, and of various sizes. The network formed by their union has been mistaken by some observers for the ramifications of vessels in the external membrane of the pollen granule, "an error similar to that which had place relative to the epidermis of leaves." "In all cases where the external membrane is cellular," Mohl goes on to remark, "I have found the surface of the granule smooth and destitute of spines." "This result is in truth altogether opposed to that M. Brongniart announces, who believes to have found in the centre of each cell an excretory conduit under the form either of a hair or a spine; for example, in *Mirabilis Jalapa, Ipomœa purpurea*; but my observations have informed me, that all the species of pollen described by M. Brongniart as cellular and spi-

* See Annals and Magazine of Natural History for Oct. last, vol. viii. p. 92.

nous are not really at all cellular, and that the oil which is found in the cells does not escape by visible apertures, but transudes through the walls of the cells."

In making the above statements Dr. Mohl and M. Brongniart are both in part in error. Mohl errs in asserting, in opposition to M. Brongniart, that the kinds of pollen which are spinous are not at the same time cellular. In the paper already referred to, I have declared that the majority, if not all (and I am inclined to think that all are so), of pollen granules which are furnished with spines have a cellular extine; and that on *each* cell, and probably formed by it, either a spine is situated, or where this is absent, its walls are perforated by an aperture, which aperture is intended for the passage of the pollen tubes. On the other hand, M. Brongniart is doubtless at fault in the belief that he has found, in each cell of the reticulated external membrane, an excretory duct under the form either of a hair, spine, or aperture. In the pollen of *Lilium*, *Pancratium*, and many other plants whose external membrane is most manifestly cellular, neither apertures nor any other visible outlets, save the longitudinal furrow for the pollen tube, are discernible; in these cases, therefore, the oily matter must escape (if it be secreted by the extine) by exudation from the general surface of the membrane, and not through apparent openings. The spines themselves are for the most part open at their extremities, and may, where they are present, perform the office attributed to them by M. Brongniart. M. Brongniart refers to the pollen of *Mirabilis Jalapa* in support of his views. It is very doubtful whether the extine of this be cellular or not, and although it is indeed perforated with numerous apertures, these all undoubtedly are designed to permit the escape of the pollen tubes.

That the external membrane of most pollen which is hispid is really cellular, any one may satisfy himself by a careful examination of the pollen of *Ipomœa purpurea*, *Cynara Scolymus*, *Pavonia præmorsa*, *Hibiscus annuus*, &c.

Mohl thus speaks of the granular appearance sometimes presented by the extine, and as his observations on this point are highly interesting, I need make no apology for introducing them at length in his own words. "In many cases the cellules of the external membrane become contracted to such a point, that one knows not whether we ought still to give them the name of cells, or whether the membrane is only made up of very large grains. In these instances one might still admit that the granular aspect of the membrane arose from the fact of its being composed of extremely small cells, although our means of observation permitted us not to recognise these grains for cells." This idea of Mohl's is supported principally by reference to the fact, that in some pollen—for example, in that of *Pitcairnia latifolia*—manifest transitions from one of these formations to the other, that is, from the cellular to the granular, may be detected. This explanation is probably the right one.

"A question difficult to resolve is, to know if one might still admit the existence of very small cells, when the external membrane appears to be no more formed of large grains, but presents a smooth surface with very little points (or spots), cases without comparison more frequent than that of the true cellular formation of the external membrane. The solution of this question is allied to the clearing up of some points of vegetable anatomy still very obscure, and which have not sufficiently fixed the attention; I mean to the exact knowledge of the structure of those cryptogamous plants among which first begin to appear certain rudiments of cells in the gelatinous mass which forms them, under the form of little grains, for example, *Ulva, Palmella, Hydrurus, Batrachiospermum, Myurus,* &c., and afterwards to the inquiry of the manner in which the cells are united to each other in plants of higher development."

"A detailed examination of these points," continues Mohl, "would delay us too long; we pass on then to observe, that the gelatinous material, which forms by far the greater part of the bulk of these Cryptogams, corresponds to an element reduced almost to nothing in more elevated plants, which is found between the cells and produces their reciprocal union, but whose anatomical examination is only possible in a small number of vascular plants, and that the little scattered grains ought to be considered as the analogues and first rudiments of cells. Such is likewise, according to me, the organic constitution of the [granular or] dotted external membrane; it is then formed of two elements: 1st, of small grains of a cellular nature; 2nd, of a uniform material of a gelatinous nature which unites these grains into a membrane. Not only is this view supported by the accordance which this granular membrane offers with the constitution of the plants of which I have spoken, but there are direct observations which are in its favour. One circumstance which speaks for the analogy of the grains with the cells is, that in the grains of pollen whose external membrane is of a granular nature, as well as in those which are provided with a membrane distinctly cellular, the oily substance, coloured, is formed and preserved in this external membrane. Another fact, which is still further favourable to this view, is the series of modifications by which an almost insensible transition is formed, from manifest angular cells even to the grains themselves." Here I would observe that Mohl has already recorded his belief that the large granules in one plant are really cells, for example, in *Pitcairnia latifolia*. "We now come to facts calculated to produce the admission, that the external membrane is not only made up of grains resembling each other, but that there is formed in it moreover a substance half membranous, half gelatinous. There are cases, where these grains, when the pollen is extended by the imbibition of water, do not touch each other; but instead of being pressed one against the other, as in most pollen, they appear scattered upon a membrane smooth and uniform, for example, in *Plumbago cœrulea, Jatropha urens*, &c. It happens also sometimes, that in causing the grain of pollen to roll in a drop of water, between two small plates of glass, that some portion of the external membrane is detached from the granule which it surrounds, and that this part presents the appearance of a uniform (homogeneous) and colourless membrane. Moreover, as we shall show further on, the external membrane of most pollen presents regular plaits, which are effaced by the extension of the grain in water. Upon the part which in the dry pollen is concealed by the folds, the grains are altogether wanting, or form groups scattered at great intervals, so that the grains are placed upon a uniform membrane, and are separated one from the other by the extension of that membrane. It is not an uncommon circumstance to find the external membrane, at the situations where it covers the papilliform processes of the internal membrane, deprived of grains and completely uniform. Whether even these proofs shall be deemed sufficient, as I now think them to be, to establish the analogy of structure and of functions between the well-formed cells and these grains, it is nevertheless, at all times, but an analogy, and we have no right to regard them as cellular tissue itself, but only as the rudiments of cells. The granular disposition of the external membrane is by much the most frequent. As we have met with gradual transitions from the membrane plainly cellular to the granular and dotted membrane, in the same manner, this itself does not always present itself equally well-formed, and we find in many species grains becoming smaller and smaller, until the membrane becomes almost completely smooth and homogeneous, and thus presents a striking resemblance with the membrane of ordinary vegetable cells. This is the case, for example, in *Allium fistulosum, Chamærops humilis, Araucaria imbricata, Rumex scutatus, Morina persica*, in the *Boraginaceæ, Chenopodeæ, Myrtaceæ, Graminaceæ*, in *Rivina brasiliensis*, &c.

"In these plants the granular formation tends so to disappear, that the external membrane presents only obscure little dots, which have scarcely any resemblance with cells. Lastly, in other kinds of pollen the grains disappear entirely, and the membrane is almost completely smooth and uniform. Nevertheless, in most cases, when the pollen is observed in water, we are able still to recognise, with the assistance of a good instrument, a very fine punctuation and a light yellow colour of the membrane, from which circumstance it is very probable that the external membrane is never perfectly homogeneous, but contains always grains, however little distinct they may be. All that has now been set forth appears to prove that the *comparison of the external membrane of the pollen granule with a vegetable cell is altogether inexact, and that it ought to be regarded as an organ composed of cells, or of the rudiments of cells, and of a homogeneous element which unites them ; and for this reason also, to compare it, not with the simple membrane of a vegetable cell, but with compound membranes, for example, with the membranes of the ovule.*"

I have stated elsewhere*, that the granular appearance sometimes presented by the external membrane of the pollen granule frequently arises from the circumstance of the active "molecular bodies" being visible through the transparent coverings of the granule, so conveying to the outer one a granular or dotted aspect. That this appearance is often, if not always, deceptive, I am still of opinion, for additional reasons. Mohl states, that upon the part which in the dry pollen is concealed by the fold, the grains sometimes form groups scattered at great intervals. Now the radiating bands, of generally a lighter colour than the proper external envelope of the pollen granule, which supply the place of the furrows on the immersion of the pollen in water, are produced by the protrusion of the *internal membrane* through the fissures in the extine placed at the bottom of the furrows, and provided for the free egress of the pollen tubes; and this membrane is admitted by Mohl, and all observers, to be a simple structure. This, although a negative objection, is still a strong one. Again, in another place Mohl observes, that in some cases it happens that a portion of the extine is detached from the internal membrane, and that this part presents the appearance of a uniform and colourless membrane: this also goes to prove that the external membrane is, in some cases at least, simple. I am, however, still willing to admit, that in some few instances the external membrane may really present a granular texture, and then

* In *loc. cit.*

Mohl's explanation of the nature of these granules and of the constitution of this membrane appears to me to be satisfactory and philosophical; but I am far from going to such an extent as to suppose that the extine is never a simple organ, analogous to a primitive vegetable cell; on the contrary, I believe it to be most commonly simple.

Mohl considers that the spines and papilliform eminences which cover the external membrane of many forms of pollen take their origin in a special development of one of the grains of the external pollenical membrane, and that they constitute a partial development of the granular membrane into the cellular. This supposition of Mohl's is decidedly erroneous. I have already declared that most, if not all, kinds of spinous pollen have a cellular external membrane, and that the spines themselves owe their existence to an extraordinary development of the outer surface of each cell, in the same way as the hairs of the epidermis of plants are produced. Concerning the nature of the papilliform projections, Mohl appears to me to be far astray. They are not occasioned by any prolongation of the external membrane, which has nothing whatever to do with their formation; they are produced by the bulging out of the intine when there are but two membranes, or of the intextine when there are more than two, through either fissures or apertures in the extine.

It has been observed before, that on the immersion of those forms of pollen which exhibit furrows upon their surface in water, or any other fluid of the same consistence, that the plaits disappear, and that bands of a lighter colour than the rest of the surface of the granule occupy the position of the plaits, the appearance of these being accompanied by a remarkable change in the shape of the granule in all those cases where it is of an elongated form; this change arising from the approximation of the extremities of the granule, occasioned by the imbibition of the surrounding fluid by endosmosis. These furrows vary considerably in number, from one to upwards of twenty, a single furrow, for the most part, being characteristic of a Monocotyledon and three of a Dicotyledon; and the bands which supply their place subsequently are invariably disposed in a radiating manner, are narrow at their commencement near the centre of the figure, and widen gradually as they approach the circumference. These light bands Mohl regards as spaces of the extine, thinner than the rest of the membrane, and consequently more transparent. He thus speaks of them :—"In all cases where the bands are dotted, there is no doubt that the external membrane forms a vesicle completely closed; but upon pollen whose bands present a smooth membrane, an opposite result is almost always encountered when one examines them when fresh. The membrane of the bands is then so delicate that it is torn either merely by the extension which the grain of pollen undergoes in water, or by the separation of the external membrane in such a manner that the bands appear to be true solutions of the continuity of the external membrane, in which cases the internal membrane is denuded by the swelling of the grain in water. It was not long after this observation that the examination of pollen a long time dry set right my ideas upon this point; in fine, I have always been able to observe the external membrane in the folds, in pollen in a dry state. It appears then, that the external membrane acquires by drying a very great hardness, while in the fresh pollen the concealed part of this membrane in the folds appears to possess a consistence rather gelatinous than membranous, from which it follows, that not being able to bear any great extension, it tears and presents itself in this state to the observer." In another place Mohl remarks, "but the portion which was concealed in the fold always presents a structure different from the rest of the membrane, although it is an immediate continuation of it."

My own observations do not permit me for a moment to doubt that these bands are formed, as already mentioned, by the protrusion of the internal membrane through fissures in the external, which are true and natural solutions of continuity in that membrane. This view of their nature is supported by several facts, which, when taken together, may safely be considered as conclusive: 1st, these bands differ from the external membrane in being of a lighter colour; 2nd, they are separated from that membrane by well-marked and raised lines of demarcation; 3rd, in cases where the external membrane exhibits a cellular formation, this structure cannot be traced on to the bands, although Mohl asserts that in some instances it may be thus traced; 4th, the pollen tubes are a growth or direct continuation of the bands; 5th, the bands are in some cases covered by a valvular piece of membrane, which is really a portion of the outer membrane, and when this is removed the bands themselves become visible, presenting their usual appearance; 6th, the existence of fissures in the external membrane may be demonstrated. In the dry pollen a fissure lies concealed at the bottom of each of the furrows, which generally run lengthways from one extremity of the granule to the other. In this state its edges are inverted and in *contact*, so as to prevent the egress of the pollen tubes; but as soon as the pollen comes to be immersed in water or the stigmatic secretion, it undergoes, as already mentioned, a singular change of form, the cause of which has been explained: nor is this change of form without purpose, for in it may be traced a very beautiful little example of contrivance, it being designed to facilitate the escape of the pollen tubes from the external covering of the granule, which, in its dry state, for the sake of security, imprisons them. The granule swells and contracts in its long axis, the furrows become obliterated, and the margins separated as an inevitable consequence of this approximation of the extremities of the granule, and a space is left between them, through which there is a free and unimpeded passage for the pollen tubes hitherto incarcerated for wise purposes, but now that the fitting time has arrived, liberated by the above simple but most effectual means.

With reference to the apertures found in the external membrane of numerous forms of pollen, which are either scattered in no definite manner over the general surface of the granules or are placed at certain angles of its extent, Mohl asks the following question:—"These pores,—are they really apertures, or are they anything more than a very great thinness of the external membrane, in certain points like the pores of cellular tissue? It is a question which I cannot resolve for the smallest of these pores; but in pollen, in which they acquire a more considerable size, I have been able to convince myself in a manner the most evident, by the separation of the external membrane, that these pores are not true openings, but are closed by a fine membrane."

This last statement I also consider to be untenable for the same reasons given for regarding the bands as true solutions of the continuity of the external membrane.

From the brief exposition which has now been given of Mohl's views of the structure of the external covering of pollen granule, it is manifest that he regards it as being *in all cases* a compound organ, and as forming a shut sac, being thinner in the situations of the bands and pores; opinions in which I cannot concur.

Mohl thus concludes his account of the external membrane:—"After the description given above of the cells, spines and grains of the external membrane, it is clear that these parts ought to be considered as the secreting organs and reservoirs of the viscid oil; from which it follows, that the secretion of this oil ought not to be attributed to the papilliform eminences covered by a prolongation of the external membrane destitute of grains, and which are only found in some forms of pollen, and that even when the membrane, being furnished with fine grains which cover the large papillary projections of the *Onagrariæ* and *Proteaceæ*, takes part in this formation, it is only in a much less degree than the rest of the surface. I cannot therefore adopt the opinion of Mr. Robert Brown, who especially attributes to these papillæ the secretion of the viscous matter." I have shown that the external membrane does not enter into the structure of the papillæ, and therefore in no instance can they have any participation in the formation of the fluid referred to.

Mohl considers the internal membrane of the pollen granule to be a simple homogeneous structure, and assigns to it the office of secreting the fovilla, a function which it appears to me to be very doubtful that it really performs; for in watching the progress of the formation of the pollen, the existence of the fovilla will be detected before any trace of the presence of the enveloping membrane can be discovered. This membrane, unlike perhaps all others which enter in the construction of the pollen granule, forms a closed cell, and is analogous to a primitive vegetable cell.

The interesting and remarkable facility, first discovered by M. Dutrochet, possessed by all organic membranes, whether vegetable or animal, of absorbing water or any other fluid of a less dense nature than that contained within their cavities, is thought, by M. Dutrochet, to pertain in a very high degree to the internal membrane of the pollen granule. For my own part, I do not see how a similar facility can be denied the external and other membranes of the pollen granule, since the water absorbed by the internal must necessarily, in many cases, pass through the outer before arriving at the inner membrane, and since it is the presence of the fluid which gets between the membranes which assists powerfully in causing the expulsion of the pollen tubes, from the pressure which it produces on the internal membrane.

This absorption of fluid by the investing membranes of the pollen granule sometimes takes place with such force as to occasion the rupture of the internal membrane, and according to Mohl, of that also of the thin part of the external; for it is only in this way, if Mohl's views are correct, that the pollen tubes can emerge. In the dilute mineral acids this effect is very frequently produced, but not always; and when it does occur, the effusion and coagulation of a portion of the fovilla, which often assumes a cylindrical and tortuous form, is the result, and with respect to which Mohl gives the following caution:—"We ought not to confound this mass, as has been done by M. Meyen, with the internal membrane issuing in the form of a tube; the first is distinguished easily from the second by its irregular form. M. Fritzsche, falling into the same error as M. Meyen, considers the action by which the acids occasion the pollen to burst and coagulate its contents as of the same nature as the action of water and the stigmatic secretion. M. Fritzsche does in truth distinguish between natural tubes and tubes produced artificially, and he refers to the last those which are formed in consequence of immersion in an acid, while he ranges under the first denomination those which are developed from the effect of moisture upon the stigma or upon the corolla when the grains of pollen fall there; but he attributes to them the same origin, in admitting that they are formed by the mucilaginous part of the fovilla, and that they issue by breaking through the internal membrane of the pollen granule. This certainly occurs in the formation of the tubes which he considers as produced artificially; but the natural tubes differ absolutely, in that they are immediate prolongations of the internal membrane, of which we may be convinced by detaching the external membrane. It is indeed true, as M. Fritzsche says, that these tubes pierce a membrane; but that membrane is not the internal, it is the external, which is not pierced with holes, as M. Fritzsche thinks he has observed, but, as I have above explained, lines the pores, sometimes under the form of a fine membrane, sometimes under that of an operculum."

These observations of Mohl are in part only correct. Fritzsche is doubtless in error in supposing that the pollen tube which is to convey the fovilla through the tissue of the stigma and style to the ovary, is formed by the coagulation and hardening of the surface of the cylindrical mass, and not, as it really is, by the continued growth of a portion of the internal membrane; but I cannot see that there is any essential difference between the mode of action of water or the stigmatic secretion in the production of pollen tubes, and that of any of the dilute mineral acids; the only difference which I can detect being, that the latter, from the force with which it causes the principle of endosmosis to operate, most frequently, but not invariably, occasions the rupture of the internal membrane and consequent effusion of its contents, a thing which the former does sometimes, but much less frequently. If *dilute* sulphuric acid be used to the pollen of *Scabiosa caucasica*, true pollen tubes will be emitted covered by the internal membrane, and differing in no way from those the result of natural processes. The difference is not in the *modus operandi*, but in the effects of the agents.

If my views of the nature of the folds and apertures be correct, no membrane is ruptured, not even the extine, as stated by Mohl, save in the comparatively rare cases in which the external membrane does really form a closed cell. The appearance of a thin film stretching across the apertures may be sometimes produced by the watery medium in which they are generally viewed.

The following remarks of Mohl are somewhat opposed to the opinion expressed by him, that the internal membrane should always be regarded as a homogeneous structure, thin and transparent as water. "In all pollen in which the external membrane is altogether smooth, in all those which possess but a single plait, in a great part of those which have three plaits, in those which have spiral plaits, and in a great many of those which are provided with pores, the internal membrane forms a cell altogether spherical or ellipsoidal. On the contrary, in pollen which, like that of the *Onagrariæ*, have a pore at their three truncated angles, or as that of the *Dipsaceæ*, have one upon their three sides, or as among very many species of the *Solaneæ*, *Gentianæ*, *Synantheraceæ*, *Umbelliferæ*, *Apocynaceæ*, *Papilionaceæ*, &c., have one upon their three longitudinal furrows, or as among many species of the *Boraginaceæ*, have a great number, the structure of the internal membrane is not absolutely similar in all its parts; but there exist often, even in the dry granule, papillæ, which are as little blind appendages of the internal membrane. The line of union of these blind appendages with the cell formed by the internal membrane is ordinarily well marked; sometimes, as in the *Onagrariæ*, it presents a thickening, which gives to it the appearance of a white band." I have already explained, that the papillæ, wherever met with, are formed in one of two ways, either, where there are but two membranes, by the protrusion of the internal through fissures or pores in the external, or, where there are more than two membranes, by the protrusion of the one next the external, called by Fritzsche, intextine. When produced in the latter way they are always permanent, that is, they are to be met with in every form and condition of the granule, as they are only in the *Onagrariæ*, and perhaps *Umbelliferæ*, of all the examples of their presence cited by Mohl; but when they are formed in the first way, as they are in all the other instances referred to by Mohl, they are only to be observed where the pollen has undergone either a partial or complete change of form, and are to be regarded as the commencement of pollen tubes just emerging through the fissures in the external membrane, and formed by an elongation or growth of the internal with which they are continuous, without any line of demarcation similar to that described by Mohl. Such therefore is their origin in all cases where there are but two coatings to the pollen granule.

That the external membrane is not continued on to these papillary projections may be seen by an examination of the pollen of *Stachytarpheta mutabilis*, in which there is a distinct line of separation between them and the surface of the external membrane.

With respect to the motion of the "molecular particles" found in the fovilla, Mohl thus expresses himself:—"I cannot refrain from remarking on this subject, that the movement of the grains differs in no way from the motion of all other little organic and inorganic particles; for example, globules of milk, whether vegetable or animal, metallic precipitates, &c.; that their oscillatory motion is altogether the same, and is distinguished in a manner equally striking from the spontaneous movement of infusories."

In concluding my strictures, I would observe, that to Dr. Mohl is due, and ought to be accorded, the highest credit, both for the general accuracy of his observations, as well as for their great extent. Mohl, although in error in a few instances, has been very successful in his perception of the chief differences which characterize the principal types of pollen granule met with in the course of his investigations; and it is a source of no little gratification to me to find that I should have arrived at results in this respect so nearly similar to Mohl's own, deduced from investigations carried on independently of all knowledge of his previous inquiries but that acquired from Lindley's 'Introduction.' Mohl's work in 4to, with 6 plates, was published in Berlin in 1834, a short time subsequently to the appearance of Fritzsche's first memoir in the Transactions of the St. Petersburgh Academy upon the same subject. An abridged translation of Mohl's work is contained in the 'Annales des Sciences Naturelles,' vol. iii. 2nd Series,—Botanique.

Of Mohl's opinions regarding the value of the pollen granule as an assistant in classification, I have spoken fully in a paper, a portion of which is inserted in Annals for last October *.

January 17th, 1842.

XII.—*On* Valerianella olitoria *and* V. gibbosa. By Charles C. Babington, M.A., F.L.S., F.G.S.

In a valuable paper upon the genus *Fedia* (*Valerianella*) published in the 'Linnæan Transactions,' Mr. Woods states that

* The above observations were penned on a perusal of Mohl's work, made some time subsequently to the completion of my paper on the pollen, the greater part of which has yet to appear, and which is delayed until the numerous illustrations which accompany it can be got ready.

he had not seen any specimens of the *V. gibbosa* of Gussone, and most correctly observes, that the figure given by DeCandolle (Mém. sur les Valerianées, tab. iii. f. 3.) as representing the fruit of that plant, would lead us to believe that it was scarcely more than a variety of *V. olitoria*. Mr. Leighton also, in the addenda to his valuable 'Flora of Shropshire,' compares the *Valerianella olitoria* of that county with the same figure, and expresses his opinion that the English plant is very nearly, if not exactly, the same as that of which the fruit is represented by DeCandolle's fig. 3, the only difference being the imperfect state of the dissepiment in our plant and its completeness in *V. gibbosa*, and also the ciliated bracteas of the former and their being constantly entire in the latter. From these circumstances considerable doubts have been expressed concerning the claims of these plants to be considered as distinct species. Before combining them however it was but fair to refer to the characters of the latter plant as given by its original describer Gussone (Fl. Sic. Prod., i. 28.), and there we find the fruit stated to be "altero latere coarctato plano, altero gibbo longiore, utrâque facie bistriato costis prominentibus;" and of *V. olitoria* he says, "altero latere coarctato utrâque facie bistriato." Here we first remark that the word "plano" is omitted in the second of these descriptions, and by referring to my fig. 1. it will be seen how justly what is usually called the front of the fruit, but by Gussone denominated one of the sides, is described as "plane" when compared with the same part in my fig. 2. Again, we find that the words "costis prominulis" are only employed in one of these characters as descriptive of the sides (or faces, according to Gussone's nomenclature) of the fruit, and by referring to the same figures it will be seen how correct a distinction this is. Without the aid of the figures however it would have been far from easy to determine the true distinctions between the plants, and this difficulty was greatly increased by the incorrectness of the only published representation of the fruit of *V. gibbosa*, namely, that in DeCandolle's memoir to which I have already referred.

I have now to state my reasons for believing that the fruits, of which my fig. 1. is a representation, are truly those of *V. gibbosa*. Gussone states that the discoverer of his plant was Gasparini, and it fortunately happens that that same botanist (Gasparini) has supplied me with specimens gathered in Sicily, and which he states to be *V. gibbosa*. From these specimens, which agree exactly with Gussone's characters and Bertoloni's detailed description, my drawing of the *fully ripe* fruit has been made. It is scarcely necessary to state, that in the fully ripe fruit alone can the curious distinctive characters employed in this genus be satisfactorily ascertained.

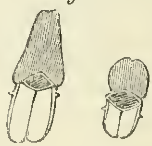
In *V. olitoria* the transverse section of the fruit shows three cells; one, nearly filled by the solitary ripe seed, has its outside enormously thickened by the development of the sarcocarp into a spongy or corky mass, down the back of which there is usually a slight furrow; and two barren cells, which are quite empty and separated from each other by an imperfect dissepiment. These barren cells are nearly equal, compressed, lateral and rounded in front, and are usually much larger than the fertile cell; their point of junction is usually marked by a shallow furrow, and each of them has a single slender rib upon its side. The presence or absence of the anterior and posterior furrows, and the greater or less development of the spongy mass, must be excluded from the specific characters, as not being possessed of sufficient constancy for scientific discrimination.

In the fruit of *V. gibbosa* we find the same three cells and the same spongy furrowed mass upon the back of the fertile one, but each of the barren cells is furnished with two longitudinal prominent ribs formed of the same spongy structure as the back of the fertile cell. Thus each side of the fruit presents two deep furrows and two prominent ribs, whilst in *V. olitoria* the furrows are totally wanting and the ribs are reduced to the one slender line upon each barren cell and the slightly projecting angle of the fertile cell.

It is hoped that there will not now remain any doubts concerning the specific distinctness of these two plants. It only remains for me to state that the drawings represent the appearance presented after the fruit has been divided transversely at about its middle.

Fig. 1.

Fig. 2.



a. *b.*

Fig. 1. *Valeriana gibbosa* from Sicily.

Fig. 2. *V. olitoria* (*a*) from an English, (*b*) from a Neapolitan specimen.

St. John's Coll., Cambridge, March 8, 1842.

XIII.—*Organographic and Physiologic Sketch of the Class Fungi*, by C. Montagne, D.M. *Extracted from* 'Histoire physique, politique et naturelle de l'île de Cuba,' par M. Ramon de la Sagra, *and translated and illustrated with short notes by the* Rev. M. J. Berkeley, M.A., F.L.S.

[Continued from p. 10.]

Gasteromycetes, Fr.

A simple or compound receptacle (*peridium, uterus*), formed by the union of cells or interlaced filaments, presents the essential character of this family, which, like the preceding, is divided into two grand sections, *Angiogastres* and *Trichospermæ*.

The *Angiogastres* are at once distinguished by having their sporidia, which are never pulverulent, contained either in mucilaginous generally fœtid matter, itself enclosed in a general peridium (*Phalloideæ*), or in partial receptacles formed by folds of the common receptacle (*Tuberaceæ*), or lastly in proper peridia, named *sporangia*, and included in a common peridium (*Nidulariaceæ*).

Not only all the genera of this first subdivision, but almost all the *Gasteromycetes*, are characterized in their young state by a consistence approaching more or less to mucilage. If the whole fungus does not offer this character, some one of its parts does.

The *Trichospermæ* differ principally from *Angiogastres* in having their sporidia free and pulverulent, mixed with simple or complex filaments. This grand section of *Gasteromycetes* itself presents three remarkably distinct forms: 1. *Myxogastres*, whose peridium is organized from mucilage, of which at first the whole fungus consists. 2. *Trichodermaceæ*, in which this organ from the beginning is formed of more or less intimately interlaced filaments. 3. *Lycoperdines*, which present a peridium or receptacle at first fleshy, then coriaceous, into the composition of which enter either cells, or felted fibres. We are going to study the successive changes of the receptacle and sporidia, in the whole series of the genera of this family, proceeding from the simplest forms to the most complex.

In the *Myxogastres*, which, as said above, consist in infancy, without exception, of a diffluent mucilage of various form and colour, we observe, in proportion as this gelatinous medium acquires consistence, either that a crust is formed common to the whole mass divided within into cells, or that a larger or smaller number of individuals separate from it, and are associated on a common stroma. This stroma, which is also called *hypothallus*, is formed by the extremely thin membranous residue of the gelatinous mass from whence the peridia spring. In the first case, a single peridium is produced, which may be regarded as a common peridium, if we consider the inner cells as partial peridia soldered together; or in the second, each individual has its own peridium, resulting from the concretion of the mucilage. This peridium, sessile or stipitate, is composed of one or more membranous, papyraceous, or crustaceous coats. In some cases, if there are two, the outer is crustaceous and persistent, or extremely thin and membranous, and breaking up into little deciduous scales. The mode of bursting of the organ is also slightly varied. Sometimes an irregular opening is formed at the summit, as in *Physarum*; sometimes it opens like a little box, as *Craterium*; sometimes the upper half falls, leaving a cup-shaped base, as in *Arcyria*; sometimes the membrane is so delicate, that it is broken up entirely into deciduous scales, and leaves the naked capillitium loaded with its sporidia, as in *Stemonitis*. But at the time when the peridium is formed, its cavity is the seat of other changes; that of the sporidia on the one hand, of the filaments or elastic fibres concerned in their dissemination on the other. The filaments on which the sporidia repose are simple or branched, free and loose, or anastomosing so as to form a net. In the *Trichiaceæ** they are spiral, and resemble the elaters of *Hepaticæ*. Stiff and brittle, they are glued and soldered one to another, so as to form the septa of cells in which the sporidia are enclosed (*e. g. Spumaria*). These fibres, which by their interlacing compose frequently elegant net-work, are sometimes so supple and elastic, that when the peridium is burst, they rise from the bottom of it resembling a coloured, erect, or drooping plume of the most elegant fashion (*e. g. Arcyria*); this is called *capillitium*. In the axis of the peridium, in many species of this section, there is yet another organ, called *columella* or *stylidium*. This, which is sometimes entirely wanting, seems to be the continuation of the stem which penetrates more or less into the peridium, and sometimes traverses its whole extent. It is sometimes rudimental. When the columella exists, the reticulate fibres proceeding from the peridium end, and are fixed upon it.

As regards the sporidia, their metamorphosis takes place at the same time as that of the filaments. Their immense quantity in proportion to the size of the fungus is most remarkable. It seems, indeed, as Fries says, as though the formation of the spores had absorbed all the vegetative force. They separate from the mucilage by the same unknown mechanism which solidifies and fashions all the other organs. That they are at first attached to the filaments, and afterwards separate from it, Mr. Berkeley's observation of the morphosis of the sporidia in many genera of the following section do not allow us to doubt; however this may be, their metamorphosis, studied and described from the life by Corda (Ic. Fung. ii. p. 22. t. 12. f. 87.), deserves every attention. We may indeed infer from the figure just quoted, that in *Stemonitis*, where they are at first chained together, their evolution takes place in the joints of a thread, by the continuity of which they were united. If we consult analogy, we are confirmed in this opinion in glancing on what takes place in the morphosis of the sporidia of the genus *Asterophora*†. In some

* Corda, sur les fibres spirales des Trichiacées, Flora, 1838, p. 419. This structure, however, was first noticed by Hedwig, Obs. Bot. Fasc. i. p. 14. t. 10, 11. 1792; and again by Kunze, Myc. Heft ii. p. 94.—M. J. B.

† Corda, Ic. Fung. iv. p. 8. t. 3. f. 24. Messrs. Léveillé and Corda have proved that this genus is parasitic on the pileus of a real Hymenomycete, as the gills are covered with basidia charged with spores. We have also observed the same structure.

Trichiæ they are at first quaternate, and end by becoming isolated. Some are supported by a pedicel*. After having partaken in their youth of the mucilaginous nature of the medium, they harden by degrees, and undergo with this change of consistence a sort of deformity. Thus, from being spherical, they assume, by a lateral contraction, the form of a grain of coffee or wheat† (*e. g. Stemonitis*). They are, however, always simple when mature, and composed of a single membrane or epispore, and of a homogeneous or heterogeneous nucleus. A great number of the species have sporidia in which are traces of a hilum, a persistent testimony that they were at first attached to a filament performing the functions of an umbilical cord.

Fries has established in this section two grand divisions, founded upon the colour of the sporidia, naming those in which they are of a dusky hue, like that of soot, *ligneospermæ*, while those whose sporidia are of a more attractive tint he calls *calospermæ*.

The metamorphosis of *Myxogastres* is a work of Nature as marvellous as it is incomprehensible. It takes place frequently in a few hours‡, and the observer can easily watch all its phases. It is matter of regret, however, that their fluxile nature never allows us to follow step by step the development of the inner parts, as we shall see that we are able to do in the *Angiogastres* and *Trichogastres*.

These fungi grow and multiply under certain meteoric circumstances: the *ligneospermæ*, which are very fugitive, on various organized bodies, even on rocks; the *calospermæ* constantly on the trunks of dead trees or rotten wood. The first appear only at certain times and in certain seasons; the latter, being less meteoric, appear indifferently in all. As regards their geographic distribution, as the essential conditions of their growth are moisture combined with heat, we may admit with Fries, that they have their centre in the temperate zone, without however excluding the tropics, where, though less common perhaps, they are by no means absent. I have received from Brazil, Chili, and Cuba, species identical with those of our continent.

The primitive mucilage or medium of the *Myxogastres*, arrested in its morphosis by dryness or any other cause, is frequently indurated, and remains a long time in the form of coloured veins, which have given rise to the genus *Phlebomorpha*, Pers., or sometimes simple hemispherical substances, which on account of their consistence have been regarded as *Sclerotia*.

This is the proper place to advert to the *Sclerotiaceæ* (referred at first by Fries to *Coniomycetes*), and in particular to the typical genus *Sclerotium*. He formerly considered the species of this tribe as formed of a fleshy, very hard stroma, on the circumference of which the sporidia originated. More recently he has regarded the outer envelope as a true peridium, and in this he has been followed by Corda

* Corda, *l. c.* i. t. 6. f. 288**.

† They recover their original form when placed in water.—M. J. B.

‡ See Ann. d. Sc. Nat. Nov. 1841, p. 308, under *Trichamphora*.—M. J. B.

(Ic. Fung. iii. p. 18.). Hence the little certainty as to their situation in his different works. The genus *Sclerotium*, whose fruit yet remains to be discovered, is placed by Corda near *Cenococcum*, which enters into the section with which we are occupied. Amongst the *Sclerotia* is the Ergot* (*Spermædia*, Fr., *Sphacelia*, Lév.), too notorious for its deleterious properties, but used to hasten parturition in cases of inactivity of the matrix.

The *Trichodermaceæ* have a peridium, originally formed of more or less closely felted filaments, and it is in this important character especially that the fungi of this order differ from *Myxogastres*. This is not however the only character which distinguishes them from *Myxogastres* or *Lycoperdineæ*; there is this also, viz. the total disappearance of filaments as the sporidia ripen. These filaments exist in an early stage of growth, as I have convinced myself in *Trichoderma viride* and *Onygena equina*. As this tribe is composed of exotic or rare genera, it is difficult to give the history of its morphosis, on which we have no sufficient information†.

The peridium, which is mitriform or spherical, is most frequently sessile (*e. g. Ostracoderma*)‡. It is stipitate in *Spadonia* and *Pilacre*, and the stem is either cellular, or smooth and fibrous. It is formed, even from the first, of more or less close byssoid filaments; but in almost all the species it opens by abrasion of the summit. In *Ostracoderma* it is smooth, and as it were crustaceous. The sporidia spring evidently, as in the following order, from the threads of which the whole fungus at first consists; and this is I think proved by the fact, that in *Trichoderma viride* they bear a very short filament in the guise of a pedicel. Their form is ovoid or spherical, and their colour various.

The *Lycoperdons* or *Trichogastres* form one of the most remarkable orders in this first section. They are distinguished from those which have been mentioned by being fleshy in their early stage of growth. Here the organization becomes more complicated. We for the first time meet with a membrane formed of threads which produce at their tips naked sporidia. Mr. Berkeley§ has shown that in *Lycoperdon cælatum*, *gemmatum*, and in *Bovista*, observed at an early stage of growth, the interior flesh (*Gleba*, Fr.) is perforated in every direction by little elongated labyrinthiform cavities, com-

* The ergot is rather a disease produced by a fungus than a fungus itself, and is in fact the effect of a *Fusisporium*. See Linn. Trans., vol. xviii. p. 475, and p. 483.—M. J. B.

† There would I think be little inconvenience in uniting it to the following tribe, since, as in the genus *Cenococcum*, the sporidia of many species of *Mitremyces* are not, at least at the time of maturity, mixed with filaments.

‡ *Institale* is omitted, as the genus is spurious, being made up of the early state of *Coprinus radians*, and *Sphæria fragiformis* with an *Isaria* growing from its base.—M. J. B.

§ Ann. of Nat. Hist. v. i. p. 81, translated by the author, Ann. des Sc. Nat. 2 série, xii. p. 160. t. 2. [See also an admirable article by Messrs. Tulasne in Ann. Sc. Nat. Jan. 1842, in which *Scleroderma* also is proved to be hymenomycetous.]—M. J. B.

posing a net by their frequent anastomoses. A very thin slice placed under the microscope shows that the inner layer of the walls of these cavities is composed of obtuse, pellucid cells, placed parallel to each other like the pile of velvet, exactly as in the hymenium of a young Agaric. At a later period Mr. Berkeley has seen four little spicules of equal length spring from the tips of the basidia, named by him sporophores, and on each of these at length appeared a globose spore. The shrinking of the basidia induces the pulpy state of the *Lycoperdon* preceding maturity, which is indicated by its pulverulence. At this period, all the moisture contained in the interior of the peridium being absorbed, either because the juices which made it succulent and fleshy have performed their functions of nutrition, or from some cause independent of the morphosis, the sporophores or basidia shrink, wither, dry, and remain under the form of confervoid filaments. The sporidia having become free are intermixed with the filaments, and bear still the thread by which they were fixed to their summit. The same observations have been made upon *Geaster*, and Corda (*l. c.* ii. p. 24. t. 12. f. 90.) has figured something analogous, if not quite similar, in his genus *Ptychogaster*. This singular morphosis, which brings the order of *Lycoperdineæ* near to the true *Hymenomycetes*, had been already observed by Vittadini*, who, from not having followed it in many species, still less in many groups, could not, as Mr. Berkeley has done, draw from it any general systematic conclusions.

Having seen what takes place in the normal evolution of Lycoperdons, let us review the principal forms assumed by the peridium in the series of genera, its texture, mode of rupture, and finally the organs of fructification which it is destined to contain. But first I would premise, that there are in this order genera whose peridium is developed on the surface of the soil (*emergens*), others in which it is not seen till it has acquired a considerable size under the surface of the earth (*innato-emergens*), and some are altogether subterraneous.

The trama of the peridium is formed by the interlacing of the filaments of which the fungus is at first entirely composed. It is formed either of a single coat of byssoid fibres (*Tulostoma*, *Lycoperdon*), or of two coats often only slightly adherent, and of which the outer one falls at maturity (*Bovista*). In the *Geastra*, where these two coats are very dissimilar, we may consider them as two peridia, of which the outer†, which is coriaceous or tuberculated, splits from the top towards the base to a greater or less extent into several rays or laciniæ, expanded like a star, or recurved, and contains from the beginning the first which is sessile, uni- or pluristipitate (*Geaster coliformis*), always thin, membranous or papyraceous.

In a single exotic genus *Mitremyces*, where the peridium is like-

* Monog. Tuberac., p. 20 and 83. t. 5. f. 9 *e*.

† In *Geaster triplex*, Jungh. (Tijdschr. voor natur. Geschied. en Physiol. 2–3 Stuck, 1840. t. 8. f. 1, 2, 3) the outer peridium is composed of two separable layers, of which the inner forms a broad cup, and the outer is divided regularly into recurved laciniæ.

wise double*, the inner, whose increase does not keep pace with that of the outer, appears to enjoy a sort of elasticity, analogous to that which we observe in *Sphærobolus*, which causes it at a certain epoch to invert itself for the dispersion of the sporidia†.

The peridium is simple or compound. In the first case it presents a single cavity, or it is divided into cells or pockets (*e. g. Scleroderma*)‡. In the second it encloses a number of partial or secondary peridia (*peridiola*), within which are enclosed the sporiferous filaments (*e. g. Polysaccum, Ciliciocarpus*). In the emergent species the mycelium furnishes the peridium either with a stem or peduncle (*stipes*), which is continuous in *Mitremyces*, only contiguous in *Tulostoma*, or merely with some root-like filaments, which are altogether wanting in the subterranean species. The stem itself, sometimes very short and obsolete, is likewise frequently prolonged into the peridium in the form of a columella. This is soft and cottony in *Cauloglossum*, hard and woody in *Podaxon*.

As regards the dehiscence of the peridium, we have just seen that it is twofold in *Geaster*. In the emergent genera it mostly takes place towards the summit, rarely laterally (*e. g. Cauloglossum*), or at the base, as in *Podaxon*. It is often regular or irregular in different species of the same genus. The irregular mode of rupture takes place by the peridium being torn or broken into scales. The regular dehiscence, which is always observed at the summit of the peridium, consists of an opening sometimes exactly orbicular, obtuse, or surmounted by a cartilaginous border (*e. g. Tulostoma mammosum*); sometimes conical, folded and finely striate, or slashed into laciniæ; sometimes plane, ciliate or dentate; sometimes also piloso-fimbriate (*e. g. Lycoperdon*). The genera whose species are subterraneous do not open spontaneously (*e. g. Cenococcum*). In *Geaster coliformis*, which seems to result from the normal confluence of several peridia, the single peridium opens by many ciliated orifices.

The flesh of the fungus is generally white or reddish in this tribe; but after the morphosis, which induces pulverulence, the mass of the filaments of the sporidia presents variations of colour in each species. The most common tints are purple-brown, olive, fuliginous with a yellow tinge, cinereous or bluish black, &c. The filaments, which constitute the fleshy mass with which the young peridium is filled, vary likewise considerably in the changes they undergo by the act of vegetation. The two extreme states are their persistence under the form of capillitium (*e. g. Lycoperdon*), and their complete absorption§ (*e. g. Cenococcum*). In the multitude of intermediate states there are two worthy of notice; that where the capillitium, detached

* Or rather triple, for at the moment of its appearing on the surface of the soil the peridium is enveloped in a hood (*calyptra*), which bursts circularly at its point of attachment to the stem, and falls.

† Berkeley, Ann. of Nat. Hist. 1839, p. 326.

‡ Messrs. Tulasne, in the paper quoted above, have proved that the structure of *Scleroderma* is in reality conformable to that of *Lycoperdon*.—M. J. B.

§ Mr. Berkeley has found filaments mixed with sporidia in *Mitremyces coccinea*, *l. c.* t. 7. fig. 1. *c*.

from the peridium, remains under the form of free filaments which are dispersed with the sporidia, and that in which they form by their union the walls of the cells in which the sporidia are contained. This latter circumstance takes place especially in the subterraneous indehiscent Lycoperdons.

The genus *Polysaccum*, DeC., has a common peridium, in the fleshy cellular mass of which appear at first amygdaloid, extremely soft and viscid bodies. As the fungus increases they become consistent, and are at length changed into peridiola, in the interior of which the complete evolution of the spores observed by Corda (Ic. Fung. ii. p. 24. t. 12.) takes place. The other species of the subterraneous genera offer almost the same morphosis.

The sporidia differ very little from those of the preceding tribe. Some have an umbilicus or hilum, and some retain the thread or cord (*funiculus*), which however is generally wanting. Most are smooth, but some are verrucose. I have already said, that in their pulverulent state they are generally mixed with the mass of filaments from which they spring. Sometimes this powder occupies the whole cavity, sometimes only a more or less circumscribed portion of the peridium. A dry state of the atmosphere is most favourable to the dispersion of the sporidia, and the wind the most effectual agent. In the subterraneous species, where they are agglutinated by the drying up of the viscid matter which assisted in their evolution, strong and continued rains are probably the most efficient.

Almost all the species grow either upon or beneath the earth; *Tulostoma exasperatum*, however, and a very few others live on half rotten wood. Some are found exclusively in sand*. They have their centre in the temperate regions of the two hemispheres. Their use is very limited. Some authors affirm, that in certain parts of Italy many sorts of puffball are eaten fried while they are still fleshy. Deer and pigs are reported to root up the *Elaphomyces*. The sporidia of *Polysaccum tinctorium* are used in the Canaries to dye wool and silk.

The *Angiogastres* comprise, as we have seen, three tribes united by a common character, sporidia never pulverulent; they are, however, distinguished by marked differences. Thus, the *Nidulariaceæ* have their sporidia enclosed in proper sporangia; in the *Tuberaceæ* they are contained in the thickness of the folds of the peridium; lastly, in the *Phalloideæ* they are dispersed in a fœtid mucilage which clothes the receptacle.

The *Nidulariaceæ* comprise a very small number of genera, all having a double peridium. The outer is called *uterus*; it varies in form, which sometimes resembles a cup or little goblet (*e. g. Nidularia*), sometimes is spherical (*e. g. Arachnion*), sometimes hemispherical (*e. g. Polyangium*); and as regards consistence, it is cottony, slightly fleshy, coriaceous or membranaceous. The inner, separable or intimately united with the first, is most frequently papyraceous

* *Podaxon cuscinomalis* is found on ant-nests.—M. J. B.

or membranous. In certain genera it is inverted elastically, in order to shoot out the sporangia (*e. g. Sphærobolus*).

The receptacle is entire, and opens at the summit by a circular or toothed orifice; or it is truncate or dimidiate, and closed by a thin membrane called *epiphragma*, which bursts to make way for the sporangia (*e. g. Cyathus*). These at first swim in a more or less consistent mucilage which at length disappears. They are free or fixed to the peridium, sometimes laterally, sometimes by the centre, by means of a sort of cord. Their consistence is sometimes hard and firm, sometimes more tender. The sporidia which they contain are of a variable colour, and generally collected in the centre. These fungi grow in autumn, and are, as far as is known, of no use. Their morphosis, which has not been followed, demands the attention of mycologists favourably situated for such observations.

The *Tuberaceæ* form an important tribe, whether on account of their structure, so well explained by Vittadini, or their use for food. The species have a single or double peridium. This peridium, when single, or the internal, when there are two, is folded more or less deeply into the interior of the fungus, so as to form veins of different colours, giving it a mottled appearance. The sinuosities formed by the folds of the peridium, which Vittadini has well compared to those of the brain, do not proceed always from every point of the circumference, as in the genus *Genea* (Vitt. Mon. Tub. t. ii. f. 7.); more frequently, in the root-bearing species, the folds radiate towards the summit from the point which is in contact with the soil; in some cases it is from the centre that they diverge. The outer peridium, which is wanting in the curious genus *Gautiera*, is frequently floccose or byssoid. In the species with a tuberculated bark, this is formed of very small and crowded elliptic cells. These cells, according to Vittadini, serve in the Truffles for the absorption of the juices necessary for their growth, and perform consequently the functions of roots. The flesh of *Tuberaceæ*, especially remarkable for its veins, is of a different colour in different species. Its consistence and hardness increase with age, which is the reverse of what takes place in *Lycoperdaceæ*. We see at once the analogy which closely binds certain genera of this order with *Hymenomycetes*, and others with *Discomycetes*. *Gautiera graveolens* is indeed very near to the Morells, and *Genea* is an introverted *Helvella*. In both cases, the organs of fructification, being disposed in an inverse manner, do not receive the action of the air and light till after their dispersion.

It would take too long time to review the forms which the peridium assumes in the very numerous genera of this tribe; it is enough, after the Italian monograph, to have indicated the origin of these inner veins, which wise and provident nature has employed to multiply the points of the fructifying surface without increasing too much the volume of the plant.

If we examine the parenchyme of *Tuberaceæ*, we recognise besides that it is composed of cells differently fashioned, but in general rather rounded than elongated. Between these cells, we observe from space to space cavities very variable in their form. The one, which are mere lacunæ, contain peridiola in which are enclosed the sporidia, which are often filled with sporidiola; others, larger, are lined with a membrane or hymenium, composed of juxtaposed cells. It is in the interior of these cells that the sporidia are contained in the genus *Genea,* and from between them that those of the genus *Rhizopogon* emerge. In some other utero-hymenian genera, the sporidia are borne by a minute peduncle, which is formed at the summit of the basidia. In the genera *Pachyma* and *Picoa*, where there is no trace of veins, the peridiola nestle here and there in the flesh of the fungus.

The sporidia of the *Tuberaceæ* are then generally contained in asci or peridiola. They are seldom smooth, more rarely striated longitudinally. Almost always, on the contrary, they are rough or echinulate, a circumstance which made Turpin regard them as the truffle in miniature. Vittadini, who has studied the germination of those of *Elaphomyces**, which are echinulate, has seen these points elongated into byssoid filaments, which at length envelope the seed in a thick down. This down, according to the author, is as it were the cotyledon of the young plant. He infers by analogy, that the same is the case with the sporidia of most other *Tuberaceæ*. The fungi, which generally are subterraneous, prefer temperate climate, and are found especially in forests of oak and chestnut. Truffles, known to Theophrastus under the name of *οἶδνον*, and to Plutarch under that of *ὕδνον*, have long been esteemed for their delicious flavour. Everybody knows that they are nutritive and aphrodisiac, and that pigs are quite as fond of them as ourselves†.

We come now to the *Phalloideæ*. The species which compose this tribe, though we derive no immediate benefit from them, are nevertheless worthy of arresting for a moment our attention, because they form a very evident passage from true *Gasteromycetes* to *Hymenomycetes*; they approach the latter by the constant presence of a volva, but especially by the structure of their hymenium. This structure indeed has been observed only in the genus *Phallus*; but, till new investigations show us the identity of structure in the other genera, analogy leads us to suppose that it does not differ in the rest of the tribe. It is to Mr. Berkeley again that we are indebted for this interesting discovery. What he has seen in *Phallus caninus* is as follows: as in the puffball, the fructiferous membrane is formed of a very sinuous hymenium. The walls of these sinuosities are composed of elongated cells, a little clavate at the tips, and surmounted by from four to six threads, each bearing an oblong spore (Berk. *l. c.* p. 164. t. 2. f. 22, 23). The basidia appear all to be fertile and of an equal length. We have then here an Hymenomycete which is distinguished from the others merely in the sporidia being soon involved in a mucilaginous mass derived from the hymenium.

* See, on the subject *Elaphomyces*, Messrs. Tulasne's admirable paper, Ann. Sc. Nat. July 1841.—M. J. B.

† Many other species of this tribe are eaten. In the Canaries, a species is much esteemed which I have referred doubtfully to *Rhizopogon albus*, Fr., but which is perhaps *Tuber niveum*, Desf., a species at present unknown. Hist. Nat. Canar. Phytogr., sect. ult. p. 85.

In all the species of this group, the young fungus is wrapt in a general volva (*uterus*, Fr.), which is sometimes double. This pouch, which is usually white and membranous, and which contains the receptacle, is separated from it by a more or less thick layer of mucilaginous matter, frequently of a fœtid, cadaverous, goaty, spermatic or musky scent, sometimes quite scentless. The volva bursts towards the summit in order to make way for the receptacle, which then increases rapidly.

Sometimes this receptacle consists of a little head (*capitulum*), which is smooth or rugged (*e. g. Phallus*), smeared with a coat of this jelly with which we have seen the volva was at first distended*, and supported by a fleshy stem or peduncle, or rarely woody, as in *Batarrea*; generally fistulose, smooth or reticulate. Sometimes the receptacle, which is still stipitate, is divided at the top into expanded and bifid rays (*e. g. Aseroe*), erect and simple (*e. g. Calathiscus, Lysurus*). Sometimes sessile, as in *Clathrus*, or pedicellate, as in *Fœtidaria*, A. St. Hil., it presents a sort of convex, ovoid or turbinate peridium, or rather a sort of net with rounded meshes, smooth or striate, in the interior of which is contained the gelatinous medium which involves the sporidia when the time of their dispersion is arrived.

The genus *Batarrea* is anomalous; its vegetation is phalloid, but its fruit is that of *Lycoperdaceæ*; indeed the naked sporidia are mixed in the pulverulent state with filaments springing from the receptacle.

All the Fungi of the tribe which we have just examined spring from beneath the soil, or on its surface; their growth is wonderfully rapid. *Batarrea Gaudichaudi*†, found at Peru, near Lima, acquires all its development in a few hours. They are of no use to man‡.

Note.—This is, on the whole, the least satisfactory of the six grand divisions of Fungi, and must doubtless be greatly modified hereafter. The affinities of *Nidularia* and its allies are at present very ill understood, and both *Hymenomycetes* and *Discomycetes* will be reinforced by far the greater portion of its other components. The great desideratum is a correct knowledge of the morphosis of *Myxogastres*, and the genus *Trichia* is especially worthy of study, as its flocci are clearly not mere relics as those of *Lycoperdon*. The notion that *Sclerotium* is allied to *Sphæria* is very ingenious, and is perhaps strengthened by the fact that *Sphæria phæocomes* and others are *Sclerotia* in an early stage of growth.—M. J. B.

* M. Legrand (Act. Soc. Linn. Bord. v. June 1832) has shown that in *Phallus vulpinus*, an excellent species described by him, this jelly, which is inodorous, diminishes as the fungus increases, and that it dies almost immediately if it is taken away before the fungus has arrived at maturity. It seems to him consequently intended by nature to furnish the nutritive matter indispensable for the evolution of the *Phallus*. Some mycologists have supposed, without any ground, that it contains the fecundating principle. Its odour is very variable; it is fœtid in many species; none in *Phallus caninus*, *vulpinus* and *indusiatus*; it has somewhat of a spermatic scent in *P. aurantiacus*, n. s. from the East Indies (Ann. Sc. Nat. Nov. 1842).

† See Mont. Ann. Sc. Nat., 2 sér. tom. ii. p. 76. t. 4. f. 1.

‡ *Lysurus Mokusin* is considered by the Chinese as an excellent remedy in gangrenous ulcers. It is also eaten; but it appears to be often poisonous.

XIV.—*Note on* Epilobium angustifolium *and* macrocarpum. By H. O. Stephens, Esq., with remarks by Sir W. J. Hooker*.

To the Editors of the Annals of Natural History.

Since the publication of Mr. Leighton's papers on these plants [*Epilobium angustifolium* and *macrocarpum*] in this work†, I have received the following remarks from Sir W. J. Hooker, which will probably go far to prove their specific identity:

"With regard to *Epilobium macrocarpum*, it seems to be what I alluded to in the 1st edition of my 'Brit. Flor.,' when I remember there was cultivated in our Botanic Garden at Glasgow an American form of this plant (*E. angustifolium*) with smaller flowers.

"From America I afterwards received states which seemed gradually to pass into our true *angustifolium*. To me, I must confess, the characters you and Mr. Leighton have pointed out do not seem sufficient to constitute a species. Are there not intermediate forms? and can you really distinguish these two when not in fruit? How do you know your *macrocarpum* is not Linnæus's *angustifolium*? What does Mr. Leighton mean by saying that *E. angustifolium* does not bear *perfect* capsules? If so, how is it so extensively propagated? and if true, may not that account for the difference in the fruit? and surely a barren plant ought not to be the type of the species.

"I have numerous specimens in my herbarium of what I consider *E. angustifolium* from Mount Olympus to Iceland and Norway in the old world, and from the Atlantic to the Pacific in the new world, and all that have fully formed fruit have it resembling your *macrocarpum*. My large and small flowers seem equally to have fruit of the same character."

It must be acknowledged, that if these plants are distinct, the specific character rests on the size and shape of the capsules; and if these are alike in both, I cannot but agree with Sir W. J. Hooker, there scarcely remains sufficient difference to constitute two species; for the elaborate descriptions of Mr. Leighton contain nothing tangible, all the remaining differences between the two forms being of a comparative kind. Having no means of consulting the Linnæan herbarium, I could not be certain my *macrocarpum* was not the *angustifolium* of that author; for the plant of Linnæus I rested on the authority of Smith. I now find Linnæus's *angustifolium* is my *macrocarpum*, although Smith describes and figures in 'Eng.

* Read before the Botanical Society of London, Feb. 18, 1842.

† See vol. viii. pp. 170, 246, 401.

Bot.' the dark-leaved and large-flowered form. In gardens, *E. angustifolium, brachycarpum,* Leighton, is propagated by creeping roots, and this will account for its barrenness under cultivation. I shall try, when its roots are confined by a garden-pot, if perfect seed will be produced.

HENRY OXLEY STEPHENS.

Bristol, Terrell Street, Feb. 8, 1842.

XV.—*Insectorum novorum Centuria, auctore* J. O. WESTWOOD, F.L.S., &c.

Decadis quintæ, ex ordine Homopterorum Latr., *Synopsis.*

Familia CICADIDÆ.

Cicada imperatoria, W. Luteo-fulva, capite et thoracis dorso maculis numerosis (magnitudine et formâ variis) nigris, mesothoraceque figurâ trifidâ notatis: pronoti lateribus in medio emarginatis; abdomine brunneo lateribus pallidioribus, maculâ in singulo segmento utrinque nigrâ; alis flavido-hyalinis venis fulvis; anticarum venis transversis subapicalibus fusco nebulosis, maculisque septem versus marginem fuscis. Long. corp. unc. $3\frac{1}{8}$. Expans. alar. unc. $8\frac{1}{4}$.

Obs. Gigas in genere. Affinis *C. fuscæ,* Oliv., Stoll., Cig., fig. 36.

Hab. East Indies and the Indian Islands. Mus. Hope, Westwood, &c.

Cicada Mearesiana, W. Nigra, pronoti margine postico flavo: mesothorace posticè utrinque puncto oblongo ferrugineo, metathorace fulvo marginato; alis anticis nigro-fuscis, venis nigris; posticis lætè testaceis, areâ anali margineque tenui apicali fuscis venis nigris. Long. corp. unc. $1\frac{3}{4}$. Expans. alar. unc. $5\frac{1}{2}$.

Hab. The Himalayas. D. Meares. Mus. Parry.

Cicada dives, W. Nigra, alis anticis nigris, venis rubris, fasciâ mediâ transversâ albidâ; posticis testaceis, dimidio apicali nigris. Long. corp. lin. 12. Expans. alar. unc. 3.

Hab. Sylhet in the East Indies. Mus. Hope.

Cystosoma (subg. nov. Caput parvum. Promuscis ad basin femorum intermediorum extensa. Tympana musicalia omnino detecta, valdè convexa, transversè striata. Abdomen ♂ maximum valdè inflatum. Pedes breves. Alæ anticæ ultra medium valdè subhexagonaliter areolatæ).

Cystosoma Saundersii (Westw., Arcana Ent., pl. 24. fig. 1.). Pallidè lutea, costâ alarum anticarum albidâ. Long. corp. ferè unc. 2. Expans. alar. unc. $3\frac{3}{4}$.

Hab. New Holland. Mus. Curtis (cum hoc nomine inscripto).

Familia FULGORIDÆ.

Fulgora (subg. *Pyrops,* Spinola) *Spinolæ,* W. Rostro corporis longitudine adscendente, supra nigro subtùs luteo; corpore fulvo; pronoti margine antico et in medio, mesothorace plagâ latâ mediâ punctis duobus strigisque duabus obliquis lateralibus nigris, alis anticis fuscis venis fulvis ; ante medium fasciis tribus rectis transversis pallidè fulvis, maculisque 6 aut 7 subapicalibus (quarum nonnullæ fasciam macularem formant) ; alis posticis apicibus nigris. Long. corp. unc. $1\frac{3}{4}$. Expans. alar. unc. $3\frac{1}{4}$.

Hab. East Indies, Mysore ; also Assam, D. Cantor. Mus. Hope, Westw., &c. Affinis *F. Candelariæ.*

Fulgora (subg. *Pyrops*) *guttulata*, W. Rostro thorace dimidio breviori, apice subadscendente ; capite et thoracis dorso nigro-maculatis, abdominis segmentis basi fuscis, alis anticis guttis numerosis albidis nigro-cinctis ; posticis pallidè flavescentibus nigro-maculatis, margine postico latè fusco. Long. corp. ferè unc. 1. Expans. alar. unc. 2.

Hab. Northern India. Mus. W. W. Saunders.

Fulgora (subg. *Pyrops*) *virescens*, W. Rostro brevi conico vix adscendente ; pallidè virescens, prothorace et mesothoracis scutello utrinque puncto nigro ; alis anticis maculis numerosis parvis rotundatis, fulvis, ornatis, posticis virescenti-hyalinis. Long. (alis clausis) ferè unc. $1\frac{1}{2}$.

Hab. East Indies. Mus. Hope, Leadbeater.

Fulgora (subg. *Episcius*, Spin. ?) *amabilis*, W. Rostro, thoracis longitudine suprà plano subconico, capite thoraceque griseo-fuscis, abdominis dorso testaceo, maculis lateralibus nigris, alis anticis brunneo-fuscis apice pallidioribus fusco nebulosis, posticis basi fulvis, medio fuscis, apice hyalinis. Long. corp. lin. $5\frac{1}{2}$. Expans. alar. lin. $10\frac{1}{2}$.

Hab. Mexico. Mus. Westw.

Obs. Episcius Guerini, Spin. = *Fulgora platyrhina*, Germ., Westw.

Eurybrachis insignis, Westw. Pallidè fulvescens, abdominis lateribus sanguineis, genitalibus lateralibus maximis cochleiformibus, alis anticis albidis basi magis fulvescentibus in medio roseo-tinctis, strigis brevibus nigris transversis apiceque punctis minutis nigris notatis, alis posticis albis, pone medium maculis nonnullis nigris, pedibus anticis dilatatis fusco-nebulosis. Long. corp. lin. $7\frac{1}{2}$. Expans. alar. unc. $2\frac{1}{3}$.

Hab. Malabar (E. Ind.). Mus. Westw.

Familia Cercopidæ.

Smilia informis, W. Albida, pronoto maximo, valdè inflato, totum corpus obtegente ferè ut in *Smil. inflatâ*, at magis tumido, in medio constricto, et ad apicem spinâ armato, dorso irregulariter areolato, areis præsertim posticis maximis fusco interdum marginatis et maculatis, alis anticis venis crassis, punctoque subapicali fuscis. Long. corp. lin. $4\frac{1}{2}$.

Hab. Brazil. Brit. Mus. et D. Hooker.

XVI.—*Contributions to the Ichthyology of Australia.* By JOHN RICHARDSON, M.D., F.R.S., &c., Inspector of Hospitals, Haslar.

[Continued from p. 31.]

CENTROPRISTES SCORPENOIDES (*Cuv.* & *Val.*), Scorpenoid Centropristes.

Scorpène de Waigiou, Quoy & Gaimard, Zool. Voy. de Frey., pl. 58. f. 1.
Centropristes scorpenoides, Cuv. & Val. Hist. des Poiss. iii. p. 48.
No. 31. Mr. Gilbert's collection.

IN characterizing the *Plectropomes,* Cuvier observes that they differ from the *Serrani* in the teeth of the angle and under limb of the preoperculum being directed forwards, and that he has separated them merely to facilitate their nomenclature. Had the *Centropristes* been equally numerous, this species might have been detached by the same character as the *Plectropomes,* for its preoperculum is spurred beneath still more strongly and acutely*. But though the *Centropristes* do not form a copious group, neither do they, as enumerated in the 'Histoire des Poissons,' constitute a very natural one. The illustrious authors of that work have pointed out the resemblance of the *C. truttaceus* to a *Cæsio,* and indicated it as the probable type of a distinct genus, and its allied species *C. georgianus* has actually been made the type of the genus *Arripis*† by Mr. Jenyns. Abstracting these and the Japanese *C. hirundinaceus,* which has also a peculiar aspect, the remaining *Centropristes* described in the 'Histoire des Poissons' are all American.

The species at present under consideration is named by the natives at Port Essington 'Seebererdidwee,' and is abundant in all the shallow parts of the harbour. It has a strong resemblance to a *Scorpæna* in the character of its scales, in general form, in possessing a nasal cirrhus, in the structure of the anal spines, and in the small number of rays in that fin. These peculiarities no doubt determined Messrs. Quoy and Gaimard to place it in the genus *Scorpæna.* The teeth of the typical *Serrani* being long and slender, particularly posteriorly and towards the mesial line, as well as curved backwards, and having moreover a few stronger ones intermixed, are especially adapted for preventing the escape of the animals on which these fishes feed. But the numerous spe-

* The appellation of *Centrogenys,* which is nearly synonymous with that of *Plectropoma,* would have been appropriate had it been advisable to give a subgeneric name to this curious fish. A specimen having the vomer and palate bones cut away might be taken for a *Centropomus.*

† Zoology of the Voy. of the Beagle.

cies which enter into the genus show various gradations* in the strength of their cardiform dentition; and the teeth in some being finely villiform, with small and scarcely projecting canines, are in fact less efficient organs of retention than the teeth of *Centropristes nigricans,* which are stated by Cuvier to be all 'en fort velours.' The *Centropristes scorpenoides,* on the other hand, has very short, densely crowded teeth, with the dental surfaces curved and fitting into each other, and evidently adapted for rubbing down or bruising soft substances rather than for retaining a living prey. This species also differs from the other *Centropristes,* and approaches the *Serrani* in the snout and suborbitar being scaly. The unusual strength and length of the second anal spine, being proportionally greater than even in the *Holocentri,* is a peculiar character. Mr. Gilbert has brought home three specimens in spirits, together with several dried skins, all retaining the configurations of the dark colour strongly defined, particularly on the spines and fins. One of the dried skins has been presented by Mr. Gould to the Muséum d'Histoire Naturelle at Paris. The description of Quoy and Gaimard's specimen, contained in the 'Histoire des Poissons,' agrees exactly with the examples from Port Essington, except in the statement of the suborbitar not being scaly and the operculum having only one acute point; but the figure in the zoological volume of Freycinet's voyage is characteristic enough to show that there can be no mistake as to species. The markings are not however so boldly defined in that figure as they still appear on Mr. Gilbert's specimens.

Form.—Snout gibbous, the cranium being arched between the orbits both longitudinally and transversely. The head is concave behind the orbit† and rises again to the beginning of the dorsal fin, from whence to the end of the fin the profile of the back is moderately and regularly arched: the curve of the belly is flatter.

The length of the trunk of the tail is equal to its own height, or to about one-third of the height of the body, which at the insertion of the ventrals, where it is greatest, is exactly equal to the length of the head, measured to the tip of the gill-cover; the total length of the fish exceeds thrice the length of the head by half the length of the caudal fin. The greatest thickness is just above the pectorals, and is equal to half the height; the body thins off more rapidly towards the back, which is rather acute, than towards the belly, which is flattish and has some breadth before the ventrals. Towards the

* The genus *Prionodes* of Mr. Jenyns exhibits a peculiar modification of the teeth of this tribe, the species on which it is founded being in fact a *Serranus* with toothless vomer and palate bones.

† This peculiarity is owing to the soft parts, and not to the form of the skull, which is convex.

tail the fish becomes gradually much compressed, the thickness of the trunk of the tail not exceeding one-third of its height.

The *head* is rather thick and convex above. The distance between the eyes is equal to the vertical diameter of the orbit, and the snout is very short. The moderately large eye is placed high up, occasioning apparently the arching of the frontal bone: it is half a diameter from the edge of the snout, a diameter and a half from the under surface of the head, and two and a half from the tip of the gill-flap. The nostrils are situated on the verge of the orbit, above its upper anterior angle, the two orifices being contiguous, and the foremost one emitting a cirrhus which is two lines high. The mouth opens forwards and is of moderate extent, the jaws not separating beyond an angle of 60°. The under jaw is equal in length to the upper one, but as it ascends when the mouth is closed, it appears slightly longer when depressed. The lips are thin. The intermaxillaries are moderately protractile, and, owing to the shortness of the snout, their pedicles, which are of the same length with the oral limbs of the bone, slide over the anterior third of the orbit. The maxillary is wide at its lower end and evenly truncated, and its upper end is only very partially covered by the edge of the preorbitar. The lips, jaws, isthmus, and branchial membrane are the only parts of the head that are not scaly; the snout, top of the head, suborbitars, cheeks, and whole opercular pieces being densely covered to their extreme edges with scales. The preorbitar is narrow, and curves away to a thin slip as it passes under the anterior third of the orbit; it is scaly, though the scales, being imbedded in integument full of small pores, are not easily seen unless in the dried specimen. The rest of the suborbitar chain is restricted to a smooth mucous canal or fold which divides the orbit from the densely scaly cheek. Neither the margin of the orbit nor the preorbitar show any acute points, though the anterior edge of the latter is slightly uneven. There are many minute pores with branching mucous tubes on the lower jaw not disposed in any regular order.

The upper limb of the preoperculum inclines slightly forwards as it ascends, and is finely and very acutely serrated; the teeth are divergent on the rounded angle and a little stouter; and the under edge of the bone, which is slightly arched, is occupied by three strong conical and very acute spines which point forwards. The foremost of the three is the largest, being twice as long as the posterior one, which is less than the middle one. These spines lie beneath the scaly edge of the bone, and are not readily seen in the recent fish. The whole edge of the preoperculum is free to a considerable extent, and can be raised from the gill-cover. The gill-flap is triangular, its under edge sloping much upwards to the not very acute scaly tip, which is situated high above the pectoral fin and nearer to the lateral line. There is no membranous margin to the flap, and the scales conceal the unions of the opercular pieces. The under edges of the interoperculum and suboperculum are quite entire. A flat acute spine is situated on the operculum, about its own length from the tip of the gill-flap and immediately behind it. The point of a second spine is just perceptible higher up, near the superior angle of the gill-opening: this point is conspicuous enough in the skeleton, the bone being cut away in a semicircular arc between it and the principal point. There is no peculiarity in the scales which conceal the supra-scapular and humeral bones.

The *teeth*, which are, singly, but just visible to the naked eye, are disposed in villiform bands, very densely crowded; and by the aid of a microscope are seen to be very short and obtuse, a few scattered ones near the symphysis being more so than the rest. The dental surface on the intermaxillary is concave and inclines much inwards, receiving that of the lower jaw, which is convex. On both jaws it tapers as it recedes from the mesial line. The chevron of the vomer, resembling an inverted Λ, is armed, together with the edge of the palate bones, with very minute villiform teeth.

RAYS:—B.7—7;	D.12|12;	A.3|5;	C.$12\frac{3}{3}$;	V.1|5;	P.13;	1st specim.
7—7;	13|9;	3|5;	$12\frac{3}{3}$;	1|5;	13;	2nd —
7—7;	13|10;	3|5;	$12\frac{3}{3}$;	1|5;	14;	3rd —
7—7;	13|9;	3|5;	$12\frac{3}{3}$;	1|5;	13;	4th —
7—7;	13|11;	3|5;	13;	1|5;	13;	C. & V.

The narrow branchiostegous membrane is supported by seven cylindrical rays, the two lower ones being short, very slender, and easily overlooked. The gill-opening is wide. The dorsal varies in different individuals more than is common among the acanthopterygian fishes in the number of its soft rays, viz. from nine to twelve, the last one being in each case deeply divided. One specimen also has a spine fewer than the rest. The fin commences a little behind the edge of the preoperculum; the spinous portion is arched and occupies twice the space of the soft rays, which rise above the posterior spines, and are like them oblique. The anterior spines are the strongest; the first is half the height of the second, and when the fin is fully extended inclines forwards; the third is the tallest, but is very little higher than the second and third; the membrane is more deeply notched between the first three spines than in the succeeding part of the fin; the remaining spines decrease very gradually in succession, the thirteenth being a little taller than the first, and about one half the height of the soft part of the fin, which has a rounded outline. All the spines after the second one are slightly curved. There are no scales on the fin before the third spine, but more posteriorly a little triangular fillet of scales inclines against the fore side of each spine, the fillets increasing successively in size, and the base of the soft fin is densely scaly.

The anal commences far behind the anus and nearly opposite to the middle of the soft dorsal. The first spine is short, tapering and acute, and convex before and behind, whereby it is prevented from reclining against the second spine, which is very long, strong, slightly curved and compressed in an opposite direction, having its anterior and posterior edges acute. The membrane slopes off from it to the point of the third spine, which is one-fourth part shorter, producing an acute notch in the fore part of the fin. The third spine is however as tall as the highest dorsal spine, and it is flattened or grooved behind for the reception of the first soft ray, which is closely applied to it and overtops it, but does not equal the second spine. The other rays are successively shorter, and the fin terminates sooner than the dorsal, leaving consequently more space between it and the caudal. It contains five articulated rays, the last one deeply divided, and its base is scaly like the dorsal. The caudal terminates evenly with rounded corners, and contains twelve or thirteen forked or branching rays, with three visible, incumbent, simple but jointed ones above and below. The pectoral is rounded and is attached low down, the lower rays partly overlapping the ventrals. All its rays are twice or thrice divided at the tips, but the branches remain in contact without spreading through the membrane that connects one ray to another. The ventrals are attached near each other, entirely on the ventral aspect of the fish, and open horizontally. The spine is one-third shorter than the soft rays.

Scales.—The scales, *in situ*, have a striking resemblance to those of *Scorpæna porcus*. They are individually truncated at the base, with parallel rectangular sides and an elliptical exterior edge, which is finely ciliated by slender rigid teeth and narrowly bordered by a shagreened surface. From five to nine furrows originate in a point close to this border and run in a fan-like manner to the basal edge, but do not occasion crenatures thereon. The scales on the head are about one-third smaller than those on the body, and appear to be rougher. They are smallest on the bases of the fins, the snout, and tip of the gill-cover; the cheek ones nearly equal those on the operculum in size. They do not extend far on the pectorals and caudal, and there are none on the ventrals. The lateral line is less curved than the back, and opposite to the posterior third of the soft dorsal, it takes a straight direction through the tail to the membrane between the two middle caudal rays, proceeding as far on the fin as the scales do. The scales composing it are smaller than the adjoining ones, and of a different shape, being wider at the base than at the exterior edge, which is rough and ciliated like the rest: each has a simple tube on its exposed disc. There are forty-two or forty-three scales on the lateral line.

Colours.—The patterns of colour appear to be equally well preserved in the dried skin and in the specimens kept in spirits, the ground-tint being however much lighter in the latter. It is honey-yellow approaching to wood-brown, and the dark parts are deep umber or liver-brown. The dark tint prevails on the top of the head, mottles the cheek, and forms four round blotches along the summit of the back, partly encroaching on the dorsal fin. There is an equal number of spots on the lateral line not so well defined, and some shadings on the sides, particularly at the base of the anal. The lips, lower jaw, margin of the eyeball, and soft dorsal, exhibit the dark colour in form of small rectangular spots; the spinous dorsal shows it in round spots, which form three rows and occupy more space than the ground-colour. The posterior surface of the pectoral is regularly barred by three dark bands alternating with as many pale ones; on the anterior surface there are some spots, and the dark bars shine partly through. The fore part of the anal is also barred, the bars being most clearly seen on the spines; the hind part of the fin is tessellated by the rectangular spots. This tessellated pattern is still more perfectly exhibited on the caudal, the dark and light colours being nearly equal over the whole fin. The ventrals are marked much like the anal. The edges of the scales are mostly lighter, which renders the dark spots less intense on the scaly parts than on the jaws, spines, and fins. The nasal cirrhus is banded by the two colours. The eye is gold-yellow in the dried specimen.

Osteology.—The cranium is convex and smooth over the posterior angle of the orbit, but there is a very small mesial ridge on the occiput between the superior ends of the supra-scapulars. Between the orbits there is a smooth mesial furrow, and the anterior frontals are hollow. The infra-orbitars are narrow, presenting a chain of cells communicating with each other. There is no process extending across the cheek to the angle of the preoperculum as in the *Scorpænæ*. The preoperculum has been described already. The bony operculum ends in two flat acute points, with an even semicircular curve between them. It is the inferior third point, usually present in the *Serrani*, which is wanting in this species. The edges of the interoperculum and suboperculum are perfectly smooth. The suprascapular presents a series of cells like the suborbitars, and the uneven or crenated edge of a small process shows itself exteriorly at the upper angle of the gill-opening. There are, as in the *Serrani*, twenty-four vertebræ, but I can reckon only nine of them as abdominal, instead of ten; for the tenth has a forked inferior spinous process, which receives the point of the large interspinous bone of the anal, but carries no ribs. There are only nine pairs of ribs, but two or three of the posterior ones are forked. The first spine of the dorsal is articulated to the first interspinous bone; in *Centropristes nigricans* there are three interspinous bones before the first dorsal spine. The small lateral process of the last caudal vertebra which exists in *Serranus rasor* and others of that genus is absent in this *Centropristes*. The three anal spines are attached to a very strong interspinous bone; the middle spine occupying most of the articulation, the first and third spines moving partly on its base. The other anal interspinous bones are much more slender and short.

Dimensions.

	inches.	lines.
Length from intermaxillary symphysis to end of caudal	5	3
——— base of ditto	4	3
——— tip of gill-flap	1	7
——— beginning of dorsal	0	11
——— centre of eye	0	6
Diameter of orbit	0	5½
Length of pectoral	1	2
——— ventral	1	0
——— dorsal	3	2
——— ditto, spinous part	2	1
——— ditto, articulated part	1	1

Dimensions.	inches.	lines.
Length of anal	0	9
——— caudal	1	0
Height of nasal cirrhus	0	1½
——— third dorsal spine	0	9
——— thirteenth ditto	0	5½
——— soft dorsal	0	7½
——— second anal spine	1	2
——— soft anal rays	1	0
Height of body at pectorals	1	6
Thickness of ditto	0	8

Therapon servus (*Cuv.*), Jarbua Therapon.

Holocentrus servus, Bl. 238. *Grammistes servus*, Bl. Schn. p. 185.
Sciæna jarbua, Shaw, Gen. Zool. iv. p. 541.
No. 2. Mr. Gilbert's list of Port Essington fish.

Mr. Gilbert states that "this fish inhabits the shallow parts of Port Essington. The specimen was taken from a *fresh-water* swamp near the settlement," and measures 6¾ inches in length, caudal included. The lateral line is continuous, being arched until it arrives opposite to the eighth ray of the soft dorsal or sixth articulated one of the anal, whence it runs a straight course to the caudal, and passes a short way between the bases of the middle rays.

Therapon theraps (*Cuv.* & *Val.*), The Slave-Therapon.

Therapon theraps, Cuv. & Val. iii. p. 131. pl. 53.
No. 15. Mr. Gilbert's collection of Port Essington fish.
At-a-goorn, Aborigines of Port Essington.

The authors of the 'Histoire des Poissons' remark that this species has a very close resemblance to the Jarbua Therapon (number 2. of Mr. Gilbert's list), and indeed at first sight our specimen, which measures nearly eleven inches in length from snout to tip of caudal, might be easily set down as merely an older individual of the preceding species. Mr. Gilbert however informs us that its habits are somewhat different, for though abundant in the harbour it keeps in the deep water, while the Jarbua seeks the shallows. An attentive comparison of Mr. Gilbert's specimens of the two species, numbers 2. and 15, elicits the following differences.

The scales of *servus* are proportionally smaller, and have a neater and more compact appearance, arising from their being more strongly ciliated, and thereby better defined. The head has rather less vertical height, and the eye, which is smaller, approaches nearer to the profile. The suborbitar is ciliated with acute teeth, and the small scales, which closely and entirely cover the cheek, abut against a smooth elevated ridge that separates the cheek from the scaleless limb of the preoperculum. In *theraps* the surface of the suborbitar is more decidedly furrowed, but its margin is merely crenated, not acutely toothed; the interoperculum has a perfectly smooth edge, instead of showing two or three minute teeth posteriorly. The eye is larger, and further removed from the profile, the skull being more arched above as well as more convex transversely. The radiations and ridges of the frontal bone are more pronounced in *theraps*, but present the same patterns as in *servus*. Both species have scaly opercula and subopercula, and there are still some scales remaining anteriorly on the interopercula of both specimens. Cuvier's figure represents the interoperculum of *theraps* as entirely scaly, and also a few crenatures on the edge of the suboperculum, which are not visible in Mr. Gilbert's specimen. Our examples of both species possess the first very small dorsal spine, which Cuvier notes as being occasionally absent in *servus*, and as wanting in *theraps*. In both the fifth spine is the tallest, the fourth and sixth being but little shorter. The second anal spine is the stoutest in *servus*, the third in *theraps*, as mentioned in the 'Histoire des Poissons.' Both have the large black mark between the fourth and seventh dorsal spines, a smaller one on the ninth and the membrane behind it, and three on the edge of the soft dorsal. The three black bands on each side of the body exist in both exactly as described by Cuvier; but our example of *theraps* wants the black mark on the lower tip of the caudal, and has a spot above, between the black tip and first bar, which does not exist in the figure given in the 'Histoire des Poissons.' There is a striking difference in the lateral line of the Port Essington *theraps*, which is perhaps merely an individual variety proceeding from an injury, viz. an interruption beneath the third and sixth soft dorsal rays; it commences anew, and is continued to the caudal at the breadth of two scales lower down, the ends of the two parts passing each other at the interruption by the breadth of four scales. As the specimen consists of only one side of the fish, we cannot speak more confidently of the nature of this interruption of the lateral line,—the scales are of the usual size and appearance around the place.

The most striking distinction of the two species appears to be in the number of the outer conical teeth. These are small, blunt, and distant in *servus*, amounting only to about four on each side of each jaw, while in *theraps* they are at least double that number, are almost contiguous, and more acute, and they decrease in succession as they recede from the symphysis. In *servus* their blunt tips only are visible.

Mr. Gray informs me that the *Pterapon trivittatus* of Hardwicke's 'Indian Zoology' is the *Therapon theraps*.

Therapon rubricatus (*Nob.*), Tile-red Therapon.

No. 36. Lieut. Emery's drawings.

Lieutenant Emery has a drawing of a fish taken on the north-west coast of Australia, which is sufficiently characteristic to enable us to place it without hesitation in the genus *Therapon*, but abundantly distinct from any species described in the 'Histoire des Poissons.' The large opercular spine and the serratures of the ascending limb of the preoperculum are distinctly shown, but there are no teeth indicated on the lower edge of that bone, nor on any other of the opercular pieces, the suborbitars or humerus. This has probably arisen partly from the drawing having been made while the fish was just taken from the sea, and consequently when the soft parts concealed the bones of the head more perfectly, and partly perhaps from the bones above mentioned being less strongly armed than in others of the genus. No radiations of the frontal bone are indicated, nor are there any teeth shown in the jaws.

The head is proportionally smaller than in *servus* or *theraps*, its profile is arched above, but the nape rises more suddenly in a slightly concave line to the commencement of the dorsal; the line of the back is nearly straight to the beginning of the soft dorsal, whence it descends and curves gently into the trunk of the tail, whose upper profile is on a line with the top of the head. The body is higher than in the preceding species, its height under the spinous dorsal being exactly equal to one-third of the whole length, measured to the end of the central caudal rays. The height of the tail is less than one-third of that of the body. The ventrals are larger than in *servus* or *theraps*. The fourth dorsal spine is the tallest; and the third anal spine is represented as considerably longer than the second one. The membrane is not so much curtailed at the eleventh spine as in *theraps*. B. 6; D. 12|10; A. 3|9; V. 1|5, &c.

The markings on the fins are dark reddish brown. One spot includes the tips of the fourth, sixth and seventh dorsal spines; there is a small one on the tip of the tenth spine, a still smaller one on the eleventh; a fourth extends from the tip of the twelfth spine to that of the second soft ray, a fifth reaches from the tip of the fourth soft ray to that of the sixth, and there is a sixth spot on the posterior angle of the soft dorsal. A paler spot covers the hinder half of the anal. The ground-colour of the caudal is imperial purple, and it is crossed by three broad bands of dark liver-brown, the upper and lower tips of the fin being also marked with the same. The back and sides are deep tile-red, which graduates into carmine on the head, the belly being whitish with a yellow tinge. The longitudinal bands are narrow, and have a honey-yellow colour. One commences just before the dorsal spines, and terminates at the middle of the soft fin, as in *servus*; another runs from the nape to the end of the soft dorsal, whence it is continued along the trunk of the tail to the upper base of the caudal. A third runs from the gill-opening, at the opercular spine, to the middle caudal bar, which has more than twice its breadth. There is a fourth very pale, and not complete stripe, at the junction of the red sides with the pale under surface, on a level with the lower third of the pectoral. The length of the individual, which the drawing represents, is noted by Lieutenant Emery as having been six inches.

Sillago burrus (*Nob.*), Crimson-backed Sillago.

No. 37. Lieut Emery's drawings.

The drawing was made from an individual $8\frac{1}{2}$ inches long, which was taken on the north-west coast. The species evidently differs from all that are described in the 'Histoire des Poissons,' but the figure expresses the generic form so exactly, that I have no hesitation as to the genus, though no scales are depicted on the side of the head, nor a spinous point indicated on the operculum. It is banded on the sides like *Sillago maculata* of MM. Quoy and Gaimard, which inhabits Port Jackson, but it wants the silvery lateral stripe, shows spots on the dorsals, and has a higher and more elliptical body than that species.

The profile is a lengthened ellipse, or, taking in the trunk of the tail, is fusiform; its greatest height, lying about midway between the ventrals and anal, is somewhat less than a fifth of the total length, caudal included. The outline descends in a flat regular curve from the first dorsal to the end of the snout, which is rendered obtuse only by the thickness of the moderately swelling lips. The mouth, situated at the apex of the subconical head, is on a low level, the under surface of the head being flattish. The curve of the belly is not quite so prominent as that of the back. The length of the under limb of the preoperculum, and its breadth downwards, characteristics of the genus, are well expressed in the figure. There are, however, no scales shown on the cheeks or opercular pieces, nor any spine on the gill-flap. The length of the head is equal to one-third of that of the fish, caudal excluded. The eye is situated near the profile, and rather nearer to the end of the snout than to the gill-opening. Its diameter is equal to one-seventh of the length of the head. The nostrils are situated high up, very near each other, and somewhat further from the end of the snout than from the orbit.

The commencement of the first dorsal, the acute tip of the gill-flap, the pectorals and the ventrals, are in the same vertical line. It is probable that a short incumbent ray at the beginning of the dorsal has been overlooked. In the drawing the first ray is the tallest, the others decrease gradually to the tenth, which has only one-fifth of the height of the first. The shape of the fin is triangular, its membrane terminating exactly at the base of the second dorsal: its height is equal to two-thirds of the height of the part of the body directly beneath it. The second dorsal lowers very gradually as it runs backwards, the last ray being only one-third shorter than the first, which is the tallest, and is as high as the seventh spine of the first dorsal: its outline is even. The anal is opposite to the second dorsal; it is a little lower, but corresponds with it in form, except that it has a short spine at its commencement. The caudal is slightly lunate on the margin. The pectoral measures one-sixth of the length of the fish, and terminates in an acute upper point. The ventral is also acute, but wants the filiform tip which exists in some Sillagos.

Rays:—D. 10|(11?)—20; A. 1|21; P. 1|5, &c.

The lateral line is less curved than the back, and is traced a little above the middle height anteriorly, but runs through the middle of the tail; it is marked by two (or more?) divergent tubes on each scale.

Colour.—The head is yellowish brown, changing on the lower half of the cheek and gill-cover to a flesh-tint. The back down to the lateral line, is crimson, the parts beneath primrose-yellow. Between the nape and caudal fin eleven, irregular, interrupted bars of yellowish brown descend obliquely forwards from the back; those which proceed from the base of the second dorsal pass the lateral line a little way; the anterior and posterior ones are shorter. The caudal is very pale ochre-yellow, without spots. The other fins are colourless, and seemingly transparent; they are also without spots, except the dorsals, which are marked by oblique rows of round brown spots, each spot being nearly as wide as the space between the rays. There are two rows on the first dorsal and five on the second, but these are not complete; for as the lower anterior row terminates, from its obliquity, at the fifth ray, another row commences on the edge of the fin, and the same thing takes place when the second row terminates at the thirteenth ray, so that there are only three rows in any one part of the fin. There is a blue patch on the scaly base of the pectoral.

Percis Emeryana (*Nob.*), Emery's Percis.

No. 22. Lieut. Emery's drawings.

The drawing was made from a fish procured at Depuch island; it measured seven inches.

In form this Percis resembles *cylindrica*, but it is still more lengthened. Its height being one-seventh of the total length, caudal included, remains nearly the same from the occiput to the posterior third of the dorsal, when it begins to taper gradually into the trunk of the tail. The head is depressed before the eye, but it is altogether shorter, and the snout more obtuse than that of *cylindrica*. The teeth are strongly marked on the jaws. In the radiating semicircular form of the spinous dorsal, as well as in the notched caudal, this fish resembles a *Trachinus*. The spinous dorsal has five rays, and the third and fourth being the longest, its outline is much arched: its membrane ends exactly at the base of the first soft ray. The articulated part of the fin and the anal are of equal height throughout, and rather exceed half the height of the body. The posterior corner of the anal is slightly rounded. The caudal is notched to a third of its length, and its lobes are acute. The pectoral is truncated, the spinous dorsal commences immediately over its base, and the elliptical ventrals are affixed a little more anteriorly. The anus is under the fourth jointed ray of the dorsal, and the anal begins a ray further back.

Rays:—D. 5|21; A. 16; V. 5 (the spine not being expressed).

Colour.—In the markings of the body this species comes near *semifasciata*, but it differs widely from it in the form of the head, body, and spinous dorsal, as well as in the number of rays of the soft dorsal. The general tint of the back and upper half of the sides is tile-red. Little specks of a deeper tint of the same colour border each scale, and these specks are at intervals crowded so as to produce five vertical bands under the soft dorsal, narrower than the intervening spaces. There is another less distinct band on the nape, and a seventh on the base of the caudal. None of the bands go beyond the general line of the red. The lower half of the side is pale primrose-yellow, which fades to white on the belly. The head, which is represented as scaly on its whole upper surface as well as on the cheeks and gill-covers, is coloured like the body, except that white replaces the yellow of the lower parts. Three azure-blue streaks cross the front between the eyes, one on the upper part of the cheek follows the curve of the orbit, two run from the eye to the upper lip, and two connected like a bent bow and its string, cross the occiput. The spinous dorsal is entirely black, the soft one pale bluish lilac; and behind each ray there are two round white spots, one above the other, and two blackish brown dots higher up, making four rows in all. The anal is also lilac, but with a tinge of crimson; and it is marked by a series of sixteen crimson streaks running obliquely forwards across the rays. The caudal is red like the back, with a yellow upper and under border, and four waving transverse lines on its distal half. The pectorals are unspotted red, and the ventrals greenish.

[To be continued.]

XVII.—*On Mucor observed by Col. Montagu growing in the Air-cells of a Bird.* From Wm. Yarrell, Esq., F.L.S.

To the Editors of the Annals of Natural History.

Gentlemen,

In addition to the instances quoted in the eighth volume of the 'Annals,' page 229, of the growth of cryptogamous plants in the bronchial tubes of a Flamingo, and on the internal surface of the air-cells of an Eider-duck, allow me to refer you to another example mentioned by Col. Montagu in the 'Supplement to his Ornithological Dictionary,' published in 1813, under the article 'Scaup Duck.' The paragraphs are as follows:—

"The cause of death (in this female) appeared to be in the lungs, and in the membrane that separates them from the other viscera; this last was much thickened, and all the cavity within was covered with *mucor* or blue mould."

"It is a most curious circumstance to find this vegetable production growing within a living animal, and shows that where air is pervious, mould will be found to obtain, if it meets with sufficient moisture, and a place congenial to vegetation. Now the fact is, that the part on which this vegetable was growing was decayed, and had no longer in itself a living principle; the dead part therefore became the proper pabulum of the invisible seeds of the *mucor* transmitted by the air in respiration; and thus Nature carries on all her works immutably under every possible variation of circumstance. It would indeed be impossible for such to vegetate on a living body, being incompatible with vitality, and we may be assured that decay must take place before this minute vegetable can make a lodgement to aid in the great change of decomposition. Even with inanimate bodies, the appearance of mould or any species of *Fungi* is a sure presage of partial decay and decomposition."

In your last number, the first of volume nine, Dr. C. Montagne, in his Sketch of the Class Fungi, says, page 10, "The *Hyphomycetes* grow on vegetable or animal substances in the course of decomposition." I refer to this only to show that Col. Montagu was well acquainted with the conditions necessary to this singular formation.

I am, yours very truly,

Wm. Yarrell.

Ryder Street, St. James's, March 18, 1842.

XVIII.—*A List of Invertebrata found in Dublin Bay and its vicinity.* By Arthur Hill Hassall, Esq., M.R.C.S.L., Corresponding Member of the Dublin Natural History Society.

The few invertebrate animals contained in the following list were found by me during the winter of 1840 and spring of 1841. The Porifera and Conchifera, with but two exceptions, are purposely excluded from it; examples of the first which I have met with having been sent to Dr. G. Johnston, and most if not all the species of the latter collected by me have doubtless been previously found, though not yet recorded, by that zealous collector T. W. Warren, Esq. For the Echinodermata the nomenclature of Forbes is adopted, and for the Crustacea that of Leach.

Echinodermata.

Comatula rosacea, very abundant in the channel between Dalkey Island and the mainland. The marking and colouring of young specimens obtained off Kingstown Harbour are very beautiful and delicate, very different from the coarse red colour which distinguishes them in their mature condition. I have collected specimens, the diameter of which when expanded did not exceed half an inch, and in them no trace of footstalks was to be detected.

Ophiura texturata.
O. albida.
Ophiocoma filiformis, a single specimen.
O. rosula.
Uraster rubens.
U. violacea.
Cribella oculata.
Solaster endeca.
S. papposa.
Asterias aurantiaca.
Spatangus purpureus.
Echinus sphæra.
Amphidotus cordatus.
Echinocyamus pusillus.

Mollusca.

Doris tuberculata, not common.

D. bilamellata, Johnston. Syn. *D. verrucosa*, Fleming's Brit. Anim.

The peculiar arrangement of the branchiæ of this species is overlooked by Dr. Johnston, the specimens from which his description of the species was derived having been preserved in spirit. As I had an opportunity of comparing several living specimens together, it may be as well perhaps to subjoin a description of its outward characters.

Length one inch and three-fourths; body ovate, the larger end anteriorly depressed; cloak tuberculated, mottled with deep brown; tubercles rounded, white, elevated, and not all of an equal size; a broad band of brown, $\frac{1}{4}$ of an inch in width, passes along its centre, commencing at the dorsal tentacula and terminating at the branchiæ; the tentacula also are encircled by a brown shading. Branchiæ conical, pinnate, varying from twenty-four to thirty in number, arranged in the form of a crescent or like the capital letter C, the horns of the crescent being much incurved; the convexity is anterior; the branchiæ are longest in the centre of the crescent and diminish greatly towards either side. A short process is frequently seen between many of the branchiæ, having somewhat the appearance of the remains of a branchia which had been broken off; tubercles also cover the space enclosed by the branchial apparatus: dorsal tentacula thick at the base, conical, and without a sheath surrounding them. Number of branchiæ in young specimens as many as in mature ones.

It deposits its ova in ribbon-like gelatinous masses early in the month of March.

Found in great abundance at Williamstown above low-water mark.

Doris pilosa, not at all common.

Several varieties of a *Doris* occur at the same locality as *Doris verrucosa*, which I was at first inclined to regard as a variety of *Doris pilosa*, but which I now am inclined to consider as distinct from that species, from which it differs in several particulars; in having the dorsal tentacula surrounded by a notched sheath; in size, the largest specimens attaining the length of one inch and three-eighths; and in colour, which is various. One variety of this elegant *Doris* is of a soot-like black colour, and this is evidently the *Doris nigricans* of Fleming. A second principal variety is of a delicate and lively canary colour. All the other varieties present different shades of these two colours, or are colourless or pure white; this last variety is frequently met with.

If the canary-coloured specimens be but varieties of the black ones, then is the name of *nigricans* improper, nor can the very great difference in colour between the varieties be explained by reference to age or locality.

Goniodoris barvicensis, at Sea Point in great numbers just below low-water mark.
Tritonia Hombergii, in deep water ; a single specimen.
Eolidia rufibranchialis, not uncommon.
Bulla haliotidoides, a single living specimen at Williamstown.
Lottia testudinalis, abundant on stones above low-water mark at Williamstown.

CRUSTACEA.

Corystes Cassivelaunus, common.
Atelecyclus Heterodon, Portmarnock Strand, after storms.
Portumnus variegatus, not uncommon.
Carcinus Mœnas, common.
Portunus puber, common.
Cancer Pagurus, common.
Pilumnus hirtellus, not common.
Pinnotheres Pisum, not common.
Hyas Araneus, not common.
H. coarctatus, common.
Inachus Dorynchus, Portmarnock, not common.
Macropodia Phalangium, common.
Pagurus Streblonyx, common.
Galathea squamifera.
Porcellana longicornis.
P. platycheles.

For the names of some of the species in the above list I am indebted to Mr. Thompson of Belfast, whose kindness in this particular I had to acknowlege on a former occasion.

XIX.—*Carabideous Insects collected by* Charles Darwin, Esq., *during the Voyage of Her Majesty's Ship Beagle.* By G. R. WATERHOUSE, Esq., Curator to the Zoological Society of London.

[Continued from vol. vii. p. 129. With a Plate.]

Section CARABIDES.

Genus ABROPUS*, nov. gen.

Caput elongatum, anticè et posticè acuminatum. *Labrum* subquadratum. *Mandibulæ* edentulæ, acutæ. *Mentum* profundè emarginatum, angulis anticis acutis. *Palpi*, articulo ultimo elongato, subcylindraceo, in medium paulò incrassato, ad apicem truncato. *Antennæ* perlongæ.

Thorax capite vix latior, ferè quadratus.

* From ἁβρὸς and ποῦς, having soft or tender feet ; the joints of the tarsi in both sexes being many of them furnished with soft brushes of hair and membranous appendages on the under side.

Elytra oblongo-ovata, posticè distinctè acuminata.

Pedes longi; *tibiæ anteriores* intùs emarginatæ; *tarsi* articulo penultimo bilobato, subtùs spongiosi; tarsi anteriores in maribus dilatati, articulis oblongo-quadratis, subtùs membranaceis.

Sp. Abropus splendidus, Plate III. fig. 1.

Metius splendidus, *Guérin*, Revue Zoologique, No. 10, 1839, p. 297.

Abr. viridis; supra splendidè viridis; antennis, palpis pedibusque flavescentibus; thorace ferè quadrato, anticè indistinctè acuminato, posticè foveis duabus impresso; elytris oblongo-ovatis, ad apicem distinctè acuminatis, leviter striatis, striis impunctatis. Long. corp. 5 lin.; lat. 2 lin.

Hab. Tierra del Fuego.

Descrip.—Head elongated and pointed in front, with a large puncture on each side near the inner margin of the eye, and two oblong shallow foveæ in front: eyes large and moderately prominent: antennæ long and slender, when extended backwards reaching to about the middle of the elytra. Thorax scarcely broader than the head, nearly of a quadrate form, but slightly contracted in front; the anterior and posterior angles very nearly forming right angles; the upper surface but little convex, with a distinct dorsal channel and two large and shallow posterior foveæ: minute transverse rugæ are generally visible on the upper surface of the thorax. The elytra are ample, and together are about twice as broad as the thorax, of an elongated and subovate form; the broadest part is rather behind the middle, and at a short distance from the apex they are suddenly contracted in width; the point of each elytron is rounded: the surface is rather delicately striated, but the striæ are obliterated near the outer margin and on the apical portion of the elytron; those striæ nearest the suture are most distinct and continued nearly to the point of the elytron: no punctures are observable in the striæ, the interspaces are flat and impunctate. The upper surface of the head, thorax and elytra is of a brilliant green colour; the under surface of the insect is chiefly of a deep green hue; the head is of a pitchy red colour beneath, but faintly tinted with greenish, and the labrum is of the same tint; the mandibles are testaceous at the base and blackish at the point; the terminal segment of the abdomen is pitchy red at the tip. The legs, antennæ and palpi are testaceous, but a slight pitchy hue is observable in the middle of the terminal joints of the palpi. The outer margin of the elytra is also reddish, and this tint is more or less visible at the suture.

This insect I feel no doubt is the *Metius splendidus* of Guérin; it differs however considerably from the *Metius harpaloides* * of Curtis, which is the type of the genus *Metius*. The general form of the two insects is very dissimilar, the one (*Metius*) having the form of a *Harpalus*, and the other approaching more nearly in form to an *Agonum*. Besides the difference in the general form, *Abropus* differs from *Metius* in having much longer antennæ (as pointed out by M. Guérin), in having longer legs, the head also more elongated, and the labrum

* Transactions of the Linnæan Society, vol. xviii. p. 189.

not distinctly emarginated in front. The most important distinguishing character however is perhaps that furnished by the structure of the tarsi, the penultimate joint of which is distinctly bilobed and furnished beneath with membranous appendages in both sexes. I fancy I can also perceive similar appendages on the under side of the antepenultimate joint. In the male the whole under surface of the anterior tarsi is covered with small hairs and membranous appendages, and at least the penultimate and antepenultimate joints of the other tarsi are provided with the same soft cushions. Most of the above characters will serve to distinguish *Abropus* from *Antarctia*, but in a less marked degree; some of the species of the last-mentioned genus approaching very nearly to *Abropus* in their general form, as well as in the structure of the parts of the mouth. The labrum in *Antarctia* is shorter and broader and more distinctly emarginated in front; the mandibles are rather more curved and acutely pointed, and one of them has a distinct tooth on the inner side; the labrum differs only in being shorter and broader; scarcely any difference is perceptible in the palpi or in the maxillæ. Whilst, on the one hand, I find species of *Antarctia* with the narrow thorax and general form approaching *Abropus*, on the other, I find species which I can scarcely say differ from *Metius*;—the *Antarctia carnifex* of Dejean, for example, might with perfect propriety be placed in the genus *Metius*.

Plate III. fig. 1 *a*, head magnified; 1 *b*, mentum; 1 *c*, fore tarsus of male.

Mr. Darwin found the *Abropus splendidus* flying in numbers about the sea-coast in the evening in the month of December. "These insects live amongst the soft yellow balls which are excrescences, or rather fungi, growing on the *Fagus antarctica*, and which are eaten by the Fuegians."

Some specimens were found by Mr. Darwin under bark at Port Famine in the month of February.

MIGADOPS*, nov. gen.

Caput latum, subdepressum: *labrum* transversum, anticè emarginatum: *mandibulæ* intùs bidentatæ: *mentum* emarginatum, dente medio, lato, ad apicem bifido, instructum: *palpi* articulo ultimo mediocriter elongato, in medium paulò incrassiore, ad apicem indistinctè truncato: *antennæ* mediocres.

Thorax transversus, elytris angustior.

Elytra ovata.

Pedes mediocres: *tibiæ* anteriores intùs emarginatæ: *tarsi* quatuor anteriores in maribus dilatati et articulis transversis, subtùs spongiosis.

Sect. A, with the four anterior tarsi distinctly dilated in the male sex.

Sp. *Migadops virescens*, Plate III. fig. 2. Mig. niger, suprà virescens; antennis pedibusque rufo-piceis; capite lato, subdepresso; thorace transverso, subquadrato, ad latera in medio paulò dilatato,

* From μιγὰς, mixed, and ὤψ, the countenance, aspect, &c. the species of the genus having the general aspect of one division of the *Carabi*, but affinity to another.

posticè foveis duabus magnis impresso: elytris ovatis, posticè obtusis, leviter striatis, striis internis subpunctatis.' Long. corp. $4\frac{2}{3}$ lin.; lat. $2\frac{1}{4}$ lin.

Hab. Tierra del Fuego.

Head broad and depressed, with a very shallow fovea on each side near the eye, and another in front of each of these. Thorax about one-third broader than the head, broader than long, but little convex above; the posterior margin slightly sinuous, the lateral margin somewhat rounded, the sides being dilated in the middle; the anterior and posterior angles nearly in the form of right angles; an impressed line runs parallel with and close to the lateral margins; the dorsal channel is distinct, and commences at the anterior margin of the thorax and terminates at a short distance from the posterior margin; on either side, behind, is a largish shallow fovea, and there is a second small and indistinct fovea close to the posterior angle. Elytra about one-third broader than the thorax, and less than one-third longer than broad; nearly ovate, but obtuse and rounded behind; the surface but little convex, striated, the striæ distinct near the suture and having a faint trace of punctures; on the outer half and apical portion of the elytra the striæ are very nearly obliterated; the interspaces are flat and smooth. The upper surface of the head, thorax and elytra is of a blackish green hue and glossy; the under parts of the head and body are black; the legs and four basal joints of the antennæ are pitchy red, but the second joint of the antennæ is black at the base; the palpi are black, with the extremities of the joints pitchy.

Plate III. fig. 2 *a*, labrum and mandibles; 2 *b*, mentum; 2 *c*, maxilla; 2 *d*, fore tarsus of male; 2 *e*, middle tarsus of ditto.

The insect from which the above description is taken, somewhat resembles an *Helobia*, and in the form of the head, thorax and body is very dissimilar to the generality of the *Harpalidæ*, though it has the four anterior tarsi distinctly dilated in the males. It appears to form a connecting link between the family just mentioned and the genus *Antarctia*.

Mr. Darwin's notes state that this species is abundant under stones, &c. in the damp forest of Navarin Island. The specimens were collected there in the month of January. Mr. Darwin also found the same species in the month of December at the summit of Hunter's Peak, an abrupt cone of greenstone 1700 feet high, in Hermite Island near Wigwam Cove, not far from Cape Horn. It was found at Hardy Peninsula in the month of March, and "under bark" at Port Famine in February.

Migadops Falklandicus.—Mig. nigro-viridis; corpore subtùs piceo; antennis ad basin femoribusque piceo-rubris; thorace transverso, lateribus paulò dilatatis, posticè transversìm impresso atque punctulato; elytris latis, ovatis, subdepressis, posticè obtusis, punctato-striatis, interstitiis paulò convexis. Long. corp. $4\frac{1}{3}$ lin.; lat. $2\frac{1}{6}$ lin.

Hab. East Falkland Island.

Head with a few waved transverse rugæ between the eyes, impunctate: thorax transverse, broadest in the middle, and but slightly contracted before and behind; the posterior angles acute, the anterior angles slightly rounded; dorsal channel distinct, and extending from the anterior to the posterior margins; on the disc of the thorax this channel is very broad; a transverse depression is observable on the hinder part of the thorax, and the space between this depression and the posterior margin is thickly but finely punctured; the lateral margins are reflected, and present a few scattered punctures. The elytra are ovate, but little convex, and obtusely rounded at the apex; punctate-striated, the punctures small, and the spaces between the striæ slightly convex; the lateral margins of the elytra are reflected. The colouring of the upper parts is blackish green; the under parts are pitchy; the thighs are also pitchy, but inclining to reddish; the tibiæ and tarsi are black; the antennæ have the four basal joints of a pitchy red colour, and the remaining joints dusky; the palpi are also pitchy red, but the terminal joint is blackish in the middle.

This species approaches in form the *M. ovalis*, but differs in being more depressed, and in having the apex of the elytra obtusely rounded.

Migadops Darwinii.—Mig. ater, antennis ad basin, pedibusque piceo-rubris, corpore subtùs piceo; thorace posticè punctulato, transversìm impresso, et foveis duabus magnis notato; elytris punctato-striatis. Long. corp. $3\frac{1}{2}$ lin.; lat. $1\frac{3}{4}$ lin.

Hab. Tierra del Fuego.

Head broad, depressed, and with four shallow foveæ arranged in a transverse line between the eyes: thorax broader than long, dilated in the middle and contracted behind; the upper surface but little convex; the dorsal channel short, the sides rather broadly marginated, especially towards the hinder angles, where the lateral margin is recurved; behind is a faint transverse impression, and two large shallow foveæ; these, as well as the whole space between the transverse impression and the posterior margin, are rather thickly and finely punctured; some punctures are also observable on the lateral margins, which have a pitchy tint: elytra considerably broader than the thorax, and of a short ovate form, moderately convex above, and punctato-striated; the punctures are small, and arranged closely together; the interspaces of the striæ are nearly flat. The general colour of the insect is black, and it is moderately glossy; the palpi and four basal joints of the antennæ are pitchy red, but the terminal joint of the former is blackish in the middle, and so is the apical portion of the second, third and fourth joints of the antennæ; the body beneath is pitchy red, and so are the legs.

The pitchy tint of the under parts of the present insect would lead one to suppose the specimens to be somewhat immature.

Mr. Darwin found this insect at Navarin Island, near Hardy Peninsula; its form differs but little from the *Mig. ovalis* (Pl. III. fig. 3); the body, however, is broader, the thorax is more broadly marginated, and the lateral margins are more recurved near the posterior angles. In size the present species slightly exceeds the *M. ovalis*.

Migadops nigro-cæruleus.—Mig. nigro-cæruleus; corpore subtùs, antennis, pedibusque piceo-nigris; thorace posticè transversìm impresso, punctis minutissimis adspersis, foveisque duabus; elytris ovatis, punctato-striatis, interstitiis paulò convexis. Long. corp. $3\frac{1}{3}$ lin.; lat. $1\frac{3}{5}$ lin.

Hab. Tierra del Fuego.

This species very closely resembles the *M. ovalis*, but the antennæ are longer and black at the base; the thorax is more dilated in front, and the elytra are rather more distinctly sculptured. The most important difference, however, consists in the intermediate tarsi of the male being distinctly dilated. In this respect the present species resembles the *M. Darwinii*; its smaller size, more elongated form, more distinctly sculptured elytra, and the steel-blue colouring of the upper parts, will serve to distinguish it.

Sect. B, with the intermediate tarsi very indistinctly dilated in the males.

Migadops ovalis, Plate III., fig. 3.—Mig. nigro-viridis; corpore subtùs piceo; antennis ad basin femoribusque piceo-rubris; tibiis, tarsisque nigris; capite lato, subdepresso, inter oculos foveis duabus impresso; thorace transverso, disco convexo, lateribus in medium dilatatis, posticè foveìs duabus, atque punctis minutis, impresso; elytris breviter ovatis, convexis, punctato-striatis. Long. corp. 3 lin.; lat. $1\frac{2}{5}$ lin.

Hab. Tierra del Fuego.

Head broad and depressed: thorax broader than long, moderately convex above, the posterior angles acute; the lateral margins somewhat reflected near the posterior angles, rounded, most dilated in the middle; the dorsal channel short, being generally confined to the disc of the thorax; behind, the thorax has a slightly marked transverse impression, the area between which and the posterior margin is very finely punctured; on each side, towards the posterior angle, is a largish and somewhat deep fovea. Elytra convex, and of a short ovate form; punctato-striated, the punctures distinct and rather close together, but not large; the interspaces of the striæ flat, or very slightly convex. The upper parts of the insect are of a greenish black colour, sometimes inclining to blue-black, the under parts are pitchy; the basal joint of the antennæ is pitchy red, the second and two following joints are black, but more or less pitchy at the base, and the remaining joints are dusky; palpi black, the terminal joint pitchy at the apex; femora pitchy red; tibiæ and tarsi black, or pitchy black.

Pl. III. fig. 3 *a*, labrum and mandibles; 3 *b*, mentum; 3 *c*, maxillæ.

This species Mr. Darwin found in considerable numbers at Kater's Peak, Hermite Island, which is close to Cape Horn; he also found it on the mountains at Hardy Peninsula, in the month of February. From the last-mentioned locality the specimens are of a larger size (being $3\frac{1}{2}$ lines in length) than those found at Kater's Peak, but do not appear to be specifically distinct. This insect is readily distinguished from others here described, if the males be examined, by the two basal joints of the intermediate tarsi only being dilated in that sex, and these joints are much less dilated than usual. The palpi are moreover shorter.

XX.—*Description of a new species of* Carinaria, *a genus of* Nucleobranchiate Mollusks. By Mr. Lovell Reeve, A.L.S.

[With a Plate.]

To the Editors of the Annals of Natural History.

Gentlemen,

In the course of a recent journey through Holland, I was fortunate enough to become the purchaser of a valuable collection of shells that had been formed with considerable taste by the late Dutch Governor, General Ryder, stationed at the Moluccas. Amongst several of extreme rarity and beauty was a fine glassy Nautilus, which I at first took to be the celebrated *Carinaria vitrea* of the Paris Museum*, and of which a model in wax has been exhibited in the British Museum for many years. But it was destined to be yet more precious, for on referring to Lamarck's description of that species, as well as to the figure in Martini's 'Conchology,' I found it to be perfectly distinct. As I am unable to identify this species with any of those since described by Rang, D'Orbigny, or Benson, I forward you the following specific characters, accompanied with drawings on copper, for publication in the 'Annals.'

On account of the elegant slender form which characterizes this shell, I propose to call it the

Carinaria gracilis. Car. testâ hyalinâ, iridescenti, gracili, lateribus elongato-compressâ, transversim rugosâ, rugis ad carinam dorsalem obliquè terminantibus; carinâ rectâ, sublatâ, margine simplici, integro; vertice minimo, compresso, ad dextram involuto; aperturâ oblongo-ovatâ, versus carinam angustiori.

Long. $3\frac{5}{12}$; lat. $1\frac{1}{6}$; alt. 2 poll.

Hab. —— ? Mus. Stainforth.

The *Carinaria gracilis* differs materially from the *Carinaria vitrea*: first, in general form, being higher and much more slender and compressed at the sides; the keel, extending from the vertex to the margin of the aperture, is accordingly of greater length; secondly, in the vertex being still more minute, more compressed, and more closely rolled inwards; and thirdly, the most marked difference, in the width and simple straight edge of the keel, which in the *Carinaria vitrea* is dentated.

I am unable to give the true habitat of this species, though,

* Mr. Gray appears to have fallen into the same error as myself; for in his zeal to communicate the circumstance of my having brought this very rare shell to England, he notices it in this work, vol. vi. p. 239, as the *Carinaria vitrea*, Lamarck.

from the fact of its having been collected at the Moluccas, there is little doubt but that it was procured somewhere about that locality.

I remain, Gentlemen, yours respectfully,
LOVELL REEVE.

8 King William Street, Strand, March 5, 1842.

Representations of the well-known *Carinaria Mediterranea* are also given in the Plate, in order to exhibit the two species in comparison with each other.

PLATE II. *Fig.* 1, 2. *Carinaria Mediterranea.*
Fig. 3, 4, and 5. *Carinaria gracilis.*

XXI.—*The Birds of Ireland.* By WM. THOMPSON, Esq., Vice-Pres. Nat. Hist. Society of Belfast.

[Continued from vol. viii. p. 502.]

No. 11.—*Family Certhiadæ* (*continued*).

THE COMMON WREN, *Troglodytes Europæus*, Selby, prevails throughout the island; and though chiefly known as an inhabitant of gardens, plantations and farm-yards, is found in summer and autumn far distant from such localities, in the wild heathy tracts both of the lowlands and mountain-tops. In similar places it has been observed by a sporting friend in a fine grouse district in Inverness-shire, where the vicinity even of the dwelling-house is unfrequented either by the robin or sparrow.

The nest is generally composed of moss, and placed in hedges, and in trees and shrubs of various kinds. Warmer sites are not unfrequently selected; thus, once in a corn-stack, and four times within houses at our country place, nests of the wren were observed: of these, one was placed on the wall-top, just under the roof of a coach-house:—in the second instance, a swallow's nest of the preceding year (built inside a shed and against a rafter supporting a floor) was taken possession of, and fitted up with moss, of which a considerable quantity was introduced, though no attempt at a dome was made: for a proper construction of the kind there would not have been sufficient room:—the third, likewise, did not present any appearance of a dome; it was built in a hole in a wall inside a house, and the only entrance was through the broken pane of a window:—the fourth was constructed in a bunch of herbs hung up to a beam across the top of the garden house for the purpose of being dried; almost the entire of the nest was formed of the herbs, and the bunch altogether was very little larger than the nest itself; the door of this house was generally kept locked, at which time the only mode of entrance was beneath the door, where there was barely room for the birds to pass through:—in all these instances the broods were reared in safety. About Whitehouse, on the shore of Belfast Bay, where the grass-wrack (*Zostera marina*) is abundant, and always lying in masses on the beach, it is the material (as I am informed by Mr. James Grimshaw, jun.) commonly used by the wren in the construction of its nest, which externally is entirely composed of it. My friend at Cromac remarks, that he has generally found upwards of a dozen of eggs in the nest of this bird, and notices, from his own observation, the well-known circumstance of its making two or three nests before laying. A gentleman of my acquaintance was once much amused at witnessing a wren purloining materials from a thrush's nest, which was built in a bush adjoining its own tenement, then in course of erection. When the thrush was absent in search of food for its young, which were nearly fledged, the wren generally contrived to steal from it " two or three good mouthfuls " to assist in the erection of its own edifice.

In a communication from Mr. R. Davis, jun., dated Clonmel, Nov. 1841, it is remarked,—" Being some years ago in want of the eggs of the spotted flycatcher, I had been watching a pair who had built in a garden near our house. The female had laid three eggs, and on my going two days afterwards hoping to find the full number, five, what was my surprise to see the nest crammed with young wrens just able to fly! they had apparently broken or thrown out all the eggs but one: the flycatchers were gone. I suppose the wrens, being 'brought out' for the first time, had taken refuge in the nest and expelled the rightful owners; but it was rather a curious and inexplicable circumstance."

In a well-sheltered locality I have often in winter seen the wren frequenting the cow-shed (where it nightly roosted) and farm-stable in the forenoon of frosty days, when there was bright and warm sunshine out of doors. To the green-houses and hot-houses in the garden of a relative this bird often resorts, especially in winter; indeed, to wherever it can find the best shelter. Under the date of Sept. 23 is a journal-note to the effect, that on the yard-wall before my window a wren appeared, singing with extraordinary loudness, its tail and wings drooping all the time. Other birds were attracted to the spot by its loud song. First came a hedge-sparrow to buffet it, which was followed by a male and female chaffinch, also with sinister intent; but bold as FitzJames,

> " Come one, come all, this rock shall fly
> From its firm base as soon as I,"

it maintained its position against one and all, and sang away as fiercely as ever. A robin too alighted beside the songster, but, unlike the others, did not seek to disturb it. There was no apparent cause for this proceeding on the part of the wren. The uproar this species keeps by the loud utterance and repetition of its call *chit** when a cat appears in its vicinity is well known, and is of service to other birds by warning them of the presence of their enemy.

Smith, in his 'History of Cork,' written about a century ago, re-

* Hence popularly called 'chitty wran' in Ireland.

marks—"as the wren makes but short flights, and when driven from the hedges is easily run down, to hunt and kill him is an ancient custom of the Irish on St. Stephen's day." The late Mr. T. F. Neligan of Tralee communicated the following note upon this subject in 1837 :—"To hunt the wren is a favourite pastime of the peasantry of Kerry on Christmas day. This they do, each using two sticks, one to beat the bushes, the other to fling at the bird. It was the boast of an old man who lately died at the age of 100, that he had hunted the wren for the last 80 years on Christmas day. On St. Stephen's day the children exhibit the slaughtered birds on an ivy-bush decked with ribbons of various colours, and carry them about singing the well-known song commencing

'The wren, the wren, the king of all birds,' &c.

and thus collect money." Mr. R. Ball* informs me that "this persecution of the bird in the south is falling into disuse, like other superstitious ceremonies." In Dr. Wm. H. Drummond's 'Rights of Animals' the cruelty practised towards the wren in the south of Ireland (for in the north the practice is quite unknown) is dwelt upon, and a tradition narrated, attributing its origin to political motives. In the first number of Mr. and Mrs. S. C. Hall's 'Ireland,' a very full and well-told account of the "hunting of the wren" appears. The legend there given as "current among the peasantry" is not however confined to them, for Mr. Macgillivray, apparently without knowing anything of the Irish fable, relates the very same as told by the inhabitants of the Hebrides (Brit. Birds, vol. iii. p. 19); and a detailed account of the wren being called a "king-bird" over a considerable part of the European continent will be found in one of the volumes of the Library of Entertaining Knowledge, entitled the 'Habits of Birds,' p. 49. Much the fullest description of the wren I have met with is from the pen of Mr. Weir, and published in Mr. Macgillivray's work just mentioned.

The Hoopoe, *Upupa Epops*, Linn., was recorded about a century since as having been met with in Ireland: it has occasionally appeared in all quarters of the island.

Smith, in his 'History of Waterford,' published in 1745, remarks of the hoopoe—"I never heard of above one being seen in this country; this was shot upon the ruins of the old church of Stradbally, during the great frost of 1739, and was long in the possession of Mr. Maurice Uniacke of Woodhouse." The same author, in his 'History of the county of Cork,' observes, that "the hoopoe is with us a very rare bird," but gives no particulars of its occurrence. In McSkimmin's 'History of Carrickfergus,' it is related that "one was shot on the shore near the town, Sept. 21, 1809;" and Mr. Templeton records another example as obtained there in 1818. By W. R. Wilde, Esq., of Dublin, I have been informed, that about the year 1819 an individual of this species was killed at Cloverhill, near the

* This gentleman mentions that the hedge sparrow (*Accentor modularis*) is called *wren's-man* in the south of Ireland, and that it often falls a sacrifice to the hunters of the wren.

town of Roscommon. Mr. R. Ball, during the many years of his residence at Youghal, saw five of these birds, which were at intervals procured in the neighbourhood, and heard of others;—in his collection are two specimens from that locality. In 1827 I was informed by a naturalist that he had seen a hoopoe which was obtained in fine adult plumage a few years before that time in the month of February near Ballynahinch, county of Down. Dr. J. D. Marshall has recorded "one which was shot [at Balbriggan] in the county of Dublin, and another [at Lord Llandaff's] in Tipperary, in 1828." In a letter from Dr. Harvey of Cork, written in March 1837, it was stated that "a hoopoe was shot by Mr. Wilson, jun., about four years since at Cape Clear, and sent to the Cork Institution." On Sept. 19, 1833, one which I saw was procured at Kirkcubbin, county of Down. In February or March 1834, as I am informed by Dr. Burkitt of Waterford, one of these birds was obtained at Kilbarry, near that city: at Banbridge (county Down) another was killed on the 6th of October, 1834*, and sent to the Belfast Museum; its weight (according to Dr. J. D. Marshall) was 3 oz. 1 dr.; the contents of the stomach were caterpillars and other insect food. Captain Walker of Belmont, near Wexford, has written to me that "in the winter of 1834 two hoopoes were seen at Killinick [in that county], but neither was shot, although a gentleman was constantly after them." At the beginning of September 1835, a specimen which was submitted to my examination was procured near Coleraine, in the north; and on the 26th of the same month another was shot within a few miles of Killaloe, and sent to the Rev. Thomas Knox of Toomavara: in its stomach were found "caterpillars and a beetle." Mr. H. H. Dombrain has informed me of his having seen a hoopoe which was shot in the county of Galway on the 20th of October, 1837. One was killed in the county of Kilkenny on the 1st of April, 1838. The following paragraph was copied from the Limerick Chronicle into the Northern Whig, a Belfast newspaper, on Sept. 13, 1838:—"A few days past a bird rarely, if ever, known in this country was seen at Fairymount, O'Brien's Bridge, the residence of H. Orlando Bridgeman, Esq., pursued by magpies, to whom the new visitor appeared a perfect stranger. The same bird was found dead a day or two after in that vicinity, having, it is thought, fallen a victim to its pursuers. Its wings were marked by regular streaks of white and black; the bill long, like that of the snipe, but very slightly curved; the head and neck of a light brown or yellow, with a beautiful tuft or crown of feathers on the head, the extremity of which was also coloured like the wings. The little wanderer was of delicate and graceful symmetry. We presume it had escaped from some aviary. The bird is not indigenous to these countries." The hoopoe is doubtless meant; the date of the paper in which the notice first appeared was not mentioned in the Northern Whig, but it may fairly be presumed to have been early in September. One of these birds, which was procured at the begin-

* A hoopoe flew on board the Shannon steam-packet when on the passage from London to Dublin in September 1834, and on the arrival of the vessel at the latter port on the 20th of that month was seen by my informant.

ning of October in the same year, near the city of Londonderry, came under my inspection. In March 1839 a second example was obtained at Kilbarry, county of Waterford, as I learn from Dr. Burkitt, who likewise adds, that the hoopoe has been met with at Tramore and Woodstown, in the same county, on three or four occasions. In a letter from Mr. R. Ball of Dublin, dated October 30, 1840, it was stated that a hoopoe had been shot at Cork a few days before. Mr. T. W. Warren of Dublin informs me that late in the autumn of 1841 two specimens of this bird, killed in the counties of Westmeath and Wexford, were sent to the metropolis to be preserved; and I received intelligence of another being obtained on the 17th Oct., 1841, at Saunder's Court, near the city of Wexford, about which place this species has been met with several times*.

From the preceding notes it appears that the hoopoe has visited Ireland for the last five years—from 1837 to 1841 inclusive;—in 1836 there is no record; but this may have arisen from mere omission: in 1833, 1834 and 1835 it was obtained. All these birds, except some two or three said to have been met with in winter, were evidently on migration, a few of them in spring, and by far the greater number in autumn—in September and October. I am not aware of the species having been noticed here during summer, though it may be expected rarely to occur at this season: it generally appears singly. It seems strange that individuals should frequently wander so far west of the direct line of their migration as this island, either when moving towards the north of Europe for the summer, or towards Africa for the winter.

On the 24th and 25th of April last (as particularly noticed in 'Annals,' vol. viii. pp. 126 and 127) two or three of these birds alighted on H.M.S. Beacon, when on the passage from Malta to the Morea. When travelling from Aix-la-Chapelle to Liège, on the 17th of July, I was gratified with the sight of a hoopoe, which alighted on the road before the carriage.

[Some instances of the occurrence of the hoopoe are recorded in our pages, vol. vi. and viii: see also p. 148.—Ed.]

[To be continued.]

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

September 14, 1841.—Prof. Owen, Vice-President, in the Chair.

A letter was read from William Ogilby, Esq., H.B.M. Consulate, Charleston, announcing a present from that gentleman of seven living Water-Tortoises for the Society's Menagerie.

A letter from R. Hill, Esq. was next read. In this letter, which is dated Spanish Town, Jamaica, July 28, 1841, Mr. Hill relates some interesting facts respecting the nests of the birds of Jamaica.

* Since the above was sent to the Annals, Mr. R. Davis, jun., of Clonmel has communicated two other instances of the occurrence of the hoopoe—one shot on the grounds of Mr. Parker, near Cork; the other, obtained within the last few months, near Waterford.

"Naturalists have remarked," observes Mr. Hill, "that in tropical countries there are a greater number of birds that build close nests than in the temperate climate of Europe. In the West Indian islands, with the exception of the Pigeon tribes and the Humming-birds, the nests are almost uniformly circular coverings of dried grass, varied by intermingled cotton, moss, and feathers, with an opening from below, or an entrance at the side. The Banana-bird weaves a hammock of fibres, sometimes of horse-hair, deep and purse-like, and loosely netted; the *Muscicapa olivacea* a hanging cot of withered leaves, straw, moss, fibrous threads, and spiders' webs, fitted together, and the Mocking-bird builds in the midst of a mass of wicker-work a neat nest of straw, lined with hair. The Woodpecker and the Parrots take to hollow trees, but I hardly know an arboreal bird beside that constructs any nest that is not wholly covered or domed over. Very many insects that are exposed to the air during their metamorphoses weave coverings of silk and cotton, in which they lie shrouded, at once impenetrable to moisture, and uninfluenced by the disturbances of the atmosphere. It would seem that the object, whatever it be, is the same in both. It is not for warmth that the insects spin these webs, for they form their coverings of silk and cotton in the hottest period of the year; and I find, that whilst all our birds that build open nests breed early, those that construct the domed and spherical ones, nestle in the season between the spring and autumnal rains, when the air is saturated with electricity, and is in a state of constant change.

"The destructive influence exercised by the active electricity of the atmosphere on the eggs of birds, accords with that organic gradation by which the higher embryonic animals commence vegetative life with an organization similar to that of the lower. The successive stages of development presented by the egg during incubation exhibit the heart and great vessels constructed like those of the Batrachian reptile, with reference to a bronchial circulation. In the descending scale of organization, in animals, where the respiration is low and the irritability high, the electric stimulus is rapidly fatal. Fish and Crustacea perish in numbers under the influence of a thunder-storm (Art. Irritability, Cyclop. Anat. and Phys.), and the half-matured embryo in the egg is destroyed by the disturbances which prevail during the activity of the summer lightning.

"Electricity being entirely confined to the surface of bodies, and the quantities they are capable of receiving not following the proportion of their bulk, but depending principally upon the extent of surface over which it is spread, the exterior of bodies may be positively or negatively electric, while the interior is in a state of perfect neutrality. Under isolation the quiescent state of the electricity occasions no sensible change in their properties. The power of retaining the electric fluid depending upon the shape, and the sphere and the spheroid retaining it readily, while it escapes from a point, or is received by a point with facility, the enveloping the eggs of birds in dried and non-conducting materials spread entirely and widely round is a means of steadily maintaining a uniform distribution of the electricity, and with it of preserving that state of quiescence by which no sensible changes are communicated to the embryo within. Thus at a time when the air is excessively disturbed by explosions of lightning and by the shocks of thunder-storms, the business of incubation is carried on in a space completely isolated, and the egg suffers no change of property by the varied electric action that is prevailing in the free atmosphere around."

Some notes on the Wild Antelope of Khaurism (*Antilope Saiga*, Pall.), by Capt. James Abbott, communicated by K. E. Abbott, Esq., Corr. Memb., were read. The author, after giving a description of the animal, adds, " It lives in large flocks in the steppe between the river Oxus and the Caspian. When pursued it bounds like the Antelope, but being much smaller and less vigorous, is run down by the coarse Persian Greyhound of the Turcoman and Kuzzauk. The Turkish name is Kaigh and Soghoke."

Mr. Gould exhibited a specimen of the *Apteryx australis*, in which the beak was shorter, and also more dilated at the base, than in other specimens which he had examined.

Mr. Yarrell read his description of the trachea of a male Spur-winged Goose, *Anser gambensis* and *Chenalopex gambensis* of authors. " A male specimen of this native of Northern and Western Africa died lately in the gardens of the Zoological Society, after living in confinement in the aviary nearly twelve years. Advantage was taken of this opportunity to examine the organ of voice, which is generally found to possess some remarkable variety in form throughout the species of the extensive family of *Anatidæ*, and this expectation was realized. The windpipe of the Spur-winged Goose, which is, I believe, undescribed, measures about sixteen inches in length; the tube flattened throughout, except at the bottom, where it is nearly cylindrical. The bone at the bottom of the trachea, from which the bronchial tubes have their origin, is again flattened, and has on the left side a bony protuberance, forming a hollow labyrinth, about five-eighths of an inch wide, seven-eighths of an inch high, and three-eighths of an inch thick from front to back. This bony enlargement is perforated with various apertures on each surface, which in a natural state are covered by a delicate semi-transparent membrane."

Mr. Waterhouse called the attention of the Members to some imperfect skins of various species of Monkeys from Fernando Po, presented to the Society by George Knapp, Esq. The Curator observed, that he had selected these specimens from a large number of skins, sent from the locality mentioned, and that on a former occasion he had had an opportunity of examining a similar series, from which the specimens were selected which were described in the Proceedings for May 1838, p. 57, under the names *Colobus Pennantii*, *Colobus Satanas*, *Cercopithecus Martini*, and *Cercopithecus erythrotis*. In the present collection is a skin of the *Cercopithecus erythrotis*, in which the face is nearly perfect, and exhibits a transverse red mark, crossing the nose; this mark is not due to the colour of the skin, but to short, bright, rust-coloured hairs. The upper lip is covered with blackish hairs, and a band composed of long blackish hairs runs backwards, from the upper lip, across the cheeks, which in other parts are covered with whitish hairs. The length of the skin is two feet, and the tail measures two feet five inches.

Of the *Colobus Pennantii* there were many specimens in the collection, all of which presented the characters pointed out in the description in the Proceedings.

The skin of the *Cercopithecus Martini*, on the table, Mr. Waterhouse observed, also agreed essentially with specimens formerly exhibited, excepting in being of a larger size, the head and body measuring nearly twenty-six inches, and the tail thirty-one inches in length. The tail is of an uniform black colour, excepting near and at the base, where the hairs are obscurely annulated with gray: the hairs on the under parts of the body are of a grayish soot-colour, obscurely annulated with whitish, and the upper surface of the head, as well as the occipital portion, the shoulders, and fore-limbs, are black: on the fore-part of the head the hairs are distinctly annulated with yellowish white.—[*See Annals*, vol. ii. p. 468.]

Sept. 28.—William Yarrell, Esq., Vice-President, in the Chair.

A letter from W. V. Guise, Esq., stated that a young Hoopoe (*Upupa Epops*, Auct.) was killed on the eighth of September, at Frampton-on-Severn.

Mr. Lovell Reeve then submitted to the Meeting a *Tabula Methodica* of the plan he intended to adopt in his forthcoming CONCHOLOGIA SYSTEMATICA, for the arrangement of the Lepades and Conchiferous Mollusca. He stated, that in reviewing the history of Conchology, which may be dated from the time of Adanson and Linnæus, it was evident that few of these remarkable animals were then known; and although the classification proposed by the latter has been abandoned, from the fact of its having been based almost entirely upon the outward characters of the shells alone, without reference to the anatomy or habits of their animal inhabitants; it may be remembered as a most laudable attempt on the part of that great father of natural history, to introduce into his theory of nature a scientific arrangement of certain shells then before him, which he knew to be the production of certain once living animals. This fallacious method, therefore, was his alternative; he must have been well aware that he could no more arrive at the true history of the Mollusca by their shells alone, than at the natural history of Birds by their feathers alone; but, in the absence of the soft and living parts, he succeeded in establishing an arrangement, by noting such marks and symbols on the shell as could be supposed by analogy to indicate corresponding characters and developments in the organization of its animal. Since the time of Linnæus our intercourse with foreign lands and the general progress of civilization have given increased facilities of obtaining the animals in their native condition; thus, their anatomy and habits have become the popular subject of investigation, raising the study of Conchology to a level with the rest of the natural sciences. From the commencement of the present century various naturalists have assisted in reorganizing the arrangement and division of the Lepades and Mollusca; Bruguière, Lamarck, Cuvier, De Blainville, Deshayes and Gray have successively devoted themselves to the subject. In illustration of the progress of Conchology, Mr. Reeve exhibited to the Society a series of written tables, showing the systems of classification and nomenclature pursued by these several authors. He observed, that the simple method of Lamarck was that usually adopted, but the last that had been introduced was that of Mr. Gray published in the British Museum Synopsis. The chief object of this author appeared to be to extend the application of the nomenclature, in which he enumerates more than three times the number of genera mentioned by Lamarck. He could not fail to appreciate many useful alterations in Mr. Gray's system of classification, and thought it was entitled to considerable merit on account of the attention with which he had studied the animals; he could not however but express his fears that many of Mr. Gray's changes were founded too much upon conjecture; it was also much to be regretted that the whole matter had not been presented to the notice of scientific men in a fair and satisfactory form.

After a careful examination of these authors, and with the view of embodying much new and important matter from various scattered memoirs and monographs, Mr. Reeve adopts the proposed system of arrangement, considering it only a matter of surprise, that whilst many eminent conchologists are indefatigable in describing new species, a revision in the general distribution of these animals has been so long neglected. The Lepades and Mollusca are to be considered as separate and distinct sub-kingdoms. The Lepades are divided into two orders, according to the established method, the sessile and pedunculated; and the Mollusca into five classes, upon the modifications of the organ of locomotion. The first class is divided, in imitation of Lamarck, according to the number and position of the adductor muscles, as indicated by the cicatrices or points of attachment on the internal surface of the shell. The second class includes but few species, and is distributed at once into families; the animals of this and the former class are all conchiferous, having a bivalve shell; the valves are connected by a ligament in the first class, but not in the second; their general organization too is essentially different. The third class, which comprehends by far the greater part of the Mollusca, is divided into seven orders, according to the varieties of the structure and position of the branchiæ, the system of respiration being the most important feature of distinction in the organization of these animals: this plan of subdividing them was proposed by Cuvier, and has been for the most part followed by subsequent naturalists. The animals of this class are not all conchiferous; some are naked, or entirely destitute of shell, and do not therefore come under the present notice. The fourth class contains but few genera; they include a singular kind of mollusk, having a small glass-like shell, found swimming in myriads on the surface of the ocean by means of a small wing-like natatory fin. The fifth and last class, which contains the Nautili, are divided into two orders, according to the plan of Lamarck. The following Table exhibits the primary distribution of these animals, with their subdivision into families; added to which is the entire classification in detail:—

Tabular Distribution of the Lepades and Conchiferous Mollusca.

Subregna.	*Classes.*	*Orders.*	*Families.*
LEPADES		Sessiles	Balanidæ.
		Pedunculatæ	Anatiferidæ.
MOLLUSCA CONCHIFERA.	Tropiopoda	Bimusculosa	Tubicola, Pholadaria. Solenacea, Myaria. Mactracea, Lithophaga. Nymphacea, Conchacea. Cardiacea, Arcacea. Trigonaeea, Naiades. Chamacea.
		Unimusculosa	Tridacnacea, Mytilacea. Aviculacea, Pectinacea. Ostracea.
	Brachiopoda		Tendinosa, Adhærentia.
	Gasteropoda	Cirrhobranchiata	Dentalia.
		Cyclobranchiata	Phyllidiana.
		Cervicobranchiata	Fissuracea, Capulacea. Macrostomata, Tubispiracea.
		Pleurobranchiata	Bullacea, Semiphyllidiana. Aplysiana.
		Nucleobranchiata	Carinariana.
		Pulmobranchiata	Limacinea, Colimacea. Cyclostomacea, Auriculacea. Lymnæana.
		Pectinibranchiata	Melaniana, Peristomata. Neritacea, Ianthinea. Plicacea, Turbinacea. Parasitica, Canalifera. Alata, Purpurifera. Columellata, Convoluta.
	Pteropoda		Thecosomata.
	Cephalopoda	Polythalamia	Foraminifera, Siphonoidea.
		Monothalamia	Argonautidæ.

Classification in detail.

LEPADES.

Order 1. Sessiles.

Tubicinella. Conia.
Coronula. Balanus.
Elmineus. Clitea.
Catophragmus. Creusia.
Octomeris. Pyrgoma.

Order 2. Pedunculatæ.

Lithotrya. Pollicipes.
Pentelasmis. Cinaras.
Scalpellum. Otion.

MOLLUSCA CONCHIFERA.

Class 1. TROPIOPODA.

Order 1. Bimusculosa.

Family 1. *Tubicola.*

Aspergillum. Clavagella.
Fistulana. Teredo.
Gastrochæna.

Family 2. *Pholadaria.*

Xylophaga. Pholas.

Family 3. *Solenacea.*

Solen. Solemya.
Solecurtus. Solenella.
Panopæa. Glauconome.
Glycimeris. Pholadomya.

Family 4. *Myaria.*

Mya. Pandora.
Anatina. Anatinella.
Thracia. Myochama.
Corbula. Cleidothærus.

Family 5. *Mactracea.*

Lutraria. Gnathodon.
Mactra. Crassatella.

Mesodesma.	Amphidesma.
Ungulina.	Cumingia.

Family 6. *Lithophaga.*

Saxicava.	Petricola.

Family 7. *Nymphacea.*

Sanguinolaria.	Corbis.
Psammobia.	Lucina.
Galeomma.	Donax.
Tellina.	Capsa.

Family 8. *Conchacea.*

Cyclas.	Astarte.
Cyrena.	Venus.
Galathæa.	Cytherea.
Cyprina.	Pullastra.

Family 9. *Cardiacea.*

Cardium.	Cardita.
Isocardia.	Cypricardia.

Family 10. *Arcacea.*

Cucullæa.	Pectunculus.
Arca.	Nucula.

Family 11. *Trigonacea.*

Trigonia.

Family 12. *Naiades.*

Unio.	Iridina.
Hyria.	Mycetopus.
Anodon.	

Family 13. *Chamacea.*

Etheria.	Chama.

Order 2. Unimusculosa.

Family 1. *Tridacnacea.*

Tridacna.	Hippopus.

Family 2. *Mytilacea.*

Lithodomus.	Mytilus.
Modiola.	Pinna.

Family 3. *Aviculacea.*

Crenatula.	Vulsella.
Perna.	Avicula.
Malleus.	

Family 4. *Pectinacea.*

Pedum.	Plicatula.
Lima.	Spondylus.
Pecten.	

Family 5. *Ostracea.*

Ostræa.	Placunanomia.
Placuna.	Anomia.

Class 2. BRACHIOPODA.

Family 1. *Tendinosa.*

Lingula.	Terebratula.

Family 2. *Adhærentia.*

Thecidium.	Orbicula.
Crania.	

Class 3. GASTEROPODA.

Order 1. Cirrhobranchiata.

Dentalium.

Order 2. Cyclobranchiata.

Chiton.	Patella.
Chitonellus.	

Order 3. Cervicobranchiata.

Family 1. *Fissuracea.*

Lottia.	Emarginula.
Siphonaria.	Fissurella.
Parmophorus.	

Family 2. *Capulacea.*

Crepidula.	Hipponyx.
Calyptræa.	Pileopsis.

Family 3. *Macrostomata.*

Velutina.	Stomatia.
Sigaretus.	Haliotis.

Family 4. *Tubispiracea.*

Siliquaria.	Vermetus.

Order 4. Pleurobranchiata.

Family 1. *Bullacea.*

Bulla.

Family 2. *Semiphyllidiana.*

Pleurobranchus.	Umbrella.

Family 3. *Aplysiana.*

Aplysia.	Dolabella.

Order 5. Nucleobranchiata.

Carinaria.

Order 6. Pulmobranchiata.

Family 1. *Limacinea.*

Parmacella. Testacellus.
Limax. Vitrina.

Family 2. *Colimacea.*

Helix. Bulimus.
Carocolla. Partula.
Anostoma. Achatina.
Pupa. Succinea.
Clausilia.

Family 3. *Cyclostomacea.*

Pupina. Cyclostoma.
Truncatella. Helicina.

Family 4. *Auriculacea.*

Auricula. Chilina.
Scarabus.

Family 5. *Lymnæana.*

Planorbis. Ancylus.
Lymnæa.

Order 7. Pectinibranchiata.

Family 1. *Melaniana.*

Melania. Melanopsis.

Family 2. *Peristomata.*

Valvata. Ampullaria.
Paludina.

Family 3. *Neritacea.*

Navicella. Neritopsis.
Neritina. Natica.
Nerita.

Family 4. *Ianthinea.*

Ianthina.

Family 5. *Plicacea.*

Tornatella. Pyramidella.

Family 6. *Turbinacea.*

Rissoa. Trochus.
Eulima. Turbo.
Scalaria. Margarita.
Delphinula. Littorina.
Solarium. Phasianella.
Phorus. Turritella.
Rotella.

Family 7. *Parasitica.*

Stylifer.

Family 8. *Canalifera.*

Cerithium. Pleurotoma.
Turbinellus. Pyrula.
Cancellaria. Murex.
Fasciolaria. Ranella.
Fusus. Triton.

Family 9. *Alata.*

Struthiolaria. Pterocera.
Rostellaria. Strombus.

Family 10. *Purpurifera.*

Cassidaria. Trichotropis.
Oniscia. Magilus.
Cassis. Leptoconchus.
Ricinula. Buccinum.
Columbella. Nassa.
Purpura. Planaxis.
Monoceros. Eburna.
Concholepas. Ancillaria.
Harpa. Oliva.
Dolium. Terebra.

Family 11. *Columellata.*

Volvaria. Voluta.
Marginella. Melo.
Mitra. Cymba.

Family 12. *Convoluta.*

Erato. Terebellum.
Cypræa. Conus.
Ovula.

Class 4. PTEROPODA.

Hyalæa. Vaginula.
Cleodora. Cuvieria.
Limacina. Cymbulia.
Creseis.

Class 5. CEPHALOPODA.

Order 1. Polythalamia.

Family 1. *Foraminifera.*

Orbiculina. Textularia.
Spiroloculina. Nodosaria.
Polystomella.

Family 2. *Siphonoidea.*

Spirula. Nautilus.

Order 2. Monothalamia.

Argonauta.

Mr. Gould exhibited two skulls of a large species of Kangaroo, from North Australia, which are remarkable for the large size of the nasal cavity, and differ likewise in some other parts of their structure from the more typical species of *Macropus*. Mr. Gould also laid before the Meeting some species of Fishes collected in North Australia.

BOTANICAL SOCIETY OF EDINBURGH.

Feb. 10, 1842.—Professor Graham in the Chair.

The following papers were read:—

1. Notices of several Vegetable Monstrosities, with Specimens. Transmitted by Mr. H. C. Watson and others.—Some of these monstrosities were very interesting, particularly a *Geranium* (*pusillum*?) having the branches terminated by heads or umbels of flowers, through adhesions and excess of parts, the petals being mostly green or obsolete, and the stamens imperfect; *Anthriscus sylvestris*, with the umbels proliferous, which was gathered in the wet autumn of 1839; *Linaria repens*, varieties growing together, and showing a gradual approach to *L. vulgaris*; *Anemone nemorosa*, having the pistils changed to leaves; and *Galium aparine*, presenting a remarkable *lusus naturæ*, probably caused by insects, the quadrangular stem being twisted, so that the stellate leaves have become secund.

2. Mr. Goodsir described the *Sarcinula Ventriculi*, a new vegetable infusorial, allied to the genus *Gonium*, which he had found existing in immense numbers in the fluid ejected for many weeks from the stomach of a patient labouring under a particular form of indigestion. This fluid was ejected in large quantities at a time, and had an appearance similar to that of liquor in a state of fermentation, The plant is microscopic, of a square form, and having the parts arranged in a beautifully symmetrical manner in the square. The number of cells of which the plant consists is 64. It propagates by the division of each of these 64 cells into four new ones, so as to consist of 256 cells; and simultaneously with this increase in the number of parts, divides spontaneously into four young plants.

The author then adverted to the extremely rapid increase of the plant by such a mode of propagation; and after some observations on the nature of the disease in which it occurred, and of which it probably constituted the cause, he concluded with remarks on the genera of plants and animals to which the new plant is allied.

3. On *Primula veris* and allied species, by the Rev. J. E. Leefe.—Mr. Leefe, after remarking that *P. inflata*, Lehm., approaches very near to *P. veris*, says, " in the woods at Audley End, Essex, I find a good deal of what is commonly known as *P. elatior* intermixed, but sparingly, with primroses and cowslips. It agrees with the character of *P. elatior*, Jacq., as defined by Koch, but not with the figure in ' English Botany.' The calyx teeth are more ovate at the base, and the leaves are those of a cowslip; indeed the teeth are almost of precisely the same form as those of the *P. inflata* before alluded to. The limb of the corolla is, however, equal in breadth to more than half of the tube, and is flat, or nearly so."

Professor Henslow writes on this subject:—" With respect to the identity of the three common *Primulæ*, I consider that no argument can be derived from their keeping distinct, in nature or under culture. It is purely a physiological question, whether *all* of them may not originate from the seeds of any one,—a question which can only be decided by direct experiment. Let a cowslip be highly manured, and its seeds sown in a shady, moist aspect, and I suspect the chances are in favour of some of them coming up as primroses, or, at least, as oxlips. I have had several independent testimonies to the fact of cowslip roots *changing* to primroses; and until proof, by direct experiment, contradict the experiments of Mr. Herbert and myself, I cannot help believing that the three species (as they are thought) and the polyanthus are merely races of one species."

4. On certain Fungi found near Audley End, Essex, &c., by the Rev. J. E. Leefe.

5. Notice of additions to the Flora of Aberdeen, by Mr. George Dickie, Lecturer on Botany, King's College, Aberdeen.—These papers, though important to the Society, do not present so much of interest for the general reader.

6. On the varieties of *Dryas octopetala*, by Mr. C. C. Babington, M.A., F.L.S., F.G.S., &c.—The characters distinguishing these are the proportional length and form of the sepals, the form of the base of the calyx, the form of the leaves, and the pubescence of the petioles. Two of these varieties are apparently confined to Ireland, where Mr. Mackay first noticed the differences existing among plants of this species, and the third is commonly found in alpine situations in England, Scotland, and on the continent of Europe. The latter being the best known form, may be considered as the type of the species, and in it the sepals are acute, and three or four times as long as broad, the base of the calyx being hemispherical; in β. the calyx is very nearly the same, being only less acute; but in γ. the sepals are scarcely twice as long as broad, and very blunt, and the base of the calyx is truncated in a very remarkable manner.

This Society held its fifth meeting for the session on Thursday evening, the 10th March, Professor Christison in the Chair.

The following gentlemen were elected as Non-resident Fellows:—William Borrer, Esq., F.R.S., F.L.S., &c., Sussex; Rev. W. Lewes Pugh Garnons, B.D., F.L.S., Cambridge; Richard Taylor, Esq., Under-Secretary L.S., F.A.S., F.G.S., &c., London; Augustus P. Hamilton, Esq., M.D., Poole, Dorsetshire; and William Mort, Esq., Manchester.

Numerous donations to the Library and Herbarium were reported from different parts of Britain and the continent.

The following papers, &c., were read:—

On four new species of British *Jungermanniæ*, by Dr. Taylor, Dunkerron. Communicated by Mr. Wm. Gourlie, jun., Glasgow. —Mr. Gourlie read the descriptions of the species, and illustrated them by beautifully preserved specimens. Some of these were so minute as to require microscopic aid for their examination, a circumstance which enhances the merit of their discovery by Mr. Wilson and Dr. Taylor, who have laboured with so much zeal and success in the field of Cryptogamic botany.

The following were the species described, viz. *J. Wilsoni*, Taylor, discovered by William Wilson, Esq., at Cromaglown, Killarney, in November 1829, and named in compliment to him by Dr. Taylor.—*J. stellulifera*, Taylor, also discovered by Mr. Wilson, who found it near Crich, in Derbyshire, in September 1833.—*J. voluta*, Taylor, and *J. spicata*, Taylor, both discovered near Killarney, in 1841, by Dr. Taylor.

Mr. Gourlie afterwards exhibited specimens of the following plants:—*Leskea pulvinata*, Wahl., discovered near York by Mr. R. Spruce, and *Gymnostomum Hornschuchianum*, Arnott, discovered at Cromaglown by Dr. Taylor, both new to the British Flora; *Jungermannia Balfouriana*, Tayl. MSS., a new and highly curious species brought from New Zealand by Dr. Stanger, and named by Dr. Taylor in compliment to Professor Balfour of Glasgow, from whose herbarium the specimens were communicated.

Notice of the discovery of *Herniaria glabra* in Berwickshire, by Mr. William Marshall, and of *Linnæa borealis* in the same county, by Dr. Johnston; communicated by Dr. Greville.—The former of these species has generally been regarded as a native of the south of England, but there seems no reason to doubt its being indigenous in the above station. It was observed that Mr. Gorrie had found the plant abundantly in Perthshire, where he had no doubt it must have escaped from gardens, though now quite naturalized, and almost a weed in some places.

The discovery of a new station for the lowly but beautiful plant named in honour of Linnæus is always a matter of interest, and especially in the south of Scotland, where it occurs very rarely.

On four new species of *Desmidium*, by Mr. J. Ralfs.—Mr. Ralfs observes, that " this natural genus is not well defined either in Agardh's ' Conspectus Criticus Diatomacearum,' or in any of our British works." Its best distinctive character seems to consist in the crenated appearance of its filaments, which is least evident in *D. mucosum*. These filaments, which are generally twisted in a regular manner, are of a pale green colour, simple, fragile, short and straight. The species are found during a great part of the year in clear, shallow pools, or in old peat-bogs, the filaments being scattered in loose bundles in the water, or forming a thin gelatinous fleece at the bottom of the pool. The species ascertained by Mr. Ralfs are named by him *D. cylindricum*, *mucosum*, *Swartzii*, and *Borreri*.

Illustrative Drawings of Australian Plants, by the Misses M'Leod of Sydney.—These drawings, which are extremely well executed, were transmitted to this country by the ingenious ladies, in order to have the species ascertained which had most struck their fancy in that land of remarkable productions.

Mr. Edmonston read a letter from Mr. P. J. Brown of Thun, respecting the three species of Primrose usually considered to exist in this country. He says, " Against Sir James Smith's opinion (in ' Rees's Cyclop.') that *P. elatior* may be a mule between *veris* and *vulgaris*, I may observe that the three are not often the inhabitants of the same district,—*veris* is almost universally diffused; but where *vulgaris* is very abundant, I have rarely seen *elatior* in any quantity, and by far the most frequently not at all; while in general, as is the case at Thun, *elatior* grows by thousands in places within many leagues of which *vulgaris* is absolutely unknown. *P. vulgaris* contents itself with an elevation but little above the level of the sea, although in the neighbourhood of the Lake of Geneva it is in perfect condition at from 1200 to 1500 feet; but at Thun, with an elevation of 1900 feet, it languishes, whether planted in a thicket, on a bank, or in a garden; while *elatior*, being more aspiring, prefers an elevation of from 1500 to 2000 feet, and although climbing willingly beyond the latter, descends reluctantly below the former level."

Professor Balfour (of Glasgow) made observations on the distinctions subsisting among the genera of Ferns, *Anemia, Mohria, Coptophyllum, Trochopteris*, and *Schizæa*, some of which had been recently established by Mr. Gardner. These distinctions, which are founded partly on the mode in which the fertile and barren fronds are developed, were illustrated with a series of specimens belonging to the above genera, most of which had been collected by Mr. Gardner in the province of Goyaz, Brazil. The professor next alluded to the various theories which have been advanced to account for the origin of woody fibre, and more especially to that of Du Petit-Thouars. He showed, by sections of palms, that the interlacing of the fibres in endogenous plants was quite in conformity with Du Petit-Thouars' theory, and that the appearance of the woody matter in tree-ferns, and in the natural orders *Piperaceæ, Aristolochiaceæ*, and the formation of roots externally in some tree-ferns, in screw-pines, *Vellosias*, &c., all supported the theory of wood being formed by the development of fibres from buds acting as fixed embryos. Dr. Balfour also endeavoured to show that the formation of what have been called by Dutrochet *embryo buds*, may in many cases be accounted for by the development of leaves on them at one period of their growth; and that on examining some others which he exhibited, the woody matter might be traced communicating with the alburnum at one point by rupture of the bark, and insinuating itself between the layers of bark.

MISCELLANEOUS.

Notices relative to Palæontology; by the Rev. Dr. Buckland. *From his Anniversary Address to the Geological Society of London.*

MAMMALIA.—OSSIFEROUS CAVERNS.

Mr. R. A. C. Austen, in a notice on the bone caves of Devonshire, at Torquay and Yealmton, disputes the opinion that the bones in these caves, many of which are evidently gnawed, have been dragged in by the agency of hyænas, founding his objection on the assumption that modern hyænas "do not inhabit caves," and "never drag away their prey, but devour it greedily on the spot." Mr. Austen must have overlooked the evidence of Busbequius, quoted in my 'Reliquiæ Diluvianæ,' p. 22, 1st edit., "Extrahitque cadavera, portatque ad speluncam suam," and cannot have heard of the gnawed bones in the Oxford Museum, extracted by

Col. Sykes from the depth of eighteen feet in a cave, at the mouth of which he shot both the male and female hyæna that inhabited it, and descending its interior ran his head against a putrid portion of an ass which stuck across and obstructed the passage.

Mr. Austen is disposed to substitute the agency of lions for that of hyænas in the work of collecting the bones that are so abundant in the caves of Devonshire, and correctly states that the bones of lions, or a large Felis, larger than a lion, have been found in nearly all the ossiferous caverns. Now in all the caves of which I have any experience, the remains of lions are very rare in comparison with the number of hyænas' bones in the same cavern; and without denying to these few lions their lion's share in the work of killing their prey and eating the flesh, I must claim the bones as the perquisite of their more ossifragous brethren, and demand justice to the hyænas, as the chief, I do not say the exclusive, agents in dragging them to their dens.

The proportion of teeth in the cave of Kirkdale indicated one lion to nearly 100 hyænas.

REPTILES.

Professor Owen, in a recent paper on the teeth of the Labyrinthodon (Mastodonsaurus of Jaeger), a genus common to the keuper of Germany and to the lower sandstone of Warwick and Leamington, has added another example to the many before produced by him, of the immense importance of microscopic odontology in geological investigations.

Two years have scarcely elapsed, since, by the application of this infallible test, he at once transferred the supposed reptile Basilosaurus of Virginia to a genus allied to the Dugongs in the class of Mammals; and as if in recompense for this abduction from the family of Reptiles, he has now, by the same microscopic test, removed even the supposed approximation in the form of the teeth of the Mastodonsaurus to that of a Mammal, and shown it to be nearer that of Ichthyosaurus than of any other animal. Professor Jaeger had already shown, by the basilar bones of the head, that his Mastodonsaurus was a huge Batrachian reptile allied to the Salamanders, and its teeth, not yet submitted to microscopic examination of their transverse section, presented no apparent peculiarity of internal structure; it was reserved for the microscope of Owen to discover within this tooth a condition of cerebriform convolutions or labyrinthoid gyrations, hitherto unknown in the entire animal kingdom; and on this just ground he substitutes the characteristic name Labyrinthodon for that of Mastodonsaurus, which implied affinities that have no existence.

The fang of the tooth of the Ichthyosaurus offers the only known approximation to the plan of that of the Labyrinthodon, but on a more simple scale, and had been hitherto considered the most complex condition of dental structure in the family of Reptiles; in both these animals the external layer of cement is inflected inwards to a certain distance from the circumference towards the centre in straight and vertical folds at pretty regular intervals, which are occupied by dentine radiating from the interior of the tooth; but in the tooth of Labyrinthodon, this dentine, or ivory, is composed of calcigerous tubes $\frac{1}{7000}$th of a line in diameter, radiating and converging with primary curvatures and secondary undulations in a manner unexampled in the history of dentition. This gigantic Batrachian prototype of the Bull Frog, Mr. Owen has discovered to be the author of the footsteps ascribed to the so-called Chirotherium. Teeth of two smaller species of Labyrinthodon have been found by Dr. Lloyd in the sandstone of Warwick, and although no English teeth of the Stutgard species have yet been submitted to the microscope, Mr. Owen strongly suspects that the cast of a large jaw containing several teeth, from Guy's Cliff, near Warwick, the original of which has been mislaid in the Oxford Museum, is identical with the Labyrinthodon Salamandroides of Stutgard; thus almost demonstrating the evidence required by Mr. Murchison and Mr. Strickland * to show the identity of the Warwick and Guy's Cliff sandstones with the keuper of Germany. Mr. Owen concludes, that if on the one hand geology has derived essential aid from minute anatomy, in no instance has the comparative anatomist been more indebted to geology than for the fossils which have revealed the most singular and complicated modification of dental structure hitherto known, and of which no conception could have been gained from an investigation of the teeth of living animals.

Professor Owen has communicated to us a Report on two new fossil reptiles, recently acquired by Sir P. Egerton from the chalk of Kent: one of them a tortoise, allied to the Chelonians which now live in fresh water, or in estuaries; the other a small Saurian, which has teeth generically distinct from any known Lacertians, and resembling the points of stout packing-needles; to this new lizard in the chalk he has given the name *Raphiosaurus.*

Mr. Mackeson has discovered in the bottom of the lower greensand formation near Hythe a very large tibia and several other bones which he refers to the Iguanodon, spread in the quarry over a length of fifteen feet; in the same quarry were a large Ammonite, a Gervillia, and other marine shells characteristic of the lower greensand. We have in these bones another case similar to that of the nearly entire skeleton of Iguanodon found in the greensand near Maidstone, and transferred with Mr. Mantell's collection to the British Museum; showing the duration of the Iguanodon to have extended beyond the period of the Wealden freshwater formation into that of the greensand. In both these cases the carcases must have been drifted into salt water from some not far distant land, the site of which we cannot conjecture to have been nearer than Devonshire, Normandy, or the Ardennes.

ICHTHYOLITES.

Respecting the bone-bed in the Severn near Aust Passage, and at Axmouth Cliff near Lyme Regis, which has hitherto been referred to the bottom of the lias formation, Sir P. Egerton and M. Agassiz have found ichthyological reasons for considering it to be connected with the Triassic or new red sandstone group; because they find in it

* Geol. Trans., N.S., vol. v. p. 345.

the teeth of four species of fishes hitherto discovered only in the muschelkalk or *grès bigarré*, and never in the lias, viz. *Gyrolepis Alberti*, *G. tenuistriatus*, *Saurichthys apicalis*, and *Hybodus plicatilis.* It remains to examine the bones of the larger animals in this stratum to ascertain how far they agree with the Saurians of the Triassic system or of the Lias. The teeth of Ceratodus, figured by Agassiz, and many other teeth in the bone-bed not yet described, are unknown in the lias.

During the past year great additions have been made to our stores of knowledge, and specimens in fossil Ichthyology, by the presentation to our Museum of a very large and rich collection of fishes from the lower beds of the old red sandstone near Forres, which we owe to the zeal and liberality of Lady Gordon Cumming of Altyre.

Her Ladyship and her eldest daughter have further contributed most accurate and exquisitely finished drawings of many fossil fishes from the same locality, in illustration of Dr. Malcolmson's paper on the old red sandstone. These ladies have also supplied many other drawings to the forthcoming volumes of Professor Agassiz. Further information on the fishes of the old red sandstone has been acquired by the diligent researches and extensive collections made in the same department of Palæontology by many scientific gentlemen in the counties of Caithness, Elgin, Nairn, Aberdeen, Forfar and Fife; following up the researches that were begun in this almost new and most curious subject by Dr. Fleming, Professor Sedgwick, Mr. Murchison, Dr. Traill, Dr. Malcolmson and Mr. H. Miller.

The three great subdivisions of the old red sandstone in these counties, with their characteristic genera of fishes, have, by these extensive researches, been fully corroborated, whilst a vast increase has accrued to the known number of species of fishes which appear to be peculiar to the upper, middle, and lower regions of this great formation.

The visit of Professor Agassiz to Scotland in September last, and the grant to him by the British Association of 100*l.* to aid in collecting materials for the publication of a memoir on the fossil fishes of the old red sandstone, have opportunely afforded a concurrence of circumstances most favourable to the diffusion of a new and brilliant light on our future researches in this very ancient department of Palæontology.

Before he left Scotland, Professor Agassiz had recognised, in various collections he visited in that country, undescribed Ichthyolites sufficient to enable him to establish fifteen genera, and more than forty species, the greater part of them not yet named, in the old red sandstone formation*. We have in these details a palæontological confirmation of the fact that the old red sandstone is a system distinct from any other formations; all its numerous Ichthyolites being different from those of the carboniferous system above it, and also

* The names of these genera are *Acanthodes, Cephalaspis, Cheiracanthus, Cheirolepis, Coccosteus, Ctenacanthus, Ctenoptychius, Diplacanthus, Diplopterus, Glyptolepis, Holoptychius, Onchus, Osteolepis, Platygnathus, Pterichthys.*

different from the few fishes yet found in the upper region only of the Silurian system next below it.

Mr. Murchison, during his extensive tour in Russia, in the late summer, has enlarged our knowledge of the range of these curious fishes and of the old red sandstone over vast regions in the north-east departments of Europe. Thus the ichthyological fauna of the old red sandstone has within a few years been found to be one of the richest and most prolific kind; and its extinct species are much more curious and remarkable than those of any other formation, by their deviation from the conditions of existing genera and species. Their most characteristic feature is an immense development of bony matter and enamel on the surface of the skin, thus approaching to the external dermal skeleton of Crustacea and Insects. One of these fishes, the Pterichthys, is so largely and almost entirely encased with bony plates and scales, that it was at first mistaken for a fossil Water-beetle.

The nearest analogies we find among modern fishes to the great development of bony matter and enamel upon the head and scales of many of these ancient species, is that afforded by the large external bones which form the head and large bony dermal scales upon the body of the modern Sturgeons, which further agree with these fossils in having no internal bony skeleton.

Another analogy occurs in the large external bones of the head of the Flying Fish, and of the common Gurnard. These bones are also beautifully studded with ornamental tubercles, arranged in symmetrical groups like gems and pearls on a jewel. This character is most strongly dominant in the tuberculated bones of the fossil genus Coccosteus. The enormous proportion in the size of the head to that of the body in the Gurnard, affords another approximation to a condition of frequent occurrence in the extinct genera of the old red sandstone, and which has given its characteristic feature to the genus Cephalaspis.

Another frequent character in the fossil fishes of the old red sandstone consists in the absence of any internal bony skeleton, as in the modern Sturgeons. The large bony dermal scales, first noticed many years ago in the old red sandstone of Fife by Dr. Fleming, and then referred by him to a fossil Sturgeon, have been confirmed by Prof. Agassiz as belonging to a genus nearly allied to the modern Sturgeon, and like it possessed a cartilaginous skeleton, of which no traces remain in the fossil state.

Among living fishes, a further analogy to this cartilaginous condition of the internal skeleton has recently been found by Professor Owen in the Siren, a fish of equivocal aspect, provided with lungs as well as branchiæ, and considered as a reptile by preceding writers; it lives in the muddy bottoms of the shallow lakes of Senegal, which are periodically dried up, the fish meantime remaining immured alive in a kind of cocoon of indurated mud*. In the cartilaginous skeleton of this existing Siren from Senegal, the anatomy of which has been admirably demonstrated by Professor Owen, we find a beautiful analogy to the cartilaginous condition of the skeleton

* See Annals, vol. vi. p. 466; vii. p. 28.

of many of the most ancient fossil fishes; and this analogy explains the circumstance of the frequent absence of any remains of an internal bony skeleton within the often perfect dermal covering of many species of fishes in strata of the older formations.

From these recent discoveries in Scotland, and the examination of the unexampled collections of fossil fishes in the museums of Lord Enniskillen and Sir P. Egerton, and in other cabinets in this country and on the Continent, Prof. Agassiz has now extended his total number of species of extinct fossil fishes to more than 1700, of which nearly 250 new species have been the fruits of his recent visit to Great Britain and Ireland. I have elsewhere spoken of the inestimable value of the discoveries of Agassiz in the department of fossil ichthyology, not only in relation to geological investigations, but also to zoology and physiology. In his history of the rapid progress he has made within the last six years, it has been duly and gratefully acknowledged by him, that his now voluminous work, the 'Poissons Fossiles,' must at an early stage have ceased for lack of funds, without the liberal support it has received from a large list of subscribers in this country, and from pecuniary grants of the British Association. [See vol. vii. p. 487.]

In the necessary preparations for this large and costly work, M. Agassiz had accumulated in his portfolio a splendid collection of drawings, chiefly by Dinkel, not less beautiful as works of art, than precious as being the originals of the plates in his great scientific monument, the 'Poissons Fossiles;' but, engaged as he is in a multitude of other costly and splendid scientific works, the Professor of Neufchatel was anxious to employ the capital thus locked up in his portfolio in a way more profitable to science, by causing it to fructify in the production of other publications. By a recent accident this fact came to the knowledge of Lord Francis Egerton, who forthwith proposed to become the purchaser of this entire collection of original drawings, about 1200 in number, permitting M. Agassiz to retain at Neufchatel the unpublished portion of them as long as may be convenient for the completion of his work. Such opportune and liberal interference to advance the progress of a work of pre-eminent scientific value is becoming of a nobleman long distinguished as a patron of Art, and whose conviction thus substantially shown of the value of researches which are rendering such inestimable service to Science, evinces his Lordship's worthiness of his position as President of the Geological Society at Manchester*.

FOSSIL CRUSTACEANS.—GIGANTIC SPECIES OF EURYPTERUS.

It will be in the recollection of those among us who have watched the progress of the recent rapid discoveries of fossil fishes in the old red sandstone, that at the Edinburgh Meeting of the British Association (1834) a most anomalous fossil from the old red sandstone of Clashbinnie, in the county of Forfar, and considered by the disco-

* M. Agassiz has acknowledged in some of the leading scientific journals of the Continent the liberality with which Lord Francis Egerton has thus come forward to facilitate the progress of researches, in which the scientific world is deeply interested.

verer to be a fish resembling the Angel Fish, was rejected by Agassiz from that class of animals; whilst neither he nor any other naturalist could even conjecture to what class in the animal kingdom it should be referred, and in this enigmatic state it was left by Agassiz in the notice given of it in his 'Poissons Fossiles.' At the late Meeting at Glasgow, this enigma found its solution by our recognising in the College Museum some of the most perplexing characters of the Clashbinnie fossil in two large specimens of Eurypterus in sandstone from the coal-field of that neighbourhood. We had before seen, at the Edinburgh Meeting, a remarkable fossil Crustacean, nearly of the size and form of a large Molucca crab, found by Dr. Simson in the carboniferous limestone of Kirkton near Bathgate, between Edinburgh and Glasgow; and Dr. Harlan had described and figured a smaller species of Eurypterus from the carboniferous limestone of the United States (see Fourth Report of British Association, 1834, p. 643). We have, therefore, now extended our knowledge of the range of this very remarkable family of Crustaceans from the sandstone and limestone of the coal formation downwards into the old red sandstone.

M. Fischer de Waldheim has lately discovered a new species of Eurypterus, *E. tetragonophthalmus*, in the transition formation of Podolia, nearly allied to the small species in the grauwacke of Westmoreland in New York, on which this genus was founded by Dr. Dekay. (Annals of the Lycæum of Nat. Hist., vol. i. p. 375, pl. 29.)

FOSSIL ARACHNIDANS.

In the family of Arachnidans we have an account by M. Corda, in the Report of the National Museum of Bohemia, 1839, of a second new genus of fossil Scorpioid, *Microlabis Sternbergii*, discovered by the late Count Sternberg in 1838, in the same quarry with the new genus Cyclophthalmus, found by him a few years before in a similar sandstone of the coal formation at Chomle, near Radnitz, in Bohemia*. M. Corda places this new fossil in the class of Pseudo-scorpions, near the Chelifer and Obisium of Leach: it is larger than the living *Obisium carcinoides*. In this, as in the *Cyclophthalmus Sternbergii*, the skin is preserved in several parts of the body in the state of a brown, semi-transparent, horn-like substance, over which pores of the tracheæ and indications of hairs are dispersed at regular intervals. The enduring nature of the peculiar substance (chitine or elytrine), of which, like the elytra of beetles, the skin of scorpions is composed, explains the cause of its perfect preservation in such ancient sandstone. M. Corda justly considers these two fossil scorpioids of Bohemia (the only two of which any account has been yet published) to be among the most remarkable discoveries of modern times.

The Marquis of Northampton has recently acquired four new species of fossil spiders, one of them imbedded in the lithographic stone of Solenhofen, the other three from the freshwater formation of Aix. The Solenhofen fossil has ten legs, and is considered by Mr J. E. Gray to be nearly allied to the genus Nymphon, the living

* Figures of this unique fossil are given in pl. 46′. of my Bridgewater Treatise.

species of which are found parasitic on marine animals; and in the same stone with it is a fossil Ophiura, to which, when living, it may have been attached. Each of the three from Aix has eight legs; they are all probably freshwater spiders of the genus Argyroneta, and two of them are of the same species. In the same freshwater limestone with one of them is an impression resembling a Chelifer or Book Scorpion, having the claws of a scorpion but not its tail.

FOSSIL INSECTS.

We noticed last year Mr. Brodie's discovery of the wing of a Libellula and other insects in the Wealden freshwater formation near Dinton, in the vale of Wardour, in Wiltshire. Mr. H. E. Strickland has more recently found a very perfect fossil wing of another Dragonfly in the lias of Warwickshire, near Evesham, on which the opake spot usually found at the anterior margin of the wing in Libellulidæ is distinctly marked. The nervures on this wing closely resemble those on recent species, and approach most nearly to the genus Æshna. The occurrence of Libellulidæ has not hitherto been noticed in any formation older than the lithographic stone of Solenhofen, in the upper region of the oolite series; and the discovery of a species so nearly allied to the existing genus Æshna in the lias formation, where it is associated with reptiles differing so widely from existing forms as the Ichthyosaurus and Plesiosaurus, leads to curious speculations respecting the fauna of this early period.

The discovery of land insects in strata that are, for the most part, crowded with marine remains, is explained by supposing multitudes of insects to have been occasionally drifted by tempests into the sea. In the Proceedings of Geol. Society, vol. ii. p. 688, is a notice by myself of a hitherto unique example of a large neuropterous wing in the Stonesfield slate, a marine formation at the top of the inferior oolite, more nearly allied to the Hemerobius than to any other modern insect. With this Hemerobioid are found at Stonesfield abundant elytra of coleopterous insects, and the bones of insectivorous marsupial quadrupeds and Pterodactyles. In the Museum of the University of Glasgow I saw, in September last, remains of some small hymenopterous insects attached to fragments of coal from the neighbourhood of that city, but of these no careful examination had then been made.

A large wing of a neuropterous insect, resembling the living Corydalis of Carolina, in a nodule of clay iron ore, probably from the coal-field of Staffordshire, has been figured by Mr. Murchison in his 'Silurian System' (Wood-cut 13, letter *a*, p. 105,) from a specimen in the Museum of Mr. Mantell.

FOSSIL RADIATA.

The history of fossil radiated animals has, during the last year, received a valuable accession from the publication, by Professor Agassiz, of the second part of his description of the fossil Echinodermata of Switzerland*.

The family of Cidarides forms the exclusive subject of this me-

* Mémoires Nouveaux de la Société Helvétique des Sciences Naturelles, vol. iv.

moir, being the most numerous of all the families of Echinites, and at the same time the earliest form under which shells of this kind appear to have existed; they are the only family that occurs so early as the muschelkalk, whilst no other family of Echini is found in formations older than the Jurassic, in which the Cidarides are most numerous; they abound also in the cretaceous and tertiary formations, and in our actual seas*. In the Jura mountains they are most numerous in a stratum, called *Terrain à Chailles*, abounding, with other littoral shells, near the middle region of the oolite formation.

Professor Agassiz has also published the first monograph of another splendid work, 'Monographies d'Échinodermes, vivans et fossiles,'† which will be extended to ten or twelve parts, to be completed in three or four years, and will contain about 150 plates, some of them coloured, from careful drawings of this most beautiful class of shells. Collections of casts of all the fossil species of this class known to M. Agassiz may be obtained by purchase, or in exchange for objects of natural history, at the Museum of Neufchatel.

In the family of Star-fish two new fossil genera have been recently established by Mr. Gray‡, one of these, Comptonia, founded on a specimen from the whetstone pits in the greensand of Blackdown, Devon, recently acquired by the Marquis of Northampton; it is preserved in the state of beautiful chalcedony, and explains the intermediate character of the genus Cœlaster of Agassiz. The other new genus Fromia, comprehends the curious tesselated star-fishes found in the chalk, and also a recent species found in various parts of New Holland.

Professor Agassiz will shortly send an artist to England, to figure for his great work on living and fossil Echinoderms, the individual specimens which Mr. Gray has described in his Monograph on Starfish. It is a new and important feature in the progress of zoology and palæontology, that this much-neglected department of radiated animals is at length receiving that attention which, from the time of Henry Linck, who dedicated a large volume on this subject to Sir Hans Sloane (1733), to the moment when it has recently been resumed by Nardo, Agassiz, and Gray, it has so long merited in vain. [To these must now be added the elegant and highly interesting History of Star-fishes and Echinodermata by Mr. Edward Forbes,—a work full of entertainment for the general reader, as well as of accurate and original information for the scientific naturalist.—Ed.]

SPONGES IN CHALK FLINTS.

Mr. Bowerbank, in a paper on siliceous bodies in the chalk, greensand, and Portland oolite, has applied the evidence of microscopic observation to confirm the opinion long entertained by many natu-

* Cidarides have recently been found in the carboniferous limestone of the Mendip Hills, near Frome, by Miss Bennet, and by myself in the carboniferous limestone near Donegal, in 1811.

† We have received from Mr. Charlesworth a translation from the second number of this work of "Observations on the progress made in the History of the Echinodermata," which will appear in our next.—Ed.

‡ See Monograph on Star-fish, Ann. Nat. Hist., No. 36, Nov. 1840, vol. vi. p. 175, 278, 286.

ralists, that the tuberous forms of chalk flints and chert are due to organic bodies acting as nuclei, or centres of attraction, to the silex of which these tubercles are composed. Mr. Parkinson, in his interesting work on 'Organic Remains of a Former World' (1808, vol. ii. p. 87 *et seq.*), had noticed acicular spicula, which he found to be common to fossil sponges and fossil Alcyonia; and in pl. 7. fig. 8. of the same volume he represents the magnified appearance of cruciform spines in a fossil Alcyonite resembling the *Alcyonium cynodium* of Linnæus, and quotes Donati as having described and delineated them before him. It has also long been known that a large proportion of the chalk flints in Wilts, Oxon, and Bucks, contain, within a gray external siliceous crust of variable thickness, a nucleus of semi-transparent flint, often of a purple tint, and exhibiting distinctly a congeries of tubes and net-work, nearly allied to modern Alcyonia; these Alcyonia were supposed to have acted as nuclei, or centres of attraction, which became first surrounded by the crust of gray flint, bearing no traces of organization, and subsequently penetrated by a kind of red or purple chalcedony, taking the place of the particles of animal matter as they gradually decayed. This hypothesis has been modified by Mr. Bowerbank, who has superadded the agency of parasitic sponges, which he supposes to have attached themselves to the alcyonic nuclei, and also to Echini and other shells, forming round these organic nuclei a covering or crust of sponge, which assumed, in its mode of growth, those irregularly tuberculated forms that are so common in, and are almost peculiar to, chalk flints.

Having submitted to his microscope thin slices of chalk flints, in search of Foraminifera and Xanthidia, he observed, together with them, patches of brown reticulated tissue and spongiform spicula pervading the entire mass of the flints under examination; this spongiform structure was further pervaded by many tortuous cylindrical and minute canals of uniform diameter, which appeared to be the incurrent canals of the sponge, and by other orifices of greater diameter, resembling excurrent canals. He thinks that the mode in which the spicula, foraminifers, and other extraneous bodies are equably dispersed throughout the silex, shows that these bodies were entangled in the spongiform tissue in which their fossilization has taken place.

With respect to the Echini and other shells, which are more or less filled with, or surrounded by gray flint, he supposes the parasitic sponges to have grown both around and within the cavity of these shells, and in the case of Echini to have sometimes protruded outwards, sending forth branches through their orifices from the parasitic sponge within. He cites the parasitic habit of some modern sponges, which are found investing shells and other substances, in support of this hypothesis.

In chalk flints from Wiltshire he found the spongiform structure and spicula pervading the gray crust that enclosed many zoophytic nuclei; but within these nuclei were neither spicula nor any of the minute extraneous bodies which are frequent in the tubular spongiform crust. The character of these fossil sponges differs from tha of any recent sponge.

In chert from the greensand of Fovant, Wilts, and from Lyme Regis, Mr. Bowerbank found a similar but coarser texture; and also in chert casts of Spatangi from the greensand near Shaftesbury. In chert from Portland and Tisbury he found similar cellular tissue, but larger, and in texture more like the modern freshwater sponge.

Mr. Bowerbank supposes the organic matter of the sponges and zoophytes to have afforded to the silex stronger centres of attraction than were offered by the siliceous spicula of the sponges; and there is a geological consideration which seems to favour the hypothesis, of the siliceous matter of chalk flints whilst in a semifluid state having been segregated from the compound mass of lime and silex of the nascent chalk beds, by the attraction of some organic body, in the facts that the upper region of the English soft chalk, which most abounds in flints, is nearly pure carbonate of lime; whilst the lower region of the hard chalk is usually destitute of flints, and has silex diffused throughout its entire substance*. I cannot, however, but think there is something too exclusive in Mr. Bowerbank's theory as to the universal presence of parasitic sponges in the external crust of every chalk-flint, and which admits of no case in which an Alcyonium or any kind of extraneous body in chalk may, without the co-operation of a sponge, have become externally invested with a crust of silex of the same kind with that which he allows to have been attracted to corallines and alcyonic bodies by the animal matter they contained.

MICROSCOPIC SHELLS.

Mr. Tennant has informed me that a microscopic examination of the Stonesfield slate by Mr. Darker, and of other oolites, has recently shown them to be crowded with remains of organized bodies, invisible to the naked eye. I learn also from Mr. Tennant that abundant microscopic organic remains have recently been discovered in thin slices of certain beds of carboniferous limestone from Derbyshire; similar results may shortly be expected from a microscopic examination of the chert of the same formation. We must not however be tempted by these discoveries to rush suddenly to the rash and unwarranted conclusion, that all limestone and all silex is of organic origin.

It has not yet been shown that the granules resembling the roe of fishes, which give character to the oolite formation, and abound occasionally in limestones of the triassic, carboniferous, and silurian series, have any necessary connexion with organic bodies. We may with Ehrenberg admit and admire the extent of microscopic chambered shells and Infusoria, which he has shown so largely to pervade the chalk and other calcareous and siliceous formations, without claiming an exclusively animal origin for the entire substance of all rocks in which lime or silex are the principal ingredients.

[* "We observed no vestige of flints in the limestone at Seedrapett, and all the fossils there consist of carbonate of lime, and effervesce freely with acid; but the vast quantity of silicified wood in the neighbouring formation of red sand, seems to point to some phænomenon similar to what must have existed during the deposition of the cretaceous beds of Europe."—*Mr. Kaye on the Fossiliferous Beds of Pondicherry, Calcutta Journ. Nat. Hist.*, No. 6.]

When we recollect what great discoveries have been already made in the investigations of fossil botany by means of the microscope, and look to the inestimable value of the information obtained by Professor Owen, as to the structure of the teeth of fossil fishes, reptiles, and mammals, and see the wonderful results of the application of this new power to the examination of chalk and flint by Professor Ehrenberg*, Mr. Lonsdale and Mr. Bowerbank, we may justly congratulate ourselves on the commencement of a new epoch in microscopic palæontology.—*Address delivered at the Anniversary Meeting of the Geological Society*, 1841.

EXPEDITION TO TORRES STRAITS AND NEW GUINEA.

The Fly, one of the vessels destined for the survey of Torres Straits, will sail from Plymouth in a few days, and, we are happy to learn, with an active botanical collector on board, and Mr. Jukes for zoology.

METEOROLOGICAL OBSERVATIONS FOR FEB. 1842.

Chiswick.—February 1. Overcast: very fine: clear. 2. Very fine: slight rain in the evening. 3. Slight haze. 4. Calm with slight haze. 5. Hazy. 6. Dry haze: fine. 7. Sleet. 8. Foggy. 9. Overcast: fine. 10. Slight haze. 11, 12. Cloudy. 13. Clear and fine. 14—16. Very fine. 17. Foggy. 18. Clear and fine. 19. Frosty and foggy. 20. Drizzly. 21. Overcast: clear. 22. Drizzly: cloudy. 23. Thickly overcast: cloudy: rain. 24. Cloudy. 25. Cold rain: showery. 26. Showery: clear and cold. 27. Stormy showers: heavy rain: densely overcast. 28. Fine: overcast: stormy at night.

Boston.—Feb. 1. Fine: rain early A.M. 2, 3. Fine. 4. Foggy. 5, 6. Cloudy. 7. Cloudy: snow A.M.: rain P.M. 8. Cloudy: rain P.M. 9. Foggy. 10. Cloudy. 11. Fine: rain P.M. 12. Cloudy. 13—16. Fine. 17, 18. Cloudy. 19. Foggy. 20. Fine. 21. Cloudy: rain A.M. and P.M. 22. Fine. 23. Cloudy: rain P.M. 24. Rain. 25. Rain: rain early A.M.: snow A.M. 26. Cloudy: snow early A.M. 27. Cloudy: rain A.M. 28. Stormy.

Sandwick Manse, Orkney.—Feb. 1. Cloudy: showers. 2. Showers: aurora. 3. Cloudy: clear. 4, 5. Fine. 6. Damp: frost. 7. Frost: aurora. 8. Frost: cloudy. 9, 10. Clear: rain. 11. Clear: showery. 12. Showery. 13. Clear: cloudy. 14. Cloudy: aurora. 15. Showers: aurora. 16. Cloudy. 17. Fine. 18. Cloudy: showers. 19. Cloudy: rain. 20. Showers. 21. Clear. 22. Clear: cloudy. 23. Cloudy. 24. Clear: cloudy. 25. Clear. 26, 27. Frost: sleet-showers. 28. Showers.

Applegarth Manse, Dumfries-shire.—Feb. 1, 2. Fine: thaw. 3. Frost A.M.: fog P.M. 4. Thaw and slight rain A.M. 5. Frost: fine. 6. Dull and cloudy, but freezing. 7. Frost: still dull. 8. Frost: clear. 9. Thaw and heavy rain P.M. 10. Wet morning: blew strong. 11, 12. Very wet and stormy. 13. Wet. 14. Slight showers. 15. Slight showers: cleared P.M. 16. Frost A.M.: fair all day. 17. Dull and moist. 18, 19. Fine and fair. 20. Fine and fair, but high wind. 21—23. Rain A.M.: cleared. 24. Frost A.M.: fine. 25. Wet A.M.: cleared P.M. 26. Rain P.M. 27. Snow, hail, rain and wind. 28. Rain.

Sun shone out 24 days. Rain fell 15 days. Frost 7 days. Snow and hail 1 day. Fog 1 day.

Wind north-north-east 1 day. East-north-east 1 day. East 3 days. East-south-east 3 days. South 4 days. South-south-west 7 days. South-west 4 days. West-south-west 1 day. West 5 days.

Calm 5 days. Moderate 12 days. Brisk 2 days. Strong breeze 4 days. Boisterous 2 days. Stormy 3 days.

Mean temperature of the month	37°·7
Mean temperature of February 1841	36 ·50
Mean temperature of spring-water	44 ·30
Mean temperature of spring-water, February 1841	42 ·60

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* See vol. vii. p. 398, and Scientific Memoirs, part x.

Meteorological Observations made at the Apartments of the Royal Society, London, *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; *by* Mr. Dunbar, *at Applegarth Manse*, Dumfries-shire; *and by the* Rev. C. Clouston, *at Sandwick Manse*, Orkney.

Days of Month.	Barometer.								Thermometer.										Wind.					Rain.					Dew-point.
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		Orkney, Sandwick.		London: R.S.			Chiswick.		Boston. 8½ a.m.	Dumf.-shire.		Orkney, Sandwick.		London: R.S. 9 a.m.	Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	London: R.S. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Lond. R.S. 9 a.m.
1842. Feb.		Max.	Min.		9 a.m.	9 p.m.	9½ a.m.	8½ p.m.	Fahr. 9 a.m.	Self-reg. Mx.	Self-reg. Mm.	Max.	Min.		Max.	Min.	9½ a.m.	8½ p.m.											
1.	30·140	30·130	30·100	29·74	29·92	29·87	29·80	29·54	39·5	47·0	37·8	46	26	35	42	32½	39	43½	w.	nw.	calm	w.	s.	·166	......	·22	......	·04	42
☾ 2.	30·198	30·241	30·059	29·79	29·85	30·09	29·72	29·94	41·7	45·7	38·0	50	40	37	46	39	40	42	sw.	w.	calm	w.	w.	......	·02	......	......	·13	38
3.	30·436	30·409	30·377	30·03	30·21	30·24	30·06	30·20	43·8	49·2	41·7	45	37	35	43½	31½	45	43½	nw.	nw.	calm	ssw.	sw.	......	......	......	......	·05	41
4.	30·480	30·439	30·351	30·12	30·21	30·20	30·15	30·18	39·8	46·3	40·3	42	30	36	44½	30½	41	41	ne.	e.	calm	ssw.	s.	......	......	......	......	......	40
5.	30·286	30·267	30·177	29·99	30·17	30·05	30·15	30·16	35·7	40·0	33·3	42	27	30	42	30	42	40	ene.	e.	calm	w.	sw.	......	......	......	......	......	35
6.	30·118	30·109	29·892	29·83	30·00	29·85	30·07	29·97	32·8	35·7	32·0	38	26	33	32½	27½	37	33½	e.	e.	calm	e.	se.	......	·06	......	0·00	......	29
7.	29·724	29·786	29·697	29·52	29·70	29·68	29·84	29·81	35·2	37·6	33·0	40	30	35	37	26	35	34	ene.	e.	calm	e.	se.	·033	·11	......	......	......	33
8.	29·828	29·816	29·786	29·55	29·69	29·69	29·87	29·86	31·8	40·6	33·0	46	28	35	41	30½	36½	37	ne.	e.	calm	ene.	se.	·094	·06	·20	......	......	33
9.	29·812	29·795	29·512	29·50	29·55	29·41	29·71	29·51	40·8	45·0	35·2	51	43	40	43	32	39	41	s.	s.	calm	ese.	se.	·063	......	·06	......	......	38
● 10.	29·946	29·986	29·895	29·53	29·57	29·55	29·52	29·35	45·7	49·0	41·2	51	41	45	46	39	41	42	s.	s.	calm	ssw.	se.	......	......	......	......	·17	41
11.	30·026	29·985	29·970	29·49	29·42	29·54	29·20	29·25	47·3	50·3	45·8	52	47	47	47	42	46	40	s.	s.	sw.	ssw.	s.	......	·14	......	......	·32	46
12.	30·072	30·065	30·004	29·50	29·49	29·53	29·35	29·20	50·2	52·2	47·4	54	30	50	48	39½	41	40	s.	s.	sw.	s.	s.	·091	......	·11	......	·15	46
13.	30·220	30·180	30·020	29·74	29·79	29·76	29·62	29·58	44·2	53·0	42·5	52	28	47·5	43½	37½	41	38½	sse.	s.	calm	ese.	sw.	·009	·04	......	1·48	·08	43
14.	30·456	30·452	30·390	29·94	30·10	30·11	29·94	29·94	40·3	50·7	38·5	52	37	38	46	34	42½	45	w.	s.	w.	sw.	s.	·061	......	......	......	·07	41
15.	30·500	30·446	30·424	29·98	30·00	30·24	29·81	29·05	46·8	49·7	40·3	54	40	41	47½	41	44	43	s.	sw.	s.	w.	sw.	......	......	......	......	·06	44
16.	30·546	30·488	30·416	30·05	30·30	30·24	30·12	30·06	46·3	51·6	44·8	53	33	39	46	32	44	45	w.	sw.	calm	sw.	sw.	......	......	......	......	......	43
17.	30·410	30·372	30·252	29·90	30·12	30·08	30·03	30·05	44·3	49·2	43·7	49	25	43	45	34	42½	39	s.	s.	calm	sw.	sw.	......	......	......	......	......	43
☽ 18.	30·374	30·367	30·316	29·94	30·12	30·20	29·95	30·12	36·8	48·2	36·0	47	24	36·5	47½	40	44½	41	s.	nw.	calm	sw.	w.	......	......	......	......	......	38
19.	30·402	30·377	30·194	29·98	30·12	29·90	29·89	29·68	34·7	43·7	33·3	49	30	33·5	48	40	42	44½	sw.	w.	calm	s.	sw.	......	·02	......	......	......	39
20.	30·054	30·030	29·881	29·68	29·75	29·59	29·52	29·53	35·3	45·0	35·0	40	31	37	48	40½	43	41	s.	sw.	calm	s.	sw.	......	......	......	0·21	·44	37
21.	29·782	29·813	29·771	29·40	29·45	29·60	29·49	29·52	39·7	40·0	35·0	48	27	36	44	43	40	39	se.	sw.	se.	ssw.	w.	......	·16	......	......	·18	36
22.	29·756	29·753	29·616	29·47	29·50	29·31	29·44	29·27	41·8	47·8	38·8	50	34	33	45	30½	40	40½	e.	s.	calm	s.	s.	·161	......	·13	......	......	39
23.	29·444	29·444	29·167	29·14	29·17	28·95	29·24	29·05	44·8	48·8	42·0	50	40	39	43	37	40	41	sse.	s.	calm	e.	se.	......	·11	......	......	......	42
24.	29·152	29·171	29·115	28·77	28·98	28·98	29·08	29·10	41·9	49·5	41·8	47	33	41·5	43	29½	37	36	s.	s.	calm	nne.	calm	·059	·11	·10	......	·15	41
○ 25.	29·216	29·250	29·180	28·80	29·07	29·08	29·12	29·09	39·3	48·0	36·3	45	23	39	44	35½	39	37	w.	w.	calm	w.	s.	·130	·07	·20	......	......	41
26.	29·400	29·570	29·367	29·00	29·00	29·24	28·93	29·15	39·2	45·3	35·0	48	30	34	42	31½	34	38	se.	w.	calm	wsw.	w.	·052	·04	·31	......	......	36
27.	29·550	29·470	29·377	29·17	28·95	28·87	29·00	28·52	40·5	46·0	35·2	44	36	35	42	29½	36	38½	s.	s.	se.	ssw.	se.	·133	·05	......	1·00	·10	36
28.	29·622	29·593	29·388	29·12	28·90	28·97	28·65	28·90	41·7	43·6	39·0	51	42	40	46	36	42	41½	s.	s.	w.	ssw.	w.	·291	·33	·09	......	·26	38
Mean.	29·998	29·953	29·882	29·59	29·681	29·671	29·610	29·590	40·9	46·4	38·4	47·71	32·78	38·2	39·3	34·9	40·50	40·21						Sum 1·346	1·32	1·48	2·69	2·20	Mean. 39

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 57. MAY 1842.

XXII.—*The Physical Agents of Temperature, Humidity, Light, and Soil, considered as developing Climate, and in connexion with Geographic Botany.* By Richard Brinsley Hinds, Esq., Surgeon R.N.

It is our present intention to institute some inquiries into the circumstances of climate and physical agents in connexion with the distribution of the vegetation of our globe; and as these are the results of several agents acting in co-operation as well as individually, and their mutual influence embraces much complexity, it will be advisable to regard them separately under the heads of, 1. Temperature, 2. Humidity, 3. Light, 4. Soil.

I. Temperature.

Climate is the great presiding agent over the flora of the world, and, as modified by external circumstances, stamps its characters on the productions. Climates vary a good deal in circumstances, according to the latitude. In the belt which borders on the equator, and is confined within the tropics, the annual climate is of the simplest kind, and is divided into a wet and a dry season. The temperature throughout the year varies but little, and a very trifling range takes place in the barometer. The seasons alternate with surprising regularity, the inhabitants looking forward to the accession or departure of the rains almost to a day. In receding north and south from the equator, the wet and dry seasons take place at different periods of the year; when the sun enters the northern hemisphere, the wet or rainy season of that side commences, and it is then the time of the dry season in the southern hemisphere. The reverse happens as the sun occupies the other side of the equator. Thus two tropical climates exist, very similar to each other, and chiefly differing in the circumstance that the seasons occur at opposing periods. These are the outlines of tropical climates as existing over continents; some modifications take place over the large oceans. Near the equator, and to about 7° N. lat., a peculiar region exists; the trade winds do not advance so far, and light baffling winds, with storms and heavy rains, are the prevailing climate throughout the year. Beyond this, and extending a few degrees outside the tropics in both hemispheres, the trade winds blow; they are remarkable for their regularity, uniform temperature, and general absence from rains.

The tropics ceasing at 23° 28′, another change occurs in the disposition of the year, extending to the thirty-fifth or fortieth parallel. There are now two dry and two wet seasons. The wet seasons occupy the periods corresponding to our spring and autumn. The former is usually trifling, and the autumnal fulfills the chief duties of the rainy season. Towards the limits of this subtropical climate frosts are not unfrequent, but snow is rarely observed. From 40° to 60° four regular seasons rule the year, familiar to us under the divisions of spring, summer, autumn, and winter, each possessing its peculiarities.

Beyond the sixtieth parallel, as far as our knowledge extends, only two seasons exist. These are not characterized by the presence or absence of rain as in lower latitudes, but by the intensity of the range of temperature. Summer and winter succeed each other with singular rapidity. The snow which covers the soil is represented as melting in the short space of fifty or sixty hours, and exposing a vegetation already in its bloom. The intensity of the sun's rays over the temperature of the air is particularly remarkable, and the great length of the day, or, in other words, the continued presence of the sun above the horizon, causes an accumulation of heat, mentioned by our northern voyagers as excessive. Hail is here unknown.

Malte-Brun enumerates nine circumstances as developing climate, the whole of which tend to influence the temperature. If the globe presented an uniform surface throughout, consisting of the same material, and equally reflecting, absorbing, and radiating heat, the distribution of the temperature, from the equator to the poles, would advance in regular progression; but there is such variety in the arrangement of land and water, elevation of surface, and in the investing productions, that every spot displays an union of causes, militating against a regular distribution of temperature.

The most natural view to be taken of climate will regard the relative distribution of temperature and moisture; for though several other agents are subservient, these two will constantly be found to preside*. In this manner it will be easy to sketch

* The subject of the Distribution of Temperature on the surface of the Earth has been elaborately investigated by Professor Dove of Berlin in two works published in 1840, 1841. abstracts of which by H. Croft, Esq., will be found in Part X. of Taylor's 'Scientific Memoirs.'—Ed.

out a number dependent on the proportionate influence of these agents, and the prominent climates of many parts of the world may be shortly and effectively expressed. This method is entirely independent of latitude or geographical position, and refers solely to the condition of the climate as it actually exists, depending on local influences. Sixteen climates of this kind may then be formed, each of which is easily expressed, and, from the examples adduced it may be stated, coincident with a peculiar vegetation.

Climates.

Mean temp. 70°—84°.

Hot and dry climate; seasons in extremes, ex.
Hot and dry climate; seasons even, ex. Arabia.
Hot and moist climate; seasons in extremes, ex. China.
Hot and moist climate; seasons even, ex. Malay islands.

Mean temp. 55°—70°.

Warm and dry climate; seasons in extremes, ex. Asia Minor.
Warm and dry climate; seasons even, ex. Egypt.
Warm and moist climate; seasons in extremes, ex. Southern States of America.
Warm and moist climate; seasons even, ex. Canaries.

Mean temp. 45°—55°.

Temperate and dry climate; seasons in extremes, ex.
Temperate and dry climate; seasons even, ex.
Temperate and moist climate; seasons in extremes, ex.
Temperate and moist climate; seasons even, ex. England.

Mean temp. 45°—32°.

Cold and dry climate; seasons in extremes, ex. Canada.
Cold and dry climate; seasons even, ex.
Cold and moist climate; seasons in extremes, ex. Siberia.
Cold and moist climate; seasons even, ex. North of Scotland.

There is, however, in spite of all local causes, a certain relation between the temperature and the latitude; from the equator to the poles a gradual decrease takes place. Rather conflicting statements have been made respecting the mean temperature at the equator. Mr. Atkinson has fixed it as high as 86°·55, which is certainly in excess; Mr. Kirwan gives 84°; Sir John Leslie 84°·2; Mr. Forbes 81°·5; and Humboldt also 81°·5. The latter have been considered as too low, but the last-mentioned authority continues to maintain his original opinion. I was induced to consider, that in the absence of a regular series of observations, the mean heat of the day, when the sun was in or near the zenith, would at least give the possible extreme of the greatest annual mean heat. From observations on two occasions, I found the mean to be 81°·9; and as this result was obtained at sea and under unexceptionable circumstances, it tends strongly to support the opinion of Humboldt and Forbes. Within the tropics the mean temperature is everywhere very similar, distance from the equator exerting a very feeble influence. After passing their limits, latitude is of greater importance, and the decrease more rapid. If implicit confidence can be placed in the details of the calculated table of Sir John Leslie, the mean temperature varies most with the parallel, between the thirtieth and fiftieth degrees. Though this table cannot be relied on for ascertaining the mean of any given place, it is yet highly useful in showing its value in any situations removed from disturbing causes; and we discover the importance of these last in the difference between the observed and the calculated result.

If some difficulty has been experienced in fixing the mean temperature at the equator, we are much more at a loss at the poles. No navigator has ever yet made, or perhaps ever will have it in his power to make, a conclusive series of observations to establish the point. Conjectures, drawn from observed temperatures in lower latitudes, are all we possess at present, and these are at great variance. Sir John Leslie considers it to be 32°, or the freezing point of water; Kirwan places it a degree less; Mr. Atkinson, who seems partial to extremes, at 10°·53 below the zero of Fahrenheit. Inferring its amount from the temperature of the old world, it appears likely to be about 10°; whilst corresponding inductions from the new world place it considerably below zero. M. Arago has given the subject his attention, and after comparing the observations of Parry, Franklin, and Scoresby, he fixes it at 13°. Here, then, we have various opinions, which state a set of means having a range of forty-two degrees and a half. Among such conflicting statements every one will desire to judge for himself; and the following observations, the first by Franklin, and the others by Parry, may be of some assistance. They may be considered as intervals of five degrees:—

Fort Enterprise	Lat. N. $64\frac{1}{2}$°	Mean temp. 15°·5
Igloolik	... $69\frac{1}{3}$	 7
Melville Island	... $74\frac{3}{4}$	... ... −1·5

It is not unlikely that Sir Edward Parry at Melville Island had attained the greatest depression of temperature, and that had he even been able to reach the pole, the alteration, if any, would have been exceedingly trifling, the arctic regions, like the tropics, through their extent, most probably offering no great variations. Recently an opinion has been advanced, that the greatest cold is not to be found in the vicinity of the poles. It is supposed that a centre of greatest cold may exist in each of the continents of Asia and America, a theory founded on the well-known cooling effects of all large masses of land in high latitudes.

The information conveyed in a knowledge of the mean temperature* is very slender. Standing alone, it gives no idea of the distribution of heat throughout the year. Indeed it must be confessed, that a complete acquaintance with the vicissitudes of any one spot, during twelve months, embraces a considerable number of details. When acquainted with the mean heat, the chief point gained is an idea of the situation of any particular place on the globe with respect to latitude; our previous knowledge fills up an outline of the climate. By no limited number of facts can much desirable information be conveyed. Perhaps the most complete will be obtained in an expression of the annual range of temperature. Even this will often be found not very satisfactory.

The range of temperature throughout the year, like the annual mean, bears a certain relation to the latitude. In low latitudes the range is comparatively small; in high it is often very great. Near the equator, and within the tropics, the range of heat is very trifling; here the changes of a day are almost those of a year. For some hours after the disappearance of the sun's rays, the temperature falls but little; during the night gradual depression goes on, and a little before sunrise it has reached its maximum. At this time the thermometer will stand from 15° to 30° lower than in the hottest period of the day. This depression, though comparatively small for its effects, has a marked influence on animated nature; not only do the inhabitants of these warm climates complain of the coldness of the atmosphere with the thermometer at 65°, but domestic animals and the birds of the forest are evidently much disturbed by it. The effects are but short, the sun rises rapidly above the horizon, and the period of excitement and of powerful heat again returns. It is most probably owing to the exhausting power of the sun's heat and

* Some rapid methods have been recommended to obtain the mean temperature, where the more lengthened processes were impracticable. The mean of the day may be found by meaning three observations made, just before sun-rise, at 2 P.M., and at sun-set. Annual means for the latitude correspond with the temperatures of considerable depths, as at the bottom of the shafts of mines, and in wells. In the tropics, Boussingault advises the sinking of a thermometer a foot below the surface of the soil, where it is constantly shaded by a roofing. He mentions particularly the belt between 11° N. lat. and 5° S. lat. as suitable. In our parallel, the mean of the month of October is said to be very near the annual mean.

light during the day, that this small decrease of temperature is so keenly felt.

Range of temperature is also much affected by local causes, as the vicinity of forests, sandy plains, and mountain ranges, which elevate or depress the sensible heat. In the northern regions a high temperature is accumulated by the continuance of the sun above the horizon, and correspondingly depressed in its absence; but on other occasions the range will be found to increase as the mean temperature diminishes. At sea the range is much smaller than on land, attributable to the equalizing power of the ocean. In the trades there is scarcely a variation of a few degrees in twenty-four hours; in higher latitudes it is greater, but is perhaps not more than half what it would be on the land.

In the subjoined table, the relation of the range of temperature to the latitude and the mean heat is shown. The agency of local causes is also visible in the great range at Astrakan in proportion to its mean heat; and again at Sidney compared with the Cape of Good Hope, both in nearly the same parallel:—

Sandwich islands	Lat. 21° 40′	N.	Mean temp. 75°	Annual range 29°
Sidney	33 51	S.	70	79
Cape of Good Hope	33 56		67·5	51
Columbia River	46	N.	54	74
Astrakan	46 21			130
London	51 31		51	79
Kinfauns	56 23		47	58
Greenland				138

The highest temperature ever recorded to have taken place occurred in Africa; here, at Fezzan, it was observed on one occasion to be 125°·5, and at Belbeis in Egypt 125°; both these are supposed to have been produced by a wind carrying minute particles of heated sand from the desert*. Under these circumstances Humboldt saw it at 114°·5 in South America. In August, at Bagdad, the thermometer has been known to reach 120°. Dr. Heberden witnessed the highest temperature in England, when, in the month of July, the thermometer stood at 98°. Sir Edward Parry has observed the greatest excess in the other extreme; at Melville Island, in the month of February, the cold was so intense, that the thermometer descended to 55° below zero. Several observers have likewise seen mercury freeze in the northern parts of America and Asia, which requires a depression of 72° below the freezing point. It so happens that this range of excesses is exactly equal to that between the congelation and boiling

* On more than one occasion I have known the sand near the sea-shore, supporting an appropriate vegetation, heated to 128°.

of water, or 180°. These extremes of temperature for the surface of the globe are indeed great, and they demonstrate how wonderfully man is capable of adapting himself to circumstances, as beneath each he is able to exist; nor does there appear any reason why the vegetable kingdom should not thrive beneath the same. Some persons, for experiment, have exposed themselves to a greater degree of heat, and without unpleasant results; but this was only for a certain time, and gives no idea of the effects of an habitual exposure to such excitement.

Observations on the condition of organized nature in the hottest regions of the world will lead us to the conclusion, that there is an intimate adjustment between the productions, animal and vegetable, and the agency of external causes. If the temperature were by any unforeseen circumstances to be raised a few degrees, a corresponding change in the temperament and organization of the living beings would be necessary for the proper fulfilment of their functions. A comparison of different latitudes with each other, and the allotted productions of each, clearly manifest the intimate relations between the climate and the vegetation, and the reluctance displayed to leave the conditions under which they have been placed. Many instances might be mentioned to prove, that the exact circumstances acting on the vegetable kingdom are those the most favourable to its existence; it will be enough at present to add, that similarity of climate does always support similarity of productions; that however distant the situations may be, wherever similar external causes are active, there we shall find similar states of organization.

There are still some remarkable instances, at times noticed by the naturalist, which demonstrate that vegetation does thrive under unusual conditions. These cases are exceptions, but not less interesting on this account, and show to what extent the organs of plants can modify their functions under the influence of unnatural circumstances. At present our attention is confined to temperature, and many curious facts have been noticed of plants appearing to thrive well in situations where the surface has been heated by internal fires, or actually in hot springs themselves. One of the most interesting, perhaps, of these circumstances is mentioned by Mr. Barrow in his 'Voyage to Cochin-China.' At the island of Amsterdam, he observed a paste near some hot springs, the temperature of which was 186° at eight inches beneath the surface. On the top were growing a *Lycopodium*, a *Marchantia*, and a small delicate moss, being members of three natural families, but all agamic. In a hot spring at Gastein, with a temperature of 117°, *Ulva thermalis* was found growing. James, in the expedition to the Rocky Mountains, relates seeing Conferva and "other vegetables" growing in the numerous thermal springs at the base of the Ozark mountains, with the temperature from 92° to 140°. The last two instances are not, however, very remarkable, when we call to mind the heat to which vegetation is exposed in low latitudes from the direct power of solar radiation. Sir W. J. Hooker has supplied us with some very interesting facts respecting the vegetation near hot springs in Iceland, and especially the Geysers, the temperature of which is equal to boiling water. On a heated bank where they were exposed to the steam, *Conferva vaginata*, *Gymnostomum fasciculare*, *Fissidens hypnoides*, and *Jungermannia angulosa*, flourished in the greatest perfection. At the Geysers, "close to the edge of many of the hot springs, and within a few inches of the boiling water, in places which are consequently always exposed to a considerable degree of heat, arising both from the water and the steam, I found *Conferva limosa*." In a similar situation, an *Oscillatoria*, and *Jungermannia angulosa*. Again, in water of a "very great degree of heat," *Conferva flavescens*; and another species, *Riccia glauca*, was also found on a surface considerably heated. All these plants, excepting the doubtful expression of James, belong to families of the simplest structure, and whose members have the widest geographic limits; among plants they appear those least affected by extremes of temperature.

Plants of more complex organization have likewise been found in similar situations, but not with the habitual frequency of the agamic families. The thermal springs of Trinchera, near Valencia, have a temperature as high as 194°; vegetation of surpassing luxuriance surrounds them, and the roots of species of *Mimosa*, *Clusia*, and *Ficus* are bathed by their waters.

Under opposite circumstances vegetation hardly thrives so well, still it is capable of enduring great depressions of temperature*. Thermometers placed in the trunks of trees have stood below the freezing point. In the arctic regions flowers struggle through the melting snows, and one plant has its existence even in the snow itself, where it vegetates, reproduces its species, and decays. *Protococcus nivalis* has been found in the snows of the arctic regions, among the Alps and Pyrenees, and in other situations in Europe; of late years it has also been observed among the islands to the south of Cape Horn. In low latitudes plants are often subject to an unexpected depression; I have already mentioned casually

* This subject has lately been treated of by M. Morren. See 'Observations Anatomiques sur la congélation des Organes des Végétaux.'—Bulletins de l'Acad. de Bruxelles, t. v. p. 64.—Ed.

how far this obtains in the tropics, and a further decrease must be allowed for nocturnal radiation. Mr. Daniel has made us acquainted with the unexpected circumstance, that in our own climate, vegetation, in ten months of the year, is subject to a temperature below the freezing point. Even in the two months which are exceptions, July and August, the thermometer exposed to terrestrial radiation sometimes sinks to 35°.

Cultivation has been always allowed to have a material influence on the temperature, but as people formerly were much less curious on the subject than at present, it is almost an impossibility to obtain correct data. Even the few years that have passed, since the reclaiming of the land in many of our colonies, had their commencement at a period when registers of daily fluctuations in the thermometer were overlooked, among the claims of more important pursuits. The effects must of course vary according to the circumstances of a tract of country previous to its being submitted to cultivation. Deep impervious forests are frequently removed by the diligence of the settler, and a new and perhaps extensive surface exposed to the direct action of the sun and air. The changes which follow here must be very different from those occurring over another space of country, where cultivation, instead of circumscribing the reign of the vegetable kingdom, continually adds to it.

To place these opposite conditions in a clearer light, we will select two instances, and by detailing the chief peculiarities of the climate of each, may be enabled to draw a satisfactory comparison between them. The island of Ascension is almost destitute of vegetation; in the sheltered ravines and temporary water-courses of the rainy season, a few ferns and other plants thrive. Their number is small, and the soil almost everywhere without a flora. The climate, however, is delightful; it is rather warm, but very healthy. In the hot season the thermometer only ranges ten degrees in the twenty-four hours, and during the time of the rains only eight. The whole range of the year is not more than sixteen or eighteen degrees. Rain is scarce even in the proper season, a circumstance always occurring in similar situations, and dews are also far from frequent; indeed the small depression of the temperature during the night can seldom be expected to reach the point of deposition. Very different conditions will be found in that part of North America which comprehends the Canadas and the northern portion of the United States. This is truly a climate of extremes; the winter is intensely cold and protracted, snow lying long on the ground; when summer succeeds, it is to run into the opposite excess of oppressive heat. The changes from heat to cold and *vice versâ* are extremely rapid, so that the spring and autumn to be expected in these latitudes are obliterated in the rapid transitions of summer and winter. The climate has not been found particularly healthy, arising, no doubt, from the exposure in the clearings of a soil containing much vegetable matter in decomposition. Vegetation is very active; immediately on the breaking up of the winter the trees put forth their buds, and herbaceous plants spring rapidly into existence. Some little cultivation is now taking place at Ascension, which is yearly increasing; about fifty acres have been broken up, and small as the quantity is, a notable change is said to have been produced by it on the climate. Rain is become more frequent than formerly; and though there is no mention of the altered temperature, the circumstance of an increased deposition of moisture bespeaks a change in the range of the thermometer. In Canada it is also generally allowed, that the climate has become milder since the disappearance of the forests from any extent of surface.

Many instances might be mentioned where the removal of forests has greatly lessened the quantity of rain; and every one of the West India islands would furnish examples, with the consequent disappearance of streams and mountain-torrents. Supposing the circumstances of evaporation to remain the same,—and surely the removal of vegetation is not likely to increase it, rather the contrary,—the only cause to which the greater rarity of rain is attributable, is the higher standard which the low ranges of temperature have taken. In Europe, where cultivation has been very extensively practised, the climate is certainly warmer than formerly; and if we trust to the accounts left us by the historian Tacitus of the circumstances of a German winter, the changes have indeed been great. At the present day, in those parts of Europe where forests exist, as in Germany and Poland, their influence is distinctly felt. In their vicinity the harvest is not so advanced by several days, and a corresponding decrease of temperature is noticed.

Among the controlling causes of temperature, the relative distribution of land and water is not the least important or interesting. In the ocean originate the peculiarities of an island-climate, conferring an atmosphere laden with moisture and limited in its range of temperature, and forming a subject of great attraction to the geographic botanist; its influence over continents is also great. We trace its outline into deep gulfs and seas, separating large masses of land from each other, and sweeping around them so as to expose their coasts to its humid atmosphere and winds. We can hardly contemplate this arrangement without acknowledging a particular object was to be obtained. Perhaps on this account it is that it has always required rather a fanciful imagination to discover that the continents and mountain ranges pursued a direction, having a general connexion with the cardinal points. The influence of the surface of the ocean will depend on the previous temperature; thus in low latitudes, where the temperature is great, the former is constantly active in depressing it. Sea-water rarely attains upwards of 86°, and the atmosphere over it 88°; as this latter is surpassed over the land, its depression at sea is solely attributable to the equalizing power of the surface of the ocean. The air also during the night undergoes very small changes of temperature; and should there be any disposition to a considerable fall, the surface of the water is always ready, as a compensating agent, to part with its heat to the cooling atmosphere. On this account the island-climates of these parallels are not subject to such high mean or daily temperatures as continents, and the range is less extensive. The agreeable influence it has is sufficiently prominent, and continues the same as we traverse higher latitudes; but its power of cooling the air gradually disappears, till it entirely ceases between the twenty-fifth and thirty-fifth degree, the exact spot fluctuating with the season of the year. An opposite effect now commences; the ocean, instead of cooling, parts with heat and elevates the temperature, whilst its power of curtailing the range remains the same. Island-climates have now higher annual and daily means, and are equally preferable as protecting us from the disagreeableness of another excess.

The conditions of an island-climate of this kind are visible over a very large portion of the continent of Europe, where its peculiarities are often developed. A comparison between its productions, and similar parallels on the continents of Asia and America, will soon satisfy us as to this circumstance. In Europe where the oak, ash, beech, and elm thrive, there are in America gloomy forests of fir and cypress. At Nootka Sound, in the western or warmer coast of America, and in a lower latitude than London, a dense forest invests the surface, consisting of species of *Abies*, *Cupressus*, *Betula*, and *Cerasus*, with shrubs of *Ribes*, *Rubus*, *Rosa*, *Vaccinium*, and *Andromeda*. Barley and rye are cultivated in Europe within the arctic circle, and forests of *Pinus sylvestris* reach to the extremity of the continent. Nothing like this occurs in America, where we find instead a scanty vegetation of lowly bushes of *Salix*, *Juniperus*, and *Betula*. At San Francisco in California, in 38° N. lat., the open forest of this fine country is composed of trees of *Quercus*, four species, two deciduous, two evergreen; *Fraxinus*; *Platanus*; *Salix*, several species; *Pavia*; *Populus*; *Betula*; *Juglans*; and often an abundant undergrowth of various shrubby *Compositæ*. *Pinus rigida* grows at the level of the ocean, and *P. religiosa* on the elevated land. In Europe we can ascend several degrees of latitude higher and still be surrounded by a milder vegetation, though the Alps present a natural and stupendous barrier to the diffusion of the southern flora. The vegetation is everywhere open, and large trees unfrequent; its larger members belong to *Quercus*, several evergreen species; *Phillyrea*; *Buxus*; *Cistus*, numerous species; *Pistacia*, and *Paliurus*. The ash meets too warm a temperature below 41°; oranges and olives are cultivated in great abundance. *Chamærops* has in Europe a representative as far north as 44°, whilst on the eastern coast of North America a near relative is limited to 36°. Some species of *Pinus* are found throughout Spain, and on its Mediterranean shores *P. halepensis* and *P. pinea* flourish.

Asia partakes of the features of America in a comparison with Europe. *Quercus robur* ceases 2° further south, and grows but sparingly below this. Barley is not cultivated nearly so far north as in Europe; *Pinus sylvestris* does not venture near the arctic circle, and many of the forest trees common to both are all more or less circumscribed by a less favourable climate. Towards Europe the vegetation of Asia becomes imperceptibly blended with that of the former. In the north-west part of Europe the climate is severer, and resembles closely the Asiatic; on this side it is invested by mountain ranges, and the cold winds blowing from them are piercing, and contrast strongly with the hot winds of the south, and the moist westerly breezes from the Atlantic Ocean.

The disparity in the temperature of the northern and southern hemispheres also originates in the equalizing power of the ocean. In the southern the proportion of water to land is greatest; within the tropics there is no great difference, but beyond them it becomes important, and as there is here no great extent of dry land, the climate possesses in many respects the character of an island-climate. To say that one hemisphere is hotter or colder than the other, is not expressing the actual condition of either; one possesses a continental climate, or a climate tending to extremes; the other an island-climate, or one limited in its range of temperature. The summers of the extra-tropical regions of the southern hemisphere are not so warm, nor the winters so cold, as in the northern; yet the total amount of the mean maximum temperatures of each throughout the year would in all probability be very similar. Under these conditions vegetation appears not to thrive so well as where the seasons are subject to extremes: thus the southern lands are almost destitute of a plant where the north of Europe supports a tolerable vegetation.

Along the margins of continents there are portions of the surface which experience the effects of the ocean, whilst beyond this in the interior a continental climate is retained. These strips have a modification of climate holding a station between continents and islands: their temperature is of course governed by the region of waters flowing around them, and are also exposed to vicissitudes from the interior. Mr. Kirwan has made an estimate of the progression of temperature in these cases; for every fifty miles from the sea he states the annual mean to be affected according to the latitude as follows:—

From latitude	70° to 35°	cooled	$\frac{1}{5}$	of a degree.
...	35 ... 30	...	$\frac{1}{8}$	...
...	30 ... 25	warmed	$\frac{1}{5}$	...
...	25 ... 20	...	$\frac{1}{2}$	...
...	20 ... 10	...	1°	

Malte-Brun, though he has treated the effects of aspect with considerable happiness, has hardly distinguished the influence of the direction of a surface, apart from its inclination, with sufficient accuracy. Aspect expresses the direction of a surface in regard to the sun; to have a good aspect is to hold one opposite to its midday rays. At the same time, inclination of surface must not be overlooked, for presently we shall show that it materially influences the temperature. Every mountain range displays a crowd of instances of its effects on the vegetable kingdom, on the habits of animals, and the migration of man. To prevent any unnecessary repetition of words, we shall confine our attention to the circumstances of inclination and direction of surface in the northern hemisphere; and on reconsidering this subject in the southern, the same causes will be found active, with the only necessary allowance for the opposite situation of the sun.

A mountain may be imagined with four sides, the direction of whose aspect is such that they regard the four points of the compass, east, west, north, and south. Suppose, further, that these sides have a regular slope or inclination, which we shall place at 45 degrees. At sun-rise in the morning the rays of heat will strike on the east side, making an allowance for the sun's rising a little to the south of true east. They will act but feebly, both from the cool air they have to traverse, and from the very trifling elevation of the sun, this latter circumstance causing them to arrive at a very unfavourable angle. The sun gradually reaches the southern side, and continues to ascend in its course. The surface becomes warmed, heat is imparted to the atmosphere, and they continue to receive warmth till some time after midday. The eastern side, however, is momentarily less exposed, and those it has received have been only the cooler rays of the morning, whilst the west is gradually becoming bared to the sun, after it has attained its meridian height and power, and the surrounding objects are all well warmed. Hence we perceive the advantage of a southern aspect in the northern hemisphere, and the superiority of a west over an east. We have supposed the sides of the mountain to have an inclination of 45°; if the meridian elevation of the sun only attains 30°, we shall have its rays impinging at an angle of 75°, and one capable of imparting very considerable warmth. By substituting any known mountain, and converting our plane sides into the customary irregularities and depressions, valleys and ridges, the great advantages of aspect will be more manifest, especially after watching the daily passage of the sun over it, and gaining an acquaintance with the vegetable productions.

Were it not for the atmosphere, the temperature throughout the day would follow the different dispositions of the sun with regularity. Instead, however, the early sun gives out very little sensible warmth, its real heat being absorbed by the atmosphere after its reflection from the surface of the earth. Even at midday, when it might be supposed that the sun was diffusing most heat, the temperature of the air has not reached its maximum. The time of this varies with the latitude between the hours of 1 and 3 P.M. In the afternoon, when the air is thoroughly warmed, and the sun approaches the western skies, the warmest portion of the day has arrived, and the atmosphere retaining the heat with some tenacity, the subsequent depression of temperature takes place slowly. Every one must at times have felt the power of the declining sun's rays through a heated atmosphere when they fall on the uncovered parts of the body. This different diffusion of apparent heat, at periods when the sun holds similar situations with regard to the earth, has its effect on aspect, and bestows some superiority on a position exposed to the afternoon's sun; thus somewhere between the south and west points will be found preferable; the mean, south-west, is perhaps the best; in low latitudes approaching a little to the south, and in high to the west. It is due to the superiority of the south-west aspect that Madeira is able to produce its Malmsey and Cercial wines, for it is on this that the vine which yields them is alone cultivated.

To ascertain the value of this varying intensity, I took the opportunity of the sun being very near the zenith to make the observations contained in the table.

Macassar, lat. 5° 8′ S., September 30th.

Time.	Sun's Altitude.	Temp. of Shade.	Thermometer.			Remarks.
			Vertical.	45°	Horizontal.	
A.M. 9	45° 15′	80°	104°	108°	102°	The three thermometers placed in the sun had their bulbs covered with cotton blackened with Indian ink. A sea-breeze throughout from the westward, slightly increased about midday.
... 10	61	82	105	111	108	
... 11	74 20	82	101	106	109	
... 12	87 40	83	97	100	113	
P.M. 1	74 20	85	95	100	109	
... 2	61	85·5	93	101	105	
... 3	45 15	84·5	91	96	101	
... 4	29	84	91	92·5	93	

Perhaps the results of these observations are not altogether what might have been anticipated; they will however show incontestably the advantage of an inclined, or even of a horizontal surface over a vertical one, when the altitude of the sun is great. To convey an idea of the customary range of the sun's altitude in the latitude of London, I add it on four astronomical periods.

	Sun's meridian altitude.
March 21, vernal equinox	38° 41′ 40″
June 21, summer solstice	62 8 43
September 23, autumnal equinox .	38 41 14
December 21, winter solstice . . .	15 13 14

Our attention is now requisite on the north aspect. The long deep shadows which attend this position on the rising or setting of the sun are strongly characteristic of mountain scenery. In the evening, long before the sun approaches the horizon, the vegetation is plunged in shade, whilst the opposite side, perhaps of a fertile mountain valley, still lies exposed to its warm beams. The direct action of the sun, or the power of solar radiation, over the vegetation is much below the average. Inclined surfaces at an angle of 45° are far beyond what are usually found supporting a rich vegetation. But taking half this amount, it will require a greater altitude than is experienced by us during a portion of the year to relieve it at all from the shade. It is not then surprising that chains of mountains will offer a difference of thousands of feet on opposite flanks, in the limits of cultivation, or the growth of members of its flora. In addition to the obliquity of the sun's rays, when they really do reach the flora, their visit is for so short a period of the day, that their influence is hardly felt till they are about to disappear.

Some illustrations will show the practical advantages arising from aspect. In the mountains on the borders of Dumfries-shire and Clydesdale, the difference is marked between the north and south faces. In the former the snow often lies on the ground, and the sheep are fed with hay, whilst the flocks on the southern sides still find pasture. Esmark has observed in the Dofrines, that those sides which are exposed to the north and north-east have the snow line at 3000 feet above the level of the sea, whilst on the south and south-east declivities, where the exposure is so much more favourable, it attains an elevation of 7000 feet. In the Valais, one side of the alpine mountains is covered with perennial ice and snow, the opposite supporting a smiling vegetation of orchards and vineyards. Another part of the central Alps has been noticed to produce oats on its southern aspect at 3300 feet, and on the northern they were scarcely growing at 1800 feet.

The Himma-leh mountains offer numerous modifications of climate arising from local causes. Their examination would furnish illustrations of almost all the modifying causes found in the mountain ranges of other parts of the world; not being merely a barrier of elevated land intersecting a large country, but consisting of numerous minor ranges of mountains crowded together, pursuing at times all directions, and presenting all exposures: often, too, at great elevations extensive valleys are displayed, enjoying a climate unusually favourable. Indeed, the space occupied by the Himma-leh mountains embraces a great extent of country, both in length and breadth, as even the most constricted parts are many miles across. The general statement is, that there is a difference of 3000 feet between the two flanks, in the elevation to which cultivation and habitations extend. Though in the northern hemisphere the difference is in favour of the northern side, here corn-fields and the dwellings of men cease at 13,000 feet, which on the south are limited to 10,000 feet. This seems to be the general difference, whilst causes in particular places will be in action to increase or diminish it. Circumstances operating on both sides of the chain have been brought forward, to account for this departure from the usual course of things; one will perhaps be found enough, and it consists merely in the very considerable elevation of the table lands stretching from their northern roots. Immediately bordering the Himma-leh range to the north are the greater and the lesser Thibet, or, as M. Balbi terms them, east and west. He regards them as consisting of two extensive table lands, having the surprising height above the ocean of from 8000 to upwards of 14,000 feet. In addition to this elevation they contain large sandy plains; and the heating of the atmosphere from their burning surface, added to the necessary allowances for elevation, will fully account for the high station cultivation takes on the north flank. It will be sufficient to add, that on the southern side the presence of moisture, and the increased quantity of rain falling over the plain of India, will of course cause a depression of temperature unknown in the transparent and heated atmosphere of Thibet.

Valleys usually enjoy a milder climate than the adjacent country, from the protection afforded them by surrounding eminences. Some of those among the Himma-leh mountains on the Indian side have a vegetation hardly to be expected in such situations. The vegetation of the tropics has migrated into them, at elevations of 2000 feet and upwards. In these valleys the advantageous circumstances are, a protection from destructive winds, and an exposure to the warm temperature and copious rains of a tropic, or at least subtropic, climate. Detracting causes will sometimes occur even in valleys; the stillness of the air promotes nocturnal radiation from the soil, and under this heat rapidly disappears. Mr. Daniel on this subject says, "I have seen a difference of thirty degrees on the same night between two thermometers, one placed in a valley, the other on a surrounding eminence, in favour of the latter." The valleys in Switzerland are cold for another reason—the sides are often so precipitous that they are more properly ravines; the sun's rays descend into them only during a very small portion of the day, and the consequence is, the snow line often sinks 2500 feet.

Similar instances of the powerful agency of local causes might be multiplied indefinitely; I shall only give one more, which places it in another point of view, where what at first appears an unfavourable exposure, and what in reality it still continues to be, has enlarged the range of a plant. In many of the alpine valleys of Dauphiné the declivities with a northern exposure are covered with larch; those, on the other hand, with a southern aspect are entirely destitute of them.

Assuming a position at the equator, it will be observed, that a set of phænomena takes place simultaneously in two directions, and with a general resemblance; the one occurs with the latitude, the other with the elevation through the atmosphere. Already the decrease of temperature with the former has been noticed; it remains to speak of a similar circumstance in the latter. Saussure was one of the earliest in noting observations on this subject, and subsequent experience has confirmed their accuracy. Still the differences among observers are even now considerable; and it appears to be a circumstance subject to numerous disturbing agents. The seasons of the year affect it, for in summer Saussure found the thermometer to sink 1° for 292 feet of elevation, whilst in winter it required 419 feet to produce the same. Raymond's observations approach those of Saussure; he found it required 299 feet. Aubuisson gives 315 feet as equal to 1° of depression. Gay-Lussac conducted his observations on a more extensive scale, and in the summer he ascended from Paris to the surprising height of 22,960 feet; for the whole distance 341 feet were found to be equivalent to 1° of the thermometer. As the decrease is now known not to be uniform, and the observations of Gay-Lussac were not made at regular intervals, their value is very trifling. Besides, they were made in open space, and are likely to give a very different result to others made at certain gradations on the slope of a mountain. Some simultaneous observations were made at Geneva and Mount St. Bernard, which give 352 feet.

Observations have not been wanting in the British Isles. From the results it appears, that it requires here a less elevation to effect the same changes in the temperature than on the continent of Europe. Sir Thomas Brisbane and Mr. Wm. Gilbraith found it to be 212 feet in heights of 2000 or 3000 feet. Mr. Hewitt Watson has conducted similar experiments, and has communicated the minutiæ of his proceedings with an unreserve that gives them an additional value. Unfortunately he himself registered the observations at the heights and bases of the mountains, which sometimes embraced an interval of several hours. He also mentions that observations made on the same spot at different times varied considerably, being a confirmation of the opinion expressed above. Several temperatures were registered among the highland mountains; they fluctuated much, and the mean of the whole gave 216 feet for 1°. Further observations, made in Cumberland during warm and dry weather, gave 298 feet; and in Caernarvonshire in cold and moist weather 212 feet. This is the reverse of what Saussure had observed in different seasons.

The observations made on the continent, taken together, will yield a mean of 336·33 feet of elevation for every degree of depression in the thermometer. Those obtained in Great Britain have the mean of 234·50 feet for the same; and the two combined give 285·41 feet. By applying these means as a correction for the elevation of any place where the mean temperature has been accurately observed, and thus finding the mean temperature of the base at the level of the sea, it will only be necessary to compare the latter with the mean temperature in Leslie's table to ascertain their correctness. The Hospice of St. Gothard is fixed at an elevation of 6390 feet, and the mean temperature of the year is 30°·4; with the correction it will be 49° at the base, whilst the latitude of St. Gothard by the table gives a mean of 57°·6. Again, Berne is situated at 1650 feet, and has a mean temperature of 49°·2; the base will be 53°·9 by the correction, and by the table 57°·2. The corrections here applied are from the mean of the European continent, as being the situation both of the experiments and of the examples, and the results can hardly be considered as approximations. With the mean of Great Britain a greater correctness is apparently obtained, making the mean temperature of the bases respectively 57°·7 and 56°·3.

Another illustration taken from an extremely interesting spot will suffice. The city of Quito occupies a plain raised to 9500 feet, and surrounded by numerous volcanoes; among them are Chimborazo, Antisana, and Pichincha, with many others equally stupendous but less known. Its mean annual heat is 67°, and is situated only 13′ from the equator. In this instance we shall use the correction for the height given by Humboldt for the Andes, and take that for the elevation of Quito. This mean, so much above the European, will be mentioned presently; at present we find it to make the base of Quito enjoying a mean of 89°·4. The equatorial mean has been already dwelt upon; and though this surpasses it by some degrees, yet some allowances for the difference will be justified on the same grounds, that the elevated plains of Thibet extend the usefulness of the northern aspect of the Himma-leh mountains.

Thus the decrease of temperature on elevation does not take place uniformly, nor does it occur in the same ratio in the equatorial and in the temperate zones. Humboldt, whose opportunities of multiplying facts at great elevations have been so unbounded, found that the progression was very irregular among the Cordilleras. His observations reduced to English feet stand thus:—

	feet.		feet.	feet.			
From	0	to	3280,	309	are equal to	1°	Fahr.
...	3280	..	6561,	536	...	1°	...
...	6561	..	9842,	423	...	1°	...
...	9842	..	13,123,	239	...	1°	...
...	13,123	..	16,404,	328	...	1°	...

A comparison of these data with those already given for higher latitudes, will show that diminution of temperature on elevation takes place more rapidly for given distances in the temperate than in the tropic regions. Another table, also constructed by Humboldt, will furnish additional grounds for some conclusive results.

Height in English feet.	Equatorial zone from 0° to 10°		Temperate zone from 45° to 47°.	
	Mean temp.	Difference.	Mean temp.	Difference.
0	81·5°	0°	53·6°	0°
3195	71·2	10·3	41	12·6
6392	65·1	6·1	31·6	9·4
9587	57·7	7·4	23·4	8·2
12,792	44·6	13·1		
15,965	34·7	9·9		

These are observations for elevations with a rapid ascent, and accordingly having peculiar conditions: another disposition of surface occurs in extensive level countries having only a slight elevation in one or more directions, perhaps rising in a gradual ascent from the sea, or showing an inclined surface to the different points of the heavens; the mean temperature at their sea-level being known, on gradually ascending a decrease will happen; but, as stated by Mr. Kirwan, in different proportions according to the degree of elevation. Taking a height of 200 feet, if the ascent is so gradual as not to exceed six feet in a mile, the diminution in the mean annual temperature will be only $\frac{1}{4}$th of a degree; if 7 feet in the mile, $\frac{1}{3}$rd; 13 feet, $\frac{4}{10}$ths; and 15 feet, $\frac{1}{2}$.

Where observations differ so much, and where those made at one place are at variance with others made under similar circumstances at the same, and even maintain an irregularity through different steps in their ascent, it is impossible to draw any safe practical conclusions. The only plan, where a necessity exists, is to make such allowances as known facts warrant; supposing at the time that it is beyond our power to obtain results for ourselves, and that none have been already made. Within the tropics the table of Humboldt can be used. In the case of Quito we took the mean of its height, and with a success which cannot be considered unsatisfactory. In temperate latitudes the above details will furnish a guide, and also the comparative table of the equatorial and temperate zones. The latter will not be found to deviate much in the warmer temperate climates, but is decidedly too great for higher parallels. Among the colder of these climates a mean of from 200 to 250 feet may be used for a depression of 1° of the thermometer.

[To be continued.]

XXIII.—*Observations on the Progress recently made in the Natural History of the* Echinodermata. By Prof. Agassiz*.

With a view of rendering more complete the results which, in the preface to the first of these Monographs, I have given of my investigation of the *Echinodermata*, I shall here offer some remarks upon the progress recently made in the natural history of this class.

The memoirs which have appeared during several years past, or which are at the present moment in course of publication respecting these animals, are sufficiently numerous. Of these some relate to their classification in general, or to the descriptive natural history of the genera and species; others have reference to their anatomy, both actual and comparative, or it may be that they embrace the study of the numerous fossils which have represented this class at the epochs of the development of organic life. It is in this order that we shall now pass them in review, and in conclusion I shall give some account of the collections which I have lately had the opportunity of examining.

As these different departments of inquiry in the natural history of the *Echinodermata* have advanced rapidly, it is the more to be regretted that a knowledge of their habits, of their alimentation, of their growth, of the functions of their organs, &c., should as it were rest stationary, if we except some detached observations upon the European species.

The only work [among the publications coming under consideration] which embraces the entire class *Echinodermata*, is the delightful volume which Mr. Edward Forbes has published upon the British species (History of British Starfishes and other animals of the class *Echinodermata*, 1840–41). He divides them into six orders :—1st, the *Pinnigrada* or *Crinoideæ*; 2nd, the *Spinigrada* or *Ophiuridæ*, which he subdivides

* From the 'Monographies d'Echinodermes,' No. 2. [We have been favoured by Mr. Charlesworth with the communication and translation of the present article.—Ed.]

into the *Ophiuræ* proper, and *Euryales*; 3rd, the *Cirrhigrada* or *Asteriadæ,* which he subdivides into the *Urasteriæ, Solasteriæ, Goniasteriæ,* and *Asteriæ* proper; 4th, the *Cirrhi-Spinigrada* or *Echinidæ,* for which he adopts the subdivisions proposed in my 'Prodromus;' 5th, the *Cirrhi-Vermigrada* or *Holothuriadæ,* of which he makes four families, the *Psolidæ,* the *Pentactæ,* the *Thyones,* and the *Synaptæ*; 6th, the *Vermigrada* or *Sipunculidæ,* which he subdivides into three families, the *Sipunculaceæ,* the *Priapulaceæ* and *Thalassamaceæ.* He also places in orders of equal rank, the *Crinoideæ,* the *Ophiuridæ* and the *Asteriadæ,* which in my 'Prodrome d'une histoire naturelle des Echinodermes' I had left in a single order; and he reunites to the *Echinodermata* the *Sipunculidæ,* which I had withdrawn to place them with the *Annelides.* I am indeed convinced, after seeing the preparations shown me by Mr. Forbes and Mr. Goodsir, that the *Sipunculidæ* are undoubtedly *Echinodermata.* The descriptions given by Mr. Forbes of the British species are far more complete than the descriptions previously in my possession; he has also considerably augmented their number, especially in the *Holothuriadæ* and *Sipunculidæ.* Conjointly with his friend Mr. Goodsir, Mr. Forbes has established the two new genera *Psolinus* and *Ocnus,* and has circumscribed in a most rigorous manner my genera *Uraster* and *Cribella* in the *Asteriadæ.* Many of the species described by Mr. Forbes were discovered by Mr. Thompson of Belfast, and Mr. Ball of Dublin. Mr. Forbes had previously published, in the eighth vol. of the 'Wernerian Transactions of Edinburgh,' a memoir upon the *Asteriadæ* of the Irish Sea, in which he had established two new genera (*Solaster* and *Luidia*) and described many new species.

MM. J. Müller and Troschel have undertaken a revision of the Starfishes (*Asteriadæ*), which they first divide into fourteen and then into sixteen genera, the characters of which are for the most part new and generally circumscribed within just limits. These genera are as follows:—*Asteracanthion,* Mül. and Tros. (Stellonia, Nard., Forb., Uraster, Ag.); *Pisaster,* Mül. and Tros.; *Stichaster,* Mül. and Tros.; *Echinaster,* Mül. and Tros.; *Crossaster,* Mül. and Tros. (Solaster, Forbes); *Chætaster,* Mül. and Tros.; *Ophidiaster,* Ag.; *Linckia,* Nard. (Mül. and Tros.); *Goniaster,* Ag.; *Platyaster,* De Blain. (Scutasterias, De Bl.); *Asterope,* Mül. and Tros.; *Culcita,* Ag.; *Asteriscus,* Mül. and Tros. (Asterina, Nard., Palmipes, Linck); *Archaster,* Mül. and Tros.; *Asterias,* Ag. (Astropecten, Linck, Stellaria, Nard.); *Hemicnemis,* Mül. and Tros. (Luidia, Forbes). The researches of these gentlemen, as yet only made known by extracts which have appeared in the Bulletins of the Academy of Berlin for April 1840, and in Wiegmann's 'Archives' for the same year (pp. 318 and 367), contain valuable details upon the organization of these animals. More recently MM. Müller and Troschel have extended their investigation to the *Ophiuridæ*, and have published a highly interesting sketch of the genera in this family, whose number they contend is not less than eight, without including the genera which I have established in the fossil species. These genera are *Ophiolepis*, Mül. and Tros.; *Ophiopholis*, Mül. and Tros.; *Ophiocoma*, Ag.; *Ophiothrix*, Mül. and Tros.; *Ophioderma*, Mül. and Tros. (Ophiura, Lam.); *Ophionyx*, Mül. and Tros.; *Ophiomyxa*, Mül. and Tros.; and *Ophiocnemis*, Mül. and Tros. (Wieg. Archiv, 1840, pp. 326–368).

Mr. J. E. Gray has published an extended and very important memoir on the *Asteriæ* in the 'Annals and Magazine of Natural History' for Nov. and Dec. 1840. The tendency of this memoir differs altogether from that published by MM. Müller and Troschel; for whilst the Berlin naturalists had especially in view the study of the organization of the *Asteriæ* in detail, Mr. Gray had for his object the grouping in the most natural manner the entire assemblage of species which he had had occasion to examine, and which are very numerous, particularly in the section of the *Pentacerotidæ*. Mr. Gray establishes among the true *Asteriæ* alone, forty-five genera (besides numerous subgenera), which he divides into the four following families:—

Asteriadæ, Gray: *Asterias*, Gray (Pentasterias, De Bl., Stellonia, Nardo, Forbes, Uraster, Ag., Asteracanthion, Mül. and Tros.); *Heliaster*, Gray (Solasterias, De Bl.); *Tonia*, Gray (Stichaster, Mül. and Tros.).

Astropectinidæ, Gray: *Nauricia*, Gray (Archaster, Mül. and Tros.); *Astropecten*, Linck (Asterias, L., Ag., Crenaster, Linck, Stellaria, Nardo); with the subgenus *Astropus*, Gray, *Luidia*, Forbes (Hemicnemis, Mül. and Tros.); *Petalaster*, Gray; *Solaster*, Forbes (Crossaster, Mül. and Tros.); with the subgenera *Endeca*, Gray, and *Polyaster*, Gray; *Henricia*, Gray (Linckia, Forbes, Cribella, Ag., Forbes).

Pentacerotidæ, Gray. 1st, *Pentacerotina*: *Culcita*, Ag.; *Pentaceros*, Linck, Gray (Goniaster, Ag.), with the subgenera *Nidorellia*, Gray; *Stellaster*, Gray; *Comptonia*, Gray; *Gymnasteria*, Gray (Asterope, Mül. and Tros.); *Paulia*, Gray; *Randasia*, Gray; *Anthenea*, Gray; *Hosea*, Gray; *Hippasteria*, Gray; *Calliaster*, Gray; *Goniaster*, Ag. (Gray); *Pentagonaster*, Gray; *Tosia*, Gray. 2nd, *Echinasterina*: *Echinaster*, Gray (now Mül. and Tros.). 3rd, *Cribellina*: *Othilia*, Gray (Echinaster, Mül. and Tros.); *Metrodira*, Gray (Chætaster, Mül. and Tros.); *Rhopia*, Gray (Echinaster, Mül. and Tros.); *Ferdina*, Gray; *Dactylosaster*, Gray (Ophidaster, Agass.); *Tamaria*, Gray; *Cistina*, Gray; *Ophidiaster*, Ag., with the subgenera *Hacelia* and *Pharia*, Gray; *Linckia*, Nardo, Gray, with the subgenera *Phataria*, Gray; *Fromia*, Gray (Linckia, Nardo); *Gomophia*, Gray; *Nardoa*, Gray (Linckia, Nardo); *Narcissia*, Gray; *Nectria*, Gray; *Nepanthia*, Gray; *Mithrodia*, Gray; *Uniophora*, Gray.

Asterinidæ, Gray: *Palmapes*, Linck (Anseropoda, Nardo, Palmasterias, De Blainv., Asteriscus, Mül. and Tros.); *Porania*, Gray (Goniaster, Forbes); *Asterina*, Nardo (Ctenaster, Ag., Asteriscus, Mül. and Tros., Pentaceros, Linck); *Partiria*, Gray; *Socomia*, Gray.

Notwithstanding their multiplicity, the greater part of these divisions appear to me natural, and I think that they should be adopted after a correction of the nomenclature, for many of the generic terms are synonymous with those of MM. Müller and Troschel and others, as may be seen from the names which I have added in parenthesis to the names proposed by Mr. Gray. It is much to be regretted that this gentleman should not have been cognisant of the memoir by MM. Müller and Troschel, which has nevertheless six months' priority over his. Mr. Gray regards the *Asteriæ* as a distinct class, to which he gives the name Hypostoma; but I think that their separation from the other *Echinodermata* should be justified upon anatomical as well as zoological evidence. In fact, the character by which hitherto it has been principally asserted that the Starfishes may be distinguished from the Sea-urchins is fallacious, since most of the *Asteriæ* possess an *anus*, as was first pointed out by M. J. Müller.

M. Ch. Desmoulin's researches among the *Echinites* is a work which should be in the hands of all those who pursue the natural history of the *Echinodermata*. Without entering here upon any detailed statement, I shall simply mention that M. Desmoulins does not admit more than seventeen genera in the order of the *Echinidæ*, which are *Clypeaster*, *Scutella*, *Fibularia*, *Cassidulus*, *Galerites*, *Pyrina*, *Echinometra*, *Echinus*, *Echinocidaris*, *Diadema*, *Cidaris*, *Echinoneus*, *Echinolampas*, *Nucleolites*, *Collyrites*, *Ananchytes* and *Spatangus*. Previously to this publication M. Desmoulins had published a descriptive catalogue, with two plates, of the living and fossil *Stelleridæ* of the Gironde (Actes de la Soc. Linnéenne de Bordeaux, tom. v.).

Among the works especially deserving notice is the monograph upon the *Asteriæ* allied to *Asterias aurantiaca*, which M. Philippi has published in Wiegm. 'Archiv,' 1837, vol. i. p. 193, and the description of a new and most curious living genus of *Crinoideæ*, named *Holopus*, which M. d'Orbigny has published in Guérin's 'Mag. de Zool.' for 1837*. In a

* Translated with illustrations in Mag. Nat. Hist., New Series, vol. iv. p. 352.—Ed.

monograph which it is my intention shortly to publish upon the living species of the genus *Echinus* (Auct. Antiq.) I have established the following divisions, of which I here only indicate the typical species: *Temnopleurus* (Ech. toreumaticus), *Pleurochinus* (E. bothyroides), *Microcyphus* (E. versicolor), *Tripneustes* (E. ventricosus), *Amblypneustes* (E. griseus), *Taxopneustes* (E. pileolus), *Stomopneustes* (E. variolaris). I have also thought it better to form three subdivisions of the genus *Arbacia*, restricting that name to the small fossil species, and proposing that of *Tragypus* for the species whose anus is closed by a valve of four pieces, and that of *Agarites* for those which have the interambulacral areas partially destitute of tubercles and spines.

The *Holothuriæ* are always the division of *Echinodermata* in which there remains the most to be effected. The difficulty of observing these animals has hitherto not enabled the science to be supplied with designs (*planches*) sufficient for its exigencies. There are none but those which are published by MM. Quoy and Gaimard in the 'Zoological Atlas of the Astrolabe,' and which, as it regards their execution, do not leave anything to be wished for; but as it respects their distribution into genera, a great deal too much of vagueness and uncertainty is presented by the characters selected as the basis of the groups.

Oken (Lehrbuch der Naturgeschichte, 1815) was the first to divide the *Holothuriæ* into four genera, which he calls *Thyone*, *Subuculus*, *Holothuria* and *Psolus*. Lamarck only admits two genera in this family, the *Holothuriæ* and the *Fistulariæ*; these genera again are not well determined. Cuvier, without giving generic names to his divisions, has nevertheless established, in the first edition of the 'Règne Animal,' six very natural sections in the genus *Holothuria*, the first of which corresponds to the genus *Psolus* of Oken, the second to the genus *Cuvieria* of Peron, the third and fourth to the true *Holothuriæ*, the fifth and sixth to the genus *Subuculus* of Oken, which is also synonymous with the genus *Cucumaria*, Auct., or *Pentacta* of Goldfuss; lastly, the sixth corresponds to the genus *Thyone* of Oken, which Mr. Fleming has named *Mülleria* in his 'History of British Animals,' but which is not the genus *Mülleria* of Jæger. Eschscholtz subsequently established in the 'Zoological Atlas,' after the second voyage of Capt. Kotzebue round the world, two new genera under the names *Synapta* and *Chisodota*, which correspond to the genus *Tiedemannia* of Leuckardt (Isis, 1831, Compte rendu de la réunion des Naturalistes Allemands à Hambourg). M. Leuckardt has also established the genera *Phascolosoma* and *Oche-*

tostoma in the family *Sipunculaceæ*; the first in his address upon the anniversary of Blumenbach (*jubilé de Blumenbach*), the second conjointly with M. Ruppell, in the Atlas appended to the journey into the north of Africa.

M. Jæger, in his dissertation upon the *Holothuriæ* (Zurich, 1833–4), has established three new divisions under the names *Mülleria, Bohadschia* and *Trepang*; but his genus *Mülleria* is not, as he supposes, identical with the genus *Mülleria* of Fleming. The second part of this treatise has reference to the anatomical details. In my Prodromus of a monograph upon the *Radiata* or *Echinodermata*, I restricted myself, as it regarded the order *Holothuriæ*, to enumerating that which had been already published, not having made at that time any observations of my own upon these animals.

The most extensive work which has appeared for a long time upon the *Holothuriæ* is that of Brandt; it forms part of his 'Prodromus descriptionis animalium ab H. Mertensio observat.' &c., inserted in the 'Recueil des Actes de la séance publique de l'Acad. des Sc. de St. Petersbourg,' 1835. He at first divides this family into two large groups, the *Pedatæ* and the *Apodes*; then he subdivides the Pedatæ into the *Homoipodes* and *Heteropodes*; the Homoipodes are in their turn divided into the *Dendropneumones* and *Apneumones*; the Dendropneumones again into *Peripodes* and *Hypopodes*, and the Peripodes into *Pentastichæ* or *Sporadipodes*; then the Pentastichæ are *Adeptopneumones* with the genera *Cladodactyla* (and the subgenera *Polyclados* and *Hologoclados*, Br.) and *Dactylota*, Br., or *Detopneumones*, with the genus *Aspidochir*, Br. The Sporadipodes only include the genus *Sporadipus*, Br., with the subgenera *Colpochirota* and *Acolpos*, Br. The Hypopodes, which are all *Platygastricæ*, include the genera *Psolus*, Oken (Jæg.), and *Cuvieria*, Per., and the Apneumones the single genus *Oncinolabes*, Br. The Heteropodes he subdivides into the *Stichopodes*, Br., with the genera *Stichopus* (which includes the subgenera *Perideris* and *Gymnochirota*, Br.) and *Diploperideris*, Br., and *Sporadipodes*, Br., which are either *Aspidochirotæ*, Br., with the genera *Holothuria*, Lin. (Br.) (and the subgenera *Thelenota*, *Camarosoma*, *Platysoma* and *Microthele*, Br.), *Bohadschia*, Jæger, *Mülleria*, Jæg., *Trepang*, Jæg., or *Dendrochirotæ*, with the genus *Cladolabes*, Br. The second great group, the Apodes, are subdivided into the *Pneumonophoræ*, with the genera *Liosoma*, Br., and *Chirodota*, Esch., and into *Apneumones*, with the genus *Synapta*, Esch. This systematic arrangement is accompanied by the description of a great number of species, principally discovered by Mertens.

Brandt afterwards describes three new species of *Sipuncu-*

lus and an *Echiurus.* Lastly, in the order of *Echinidæ* he establishes the following genera:—*Strongylocentrotus* for some new species, *Heterocentrotus* for the species of which I have formed the genus *Acrocladia, Colobrocentrotus* for those which I place in my genus *Podophora,* and *Phyllacanthus* for the *Ciderites* with large cylindrical and tuberculated spines.

M. De Blainville, in the 'Dictionary of Natural Sciences' (vol. lx.), only admits in the family *Holothuriæ* the five following genera:—*Cuvieria, Holothuria, Thyone, Fistularia* and *Cucumaria*; but in the Supplement to his 'Manuel d'Actinologie' he divides it into six groups, in which he adopts in part the genera proposed by his predecessors. His articles upon the *Echinodermata* in the 'Dictionary of Natural Sciences,' and in his 'Manuel d'Actinologie,' which is a systematic collection, contain much valuable information upon the entire class. Lastly, the numerous notes appended by M. Desjardin to the third volume of the second edition of Lamarck's 'Animaux sans Vertèbres,' have in this work brought up the history of the *Echinodermata* to the actual state of the science.

At my solicitation Professor Valentin has undertaken for the present publication, a general revision of the anatomy of the *Echinodermata*; his first monograph, embracing the anatomy of the genus *Echinus,* is already completed. Eight folio plates, drawn under the superintendence of M. Valentin by M. Dickmann, a very skilful draughtsman, are also lithographed, and the accompanying text is going through the press at this moment. The scientific world knows what it may look for from the dissecting-knife and the pen of M. Valentin; I shall only remark here, in justice to his disinterestedness, that M. Valentin, at his own expense, has made a voyage along the coasts of the Mediterranean for the special purpose of devoting himself to the necessary researches for completing this undertaking. Monographs upon the organization of these animals are at the present time so much the more necessary, as since the labours of Tiedemann and Delle Chiage, the greater part of the investigations made in this department of science relate to points of detail. The article '*Echinodermata*' by Sharpey, in Todd's 'Encyclopædia of Anatomy and Physiology,' contains a summary of all that is known of the organization of this class of animals.

Some monographs of very recent date have helped to extend this branch of scientific research. M. Grube has published a very complete anatomical description of the *Sipunculus nudus,* accompanied with well-executed illustrations (Müller's Archiv, 1837, p. 237). M. Krohn (ibid, 1839, p. 348) has added some details upon the nervous system of this species which had escaped the observation of M. Grube.

M. J. Müller has studied in great detail the organization, considered comparatively, of the *Pentacrinus Caput Medusæ*, of which he has just procured an example, preserved in spirits of wine. The publication of his memoir will form a most important addition to our knowledge of the anatomy of the *Echinodermata*: unfortunately as yet an extract of it only has appeared in the Bulletin of the Berlin Academy for April 1840; but so concise, and so rich in new facts, that it would be necessary to quote it entire to give a just idea of its value. So much of it as is already made public is of the highest interest, whether considered anatomically or zoologically. M. J. Müller, in his description of the solid parts of this animal, rejecting the fanciful nomenclature first employed by Miller, and subsequently by all those who have since written upon the *Crinoideæ*, proposes a far more simple terminology for its complex frame-work.

Many points of detail relating to the anatomy of the *Echinodermata* have been investigated with equal success. M. Krohn has published a very interesting memoir upon the nervous system of the *Echinidæ* and *Holothuriadæ* (Müller's Archiv, 1841, p. 1), which M. van Beneden has observed in the Sea-urchins (Instit., No. 273, p. 96). Ehrenberg first discovered the existence of eyes in the *Asteriæ* (Müller's Archiv, 1834, p. 570), and described their connexion with the nerves of the rays; they may be very easily seen in many species, even when in the dry state. Mr. Forbes subsequently pointed them out in the Sea-urchins (Hist. Brit. Starf., p. 152), and I have since observed them in many species. MM. Ehrenberg (Müller's Archiv, 1834, p. 580), de Siebold (ibid, 1836, p. 291), Valentin (Repert., vol. ii. p. 26), and J. Müller (Bul. de l'Acad. de Berlin, 1840), have given detailed information respecting the calcareous network of which the solid framework (*charpente solide*) of the *Echinodermata* is composed. For my own part I have endeavoured to determine the laws of the disposition and of the increase of the separate plates, and their analogy in different families (Mémoires de la Soc. des Sc. Nat. de Neuchâtel, tom. i. p. 2—6 and 7—11), respecting which M. Philippi has offered certain objections (Wiegmann's Archiv, 1837, vol. i. p. 194). M. Duvernoy has communicated to the French Academy of Sciences his ideas respecting the solid framework of these animals (Instit. 1837, No. 216, p. 208), to which he attributes an internal skeleton, but *périphérique* (Sea-urchins), whilst he regards the *Asteriæ* as formed of the union of numerous individuals attached around a common mouth. In a notice on some points of the organization of the *Euryales* (Mém. de la Soc. des Sc. Nat. de Neuchâtel, tom. ii.), I have given circumstantial details of the structure and disposition of the solid parts of these animals, and have described comparatively two new species.

Messrs. Sars and Forbes have reviewed what Otto Fr. Müller has said respecting the *Pedicellariæ* of the *Echinodermata*, and have added some new observations upon these singular bodies (Hist. of Brit. Starf., p. 155).

[To be continued.]

XXIV.—*On the Natural Arrangement of Fishes.* By W. S. MacLeay, Esq., A.M., F.L.S., in a Letter to J. M'Clelland, Esq., dated Elizabeth Bay, near Sidney, N. S. W., September 12th, 1840 *.

My Dear Sir,

I cannot find terms to express my gratitude for your kind letter of the 12th March last, and for the very valuable present which it accompanied. I assure you, that your excellent work on *Cyprinidæ* has afforded me the greatest delight, and the more so, inasmuch as I am convinced natural arrangement is always best tested by accurate analysis, and also inasmuch as I am not by any means satisfied with Swainson's arrangement of Fishes. As from everything Swainson writes there is information to be derived, so I assure you, his little volume on Reptiles and Fishes has not been lost on me; yet the perusal of your Monograph on Indian *Cyprinidæ* † has made me recur to my old views on a subject which our common friend Dr. Cantor may have told you has long occupied my thought; and although perhaps you will deem these views not sufficiently worked out, and rather crude, I cannot refrain from making you acquainted with them, in order that I may have the benefit of comparing your general arrangement of Fishes with my own.

Fishes form a class of Vertebrata which has never yet been satisfactorily divided into orders. I do not think that *Acanthopterygii* and *Malacopterygii*, for instance, are natural orders. In order therefore to arrive at the first great and natural division of Fishes, I think we must commence by incontestable data, or at least by facts that are generally agreed on. Such facts, for instance, I hold to be the three following, viz. 1. The near approach of fishes to Batrachian Amphibia, which with Swainson I consider to be made by means of *Lophius* and *Malthe*. 2ndly. The near approach of fishes to Cetaceous Mammalia, which with him also I consider to take place by means of *Selache* and the viviparous Sharks. 3rdly. As the grand character of fishes as a class is, their being the most imperfect of Vertebrata,

* From the Calcutta Journal of Nat. Hist. for July 1841.

† See Ann. and Mag. Nat. Hist., vol. viii. p. 35.

the most typical of fishes ought therefore to be the most imperfect of them, *i. e.* the furthest removed from the type of Vertebrata. Such fishes are evidently the *Cyclostomi* of Cuvier, such as *Myxine*, and other genera leading off to *Annulosa*. Though essentially aberrant, as they relate to vertebrated animals, the Cyclostomous fishes are typical as respects the circle of fishes. Now it is this circle of fishes in which we have the above three data, namely, the two aberrant orders and one typical order : consequently I arrange the class as follows, into orders :—

ABERRANT GROUP.

CTENOBRANCHII. Gills pectinated.

1. PLAGIOSTOMI, *Cuv.*	Cartilaginous fish with fixt branchiæ, *leading to Mammalia.*
2. STURIONES, *Cuv.*	Cartilaginous fish with free branchiæ.
3. OSTINOPTERYGII, *MacL.*	Bony fish with free branchiæ, *leading to Amphibia.*

NORMAL GROUP.

ACTENOBRANCHII. Fish breathing by gills not pectinated.

4. LOPHOBRANCHII, *Cuv.*	Bony fish breathing by tufts arranged in pairs along the branchial arches.
5. CYCLOSTOMI, *Cuv.*	Cartilaginous fish breathing by a series of cells.

Now this arrangement differs from that of Swainson, in making the vast majority of fishes an aberrant group ; but it is the structure, not the number of species it contains, that determines the place of a group in nature. The group *Ungulata* is just as important now, when containing comparatively few genera, as it was in the antediluvian ages, when it contained an immense number of them. Besides, I will venture to say, that the above circular arrangement of fishes expresses their place among Vertebrata better than that of Swainson. I shall differ from him still further as I go on. But in the mean time I must observe, that the above and following new names are merely used in order that you may the better understand my meaning. I have been obliged to invent a technical name for bony fishes with pectinated gills, viz.

OSTINOPTERYGII,

which may thus be divided into tribes :—

ABERRANT GROUP.

ACANTHOPTERYGII, Artedi. Spines in first dorsal hard.—*Quere.* Are all these Ctenodians of Agassiz?

1. BALISTINA.	Plectognathi, *Cuv.*	Maxillary bones soldered to the intermaxillaries, and both to the palatine arch. Opercula and gills concealed under the skin.
2. PERCINA.		Bones of the jaws free and complete. Operculum distinct. Operculum or preoperculum generally with dentated edges, or with spines.
3. FISTULARINA.		Bones of the jaws free and complete. Operculum distinct. Operculum and preoperculum generally with smooth edges.

NORMAL GROUP.

MALACOPTERYGII, Artedi. Spines in dorsals soft.—*Quere.* Are all these Cycloidians of Agassiz?

4. PLEURONECTINA.	Ventral fins, when existing, inserted under the pectorals, and directly suspended to the bones of the shoulder.
5. CLUPEINA. Abdominales, *Cuv.*	Ventrals suspended behind the pectorals, and not attached to the bones of the shoulders.

Obs.—The *Balistina*, by the confluence of the bones of their jaw, and by the tardy induration of their skeleton, evidently lead off to the Sturgeons, with which they agree in having their free branchiæ opening by a perforation in the skin behind the temple. The *Fistularina* evidently lead off to the *Lophobranchii* by *Fistularia*. Unfortunately I have not been able to find a near character to separate *Fistularina* from *Percina*; but they are natural groups, because each forms a circle. The following groups appear to be nearly those into which the above tribes may be naturally divided :—

1. Balistina.	2. Percina.	3. Fistularina.
1. Balistidæ?	1. Chætodontidæ.	1. Scombridæ.
2. Ostraciontidæ?	2. Percidæ.	2. Fistularidæ.
3. Cephalaspis? *Ag.*	3. Scorpænidæ.	3. Gobioidæ.
4. Orthogoriscidæ?	4. Cirrhitidæ.	4. Lophiidæ.
5. Diodontidæ?	5. Sparidæ.	5. Labridæ.

4. Pleuronectina.	5. Clupeina.
1. Anguillidæ.	1. Siluridæ.
2. Echeneidæ.	2. Cypriuidæ.
3. Cyclopteridæ.	3. Esocidæ.
4. Pleuronectidæ.	4. Clupeidæ.
5. Gadidæ.	5. Salmonidæ.

Obs.—I do not believe the above places of the families of *Balistina* to be correct: besides I only know four. I shall say little therefore respecting them, except that I suspect some undiscovered family of BALISTINA leads off to the genus *Monocentris*, among the *Scorpænidæ*. I shall begin therefore with the true PERCINA and the family *Scorpænidæ*. The following are the probable genera of *Scorpænidæ*, which family agrees with the group called *Buccæ Loricatæ* by Cuvier; but it is rather a stirps than a family, and the following genera ought to be deemed of the rank of families :—

ABERRANT GROUP.

Head either tuberculous or spinous.

1. Monocentris, *Linn.*	Free spines in lieu of first dorsal.
2. Trigla, *Linn.*	Two distinct dorsal fins.
3. Scorpæna, *Linn.*	Two dorsals more or less confluent.

NORMAL GROUP.

Head neither tuberculous nor spinous.

4. Orcosoma, *Cuv.*	Ventrals complete. Free cones in lieu of first dorsal.
5. Gasterosteus, *Linn.*	Ventrals reduced to a spine or spines. Free spines in lieu of first dorsal.

For subgenera, I must always refer to Cuvier and Valenciennes.

From *Scorpæna* we proceed by means of the subgenera *Sebastes* among the *Percidæ,* which is a family that I distinguish by having seven branchiostegal rays, no mailed cheeks, no scales on the fins, and always teeth on the palate.

Probable genera of *Percidæ.*

ABERRANT GROUP.	
Two dorsals distinct.	
1. PERCA, *Linn.*	Dorsal fins near. Teeth all small, preoperculum not dentated.
2. OPOGON, *Lacep.*	Dorsals separate, some of the teeth long.
3. EXOPLOSUS, *Cur.*	Dorsal fins near. Preoperculum dentated.
TYPICAL GROUP.	
Two dorsals confluent into one.	
4. SERRANUS, *Cuv.*	Teeth hooked. Preoperculum dentated.
5. OCEVINA, *Cuv.*	Teeth small, not hooked. Preoperculum not dentated.

From *Enoplosus* we proceed to *Ephippus* among the *Chætodontidæ,* or SQUAMIPENNES of Cuvier, of which the following are probably the genera :—

ABERRANT GROUP.	
No teeth on the palatines.	
1. EPHIPPUS, *Cuv.*	Dorsal emarginate, so as to show it to be composed by the confluence of two. Ventrals distinct.
2. PSETTUS, *Comm.*	Dorsal not emarginate. Ventrals evanescent.
3. CHÆTODON, *Linn.*	Dorsal not emarginate. Ventrals conspicuous.
NORMAL GROUP.	
Teeth on the palatines.	
4. TOXOTES, *Cuv.*	Dorsal long, opposite to the anal, and reaching close to the caudal.
5. PEMPHERIS, *Cuv.*	Dorsal short, opposite to the ventral, and far separated from the caudal.

From *Chætodon* we proceed to *Amphiprion* among the *Sparidæ,* which differ from the *Chætodontidæ* by having no scales on the fins, and from the *Percidæ* by having no teeth on the palatines. The following may be the natural arrangement of *Sparidæ* into genera :—

ABERRANT GROUP.	
SCLÆNOIDES, Cuv. Operculum with spines.	Preoperculum dentated.
1. AMPHIPRION, *Bl.*	One dorsal. Branchial rays less than seven.
2. PRISTIPOMA, *Cuv.*	One dorsal. Seven branchial rays.
3. SCIÆNA, *Linn.*	Two dorsals distinct. Seven branchial rays.

TYPICAL GROUP.

No spines on the operculum, and the preoperculum not dentated.

4. MÆNA, *Cuv.* Mænides, *Cuv.* Upper jaw extensile.
5. SPARUS, *Linn.* Sparoides, *Cuv.* Upper jaw not extensile.

By means of *Polynemus* we pass from *Sciæna* to the *Cirrhitidæ*, which differ from the *Percidæ* in having in general either more or less than seven branchial rays, and from the *Sparidæ* in having teeth generally on the palatines. The *Cirrhitidæ*, however, differ from each other very much in form, as may be seen by the following genera, which are clearly of the rank of families :—

Two dorsals.

1. Polynemus, *Linn.*	Two dorsals distinct. Ventrals subabdominal.
2. Mullus, *Linn.*	Two dorsals distinct. Ventrals subpectoral. Branchial rays less than seven.
3. Trachinus, *Linn.*	Two dorsals united. Ventrals subjugular. Branchial rays more than seven.

One dorsal, ventral fins subpectoral.

4. Beryx, *Cuv.*	Branchial rays more than seven.
5. Cirrhites, *Comm.*	Branchial rays less than seven.

By means of *Trachinus* we return among the *Scorpænidæ*, from which we set out, so that the circle of PERCINA is completed. We now therefore proceed to the next tribe, FISTULARINA, which we enter by reason of the affinity reigning between the *Chætodontidæ* and *Scombridæ*, as displayed in such genera as, for instance, *Brama* and *Coryphæna*.

Probable genera of the *Scombridæ*, or family *Scomberoides* of Cuvier.

Body regular and pisciform.

1. Coryphæna, *Linn.*
2. Xiphias, *Linn.*
3. Scomber, *Linn.* Leading off by *Thyrsites* to *Lepidopus*.

Body laterally compressed and vertically elevated.

4. Stromateus, *Linn.*	Ventrals inconspicuous.
5. Zeus, *Linn.*	Ventrals conspicuous.

By *Lepidopus* we enter among the *Fistularidæ*, or long eel-shaped Acanthopterygians, which may be arranged as follows :—

TÆNOIDES, Cuv. One long dorsal. Cranium not produced into a tube. Body tolerably compressed.

1. Lepidopus, *Gouan.*	Muzzle elongated; mouth considerably cleft, and a caudal fin present.
2. Cepola, *Linn.*	Mouth considerably cleft; no caudal fin.
3. Gymnetrus, *Bl.*	Muzzle elongated, mouth small, caudal fin present.

FISTULARIDES, Cuv. Cranium produced into a tube.

4. Centriscus, *Linn.*	Body oval, compressed; scales conspicuous; dorsals two.
5. Fistularia, *Linn.*	Body elongated, cylindrical; scales small; only one dorsal.

By *Aulostomus* we return to *Lepidopus*, and by means of *Gymnetrus* and one of its subgenera, *Murænoides*, we pass to the *Gobioidæ*, a family easily known by the extreme length and tenacity of their dorsal spines. The following are possibly the genera which generally have a tubercular appendage to the anus:—

Ventrals not thoracic.

1. Blennius, *Linn.*	Ventral subjugular, consisting of only two rays. One dorsal.
2. Anarrhicas, *Linn.*	Ventrals none. One dorsal.
3. Callionymus, *Linn.*	Ventrals subjugular. Two dorsals.

Ventrals thoracic, or placed further back than the pectorals.

4. Mugil, *Linn.* Mugiloides, *Cuv.*	Ventrals separate. Cæca numerous. Two dorsals.
5. Gobius, *Linn.*	Ventrals united at base. Cæca none. Two dorsals, sometimes confluent into one.

By means of *Callionymus, Eleotris* and *Chirus*, we pass to the *Lophiidæ*, or Amphibious Acanthopterygians, of which the known genera may probably be as follows; but the truth is, that I have never had an opportunity of accurately examining any of Cuvier's '*Labyrinthiform Pharyngeals*.' The following genera are chiefly to be ranked as families:—

LABYRINTHIFORM PHARYNGEALS, Cuv. Carpal bones no elongated.

1. * * * * *	
2. Anabas, *Cuv.*	Spines in the fins?
3. Ophicephalus, *Bl.*	No spines in the fins?

PEDICLED PECTORALS, Cuv. Carpal bones elongated.

4. Batrachus, *Bl.*	One dorsal.
5. Lophius, *Linn.*	Two dorsals.

By means of *Ophicephalus* we pass to the *Labridæ*, or fleshy-lipped *Fistularina* that have no spines on their operculum or preoperculum. Their genera are probably as follows:—

Teeth concealed by the double lips, which are large and fleshy.

1. Labrus, *Linn.*	Muzzle not protractile. Body not laterally compressed. One dorsal.
2. Gomphosus, *Lac.*	Mouth protractile. One dorsal.
3. Xyricthys, *Cuv.*	Mouth not protractile. Body laterally compressed. Two dorsals.

Teeth uncovered by the lips, which are single.

4. Acanthurus, *Bl.* Theutyes, *Cuv.*	Spines arming some part of the body.
5. Scarus, *Linn.*	No spinous armature on the body.

By means of *Xyrichthys* we return among the *Scombridæ*, and so complete the circle of *Fistularina*, which is therefore a natural tribe.

Let us now go back to the family *Gobioidæ*, and by means of *Gobius* we can easily make the transition from the tribe *Fistularina* to the Malacopterygian family *Cyclopteridæ*, which forms part of the tribe PLEURONECTINA, *i. e.* Malacopterygian fishes, which have never their ventral fins abdominal.

The families of *Pleuronectina* are probably as follow; but they are rather *stirpes* than families:—

ABERRANT GROUP.

1. CYCLOPTERIDÆ. DISCOBOLI, *Cuv.* Ventrals united under throat.
2. ECHENEIDÆ. Ventrals separate.
3. ANGUILLIDÆ. APODES, *Linn.* Ventrals none.

NORMAL GROUP.

4. GADIDÆ. GADIDES, *Cuv.* Symmetrical body, with jugular ventrals far apart from anal fin.
5. PLEURONECTIDÆ. PLATESSA, *Cuv.* Body not symmetrical, having the ventrals generally a continuation of the anal.

Many genera of these families of *Pleuronectina* are wanting, so that I can only guess the above to be the natural series. *Brotula* and *Macrourus* certainly show the affinity of *Anguillidæ* to *Gadidæ.* The affinity of *Siluridæ* to *Anguillidæ* is well known, so that we next pass thus to the tribe CLUPEINA, which are Malacopterygian fishes with abdominal ventrals, *i. e.* the same as the group called ABDOMINALES by Cuvier. We are now more truly on the ground of your 'Monograph on Indian *Cyprinidæ*,' and I have little doubt of the following being really and truly the families or stirpes of the tribe CLUPEINA, viz.:—

ATHYLACENTERA. Intestinal canal not furnished with cæca.

1. SILURIDÆ. SILURIDES, *Cuv.* No true scales on body; representing PLAGIOSTOMI.
2. CYPRINIDÆ. CYPRINOIDES, *Cuv.* Body scaly, mouth slightly cleft; representing CYCLOSTOMI.
3. ESOCIDÆ. ESOCES, *Cuv.* Body scaly, mouth widely cleft; representing LOPHOBRANCHII.

THYLACENTERA. Intestinal canal furnished with cæca.

4. CLUPEIDÆ. CLUPEÆ, *Cuv.* No second dorsal; representing OSTINOPTERYGII.
5. SALMONIDÆ. SALMONIDES, *Cuv.* Second dorsal adipose; representing STURIONES.

I am often afraid of trusting myself to Mr. Swainson's method of drawing analogies between things in themselves wide apart. A person may reasonably doubt the legitimacy of any comparison between a fish and an insect, or even between a fish and a bird; because he may attribute all such resemblances to the imagination, the objects being in themselves so very dissimilar in every leading point of view. But no one can doubt that a fish may legitimately be compared with a fish, and every one will I think see that there is no effort of the imagination at work when a *Silurus* is compared with a *Chiloscyllium*, a *Cobites* with Cyclostomous fishes, or some of the mailed *Esocidæ* with the *Lophobranchii.* The *Clupeidæ* represent the *Ostinopterygii* typically in form, so that I have no doubt you will discover the analogy, as yet unknown to me, which exists between the *Salmonidæ* and *Sturiones.* I was ignorant of the true arrangement of *Cyprinidæ* until I read your valuable Monograph. I have now no doubt of its being nearly as follows into genera, or rather into families :—

VERÆ, M'Clel. Body regular.

1. PÆONOMINÆ, *M'Clel.*, or genus CYPRINUS, *L.* Intestinal canal long ; representing STURIONES.
2. SARCOBORINÆ, *M'Clel.*, or genus LEUCISCUS, *Kl.* Intestinal canal short ; representing OSTINOPTERYGII.

APALOPTERINÆ, M'Clel. Body invested with a slimy mucus.

3. PŒCILIANÆ, *M'Clel.*, or genus PŒCILIA, *Sch.* Snout prolonged, no cirri. Branchial rays more than three ; representing LOPHOBRANCHII.
4. COBITINÆ. Mouth provided with cirri. Branchial rays three ; CYCLOSTOMI.
5. PLATYCARINÆ, *M'Clel.*, or genus PLATYCARA, *M'Clel.* Head flattened, round and short. No cirri, branchial rays less than three; representing PLAGIOSTOMI.

Thus we see why the *Platycara* has the form of a shark; why Loaches, such as *Schistura*, M'Clel., have an analogy to the Lampreys and Myxines ; why *Psilorhynchus* has so long a snout ; and why *Gonorhynchus* has the muzzle of a sturgeon. The nearer two groups are in general structure, the more striking their parallel analogies will be ; and therefore I think, that by comparing fish with fish, we may obtain more striking analogies than by comparing them, as Swainson does, with Mammalia, birds, or insects ; at all events, we shall have less reason to distrust the effects of a fertile imagination. Still I am far from denying, that such analogies as he delights in exist in nature. I only say, that they are dangerous things to deal with, and that in his hands they often become far-fetched and even ludicrous. The cause of the greater part of the resemblances which he discovers between objects the most apart from each other in general structure, seems to be a general law of nature, which has ruled that in every group of animals there should be a minor group more essentially carnivorous, another minor group more essentially herbivorous, another more aquatic or natatorial, and so on. These minor groups may also be characterized by one being more essentially terrestrial, another more essentially aërial, another more aquatic, another more amphibious, and so on. These general principles are the occasion of resemblances between animals the most distinct in their structure, and therefore I understand perfectly what Swainson means when he speaks of a Rasorial type of fish ; yet surely it is an incorrect expression, for so far from fishes having been created on the models of Rasores or Grallatores, for all that we know, birds may have been created on Plagiostomous or Cyclostomous types. The general model was undoubtedly one ; but why Swainson should assume this one model to have been taken from birds I cannot divine, except that in ornithology he is most at home. However, to return to the subject of *Cyprinidæ*, your arrangement of them shows another set of analogies, which I also think very conspicuous ; for instance,

The Pæonominæ are the types of the family Cyprinidæ.
The Sarcoborinæ represent .... the Esocidæ.
The Pœcilianæ represent .... the Clupeidæ.
The Cobitinæ represent .... the Salmonidæ.
The Platycarinæ represent .... the Siluridæ.

You will perhaps say, that the *Cobitinæ* ought to represent the *Siluridæ*; but the relation between the *Cobitinæ* and *Siluridæ* is one of direct affinity, in which I perfectly agree with Swainson; and I have accordingly made the *Cyprinidæ* and *Siluridæ* contiguous groups in the table of CLUPEINA, given on a preceding page.

When I can secure a safe private hand, I shall beg your acceptance of a copy of the third part of the 'Illustrations of the Geology of South Africa.' In the mean time I must refer you to a copy which I gave our friend Dr. Cantor. In page 9 of that work you will see a Table which is in perfect accordance with your views of the value of the word *genus*; but not perhaps with your view of the word *family*; nor is what I have written above consistent with the view I have taken in that table of the value of the words *genus* and *family*. The truth is, what in the foregoing part of this letter are called Genera, are Families, and ought to end in *idæ*, as the peculiar designation of that rank of group; but as these groups agree wonderfully with the extent of the old genera of Linnæus, I left them that name for your more clear comprehension of my meaning. To be consistent, however, with myself in the above-mentioned table (page 9 of the 'Illustrations'), the following ought to be the gradation of groups:

Regnum.—Animalia.
  Subregnum.—Vertebrata.
    Classis.—Pisces.
      Ordo.—Ostinopterygii.
        Tribus.—Clupeina.
          Stirpes.—Cyprininæ, above called 'Cyprinidæ.'
            Family.—{ Cyprinidæ, above called 'Pæonominæ, or the genus Cyprinus.'
              Genus.—Cyprinus.
                Subgenus.—Tinca.
                  Section:—and so on to the species.

Your table therefore, given p. 261 of your Monograph, is more in harmony (except indeed the names, which are things of artifice, and have nothing to do with nature) with my table given in the 'Illustrations' than is the foregoing letter; and I wish you to understand, that were I to publish on Fish, I would make it clearly understood, that I view Linnæus's genera to be groups of the rank of families, so that the groups above called *Perca, Scomber,* &c., ought to be called *Percidæ, Scombridæ,* &c.

I have now written enough to show you how I imagine Fishes may be distributed into something like a natural arrangement. My views must of course be subject to a multitude of corrections; but I think they are more connected, that is, they show more unity, than any ichthyological synopsis which I have yet seen. I have worked out the *Plagiostomi* with particular care, as my friendship with Dr. Smith made me pay great attention to his unrivalled collection of Sharks and Skates. If you would wish to see the conclusions at which I have arrived with respect to the *Plagiostomi,* I shall be happy to send you a sketch in some future letter. In the mean time, you may make what use you please of what I have written in this letter, provided it be clearly understood, that I am asking naturalists whether such be not the facts of the case, instead of dogmatically insisting upon it that they are. I have no idea of publishing on Fishes, at least for the present.

By the way, I observe that my old friend Colonel Sykes has been describing a number of Indian *Cyprinidæ* in the 'Proceedings of the Zoological Society.' Of course there must be "*double emplois*," which I hope you will rectify. I am sorry that I have not been able as yet to get any *Cyprinidæ* from our New Holland rivers; but I attribute it to my own residence so far from any river, not to the absence of them. I am promised by friends, who have better opportunities, the result of their researches; but *I receive nothing*, as they know not how to catch the minute fish of the river. However, I intend to try the Nepean river myself when I go down there, which I soon propose to do. In the mean time, my residence on the sea-side enables me to increase my collection of marine genera, and if there be any you wish for, I shall be most happy to send them. A thousand thanks for your kind method of *beating up* for insects to be sent me from India. I shall be happy to pay any fair price for the collector's time and trouble. Tell Dr. Cantor, that I depend on *him* to increase my collection of Annulose animals, and that I hope he will soon write me. Tell him also, that I have got a marine serpent of the genus *Pelamys*, caught in the mouth of Port Jackson harbour, the only one our fishermen have ever seen. If he wishes for it, it is at his service; for he knows infinitely more of Serpents than I do, and my grand desire is, to increase my collection of Annulose animals.

* * * * * *

But I could go on writing to you on these subjects *ad infinitum*, and therefore I trust you will excuse any tediousness on the score that my thoughts have been directed into this channel by the perusal of your Monograph. Pray remember me to Dr. Cantor, Dr. Griffith, Mr. Grant, and all who concern themselves with the works of nature, believing me always,

My dear Sir, your obliged and truly faithful,

W. S. MacLeay.

October 12, 1840.

P.S.—As I have had no opportunity of forwarding the enclosed letter, I sit down to make some observations on it that occur to me on now reading it over some weeks after it has been written.

I know not whether you will clearly understand my meaning in making the *Cyclostomi* the most typical of fishes. Cuvier says that "the *Acanthopterygii* form the type most perfected by nature;" and in this I agree with him, namely, that their structure is most perfected; but the *Acanthopterygii* are not therefore the most typical of fishes, *i. e.* of a class, the general character of which is, to be the most imperfectly constructed of *Vertebrata*. Cuvier talks much of the *Acanthopterygii* being the most homogeneous in their variations; but are not the groups of Sharks and *Cyclostomi* quite as homogeneous? Nay, are not *Fistularia* and *Vomer* more distinct from each other in form than a Shark from a Skate, or a Lamprey from a Myxine?

There are some relations that require still to be expressed by my foregoing arrangement, such for instance as that of *Platycephalus* to *Eleotris*, as that of *Sphyræna* to certain *Esocidæ*, &c. &c. Are all such merely relations of analogy? If so, they are expressed; but I cannot help thinking, that the relation is still stronger than that of mere representation.

All geological forms may I think be referred with ease to the foregoing arrangement, even the most anomalous in appearance, such as *Aphalaspis*; for this fossil form may, in my opinion, be understood by looking at the head of *Platycephalus*. However, the most extraordinary forms of fossil fish belong to the *Ganoids* of Agassiz, or rather to the *Sturiones*, and those other orders of the class Pisces that present the fewest existing forms. But on this head I shall at once frankly say, that if any fossil forms can be shown not to fall into a place in the preceding arrangement, then my general view of Ichthyological affinities is wrong; for I am convinced that there is but *one* system for all animals, whether Antediluvian or not. I shall write you on *Echinidæ* in my next, and send you some the very first opportunity.

XXV.—*Contributions to the Ichthyology of Australia.* By John Richardson, M.D., F.R.S., &c., Inspector of Hospitals, Haslar.

[Continued from p. 131.]

Uranoscopus maculatus (*Forster*), Bearded Uranoscope.

Uranoscopus maculosus, Soland. Pisc. Austr. MSS. p. 21.
——— *maculatus*, G. Forst.; Fig. Nos. 176, 177, Banks. Libr.
——— *monopterygius*, Bl. Schn., p. 49, ex notis J. R. Forsteri, nomine specifico ejus mutato.
——— *cirrhosus*, Cuv. & Val. iii. p. 314. An. 1829.
——— *Forsteri*, Id. iii. p. 318.
——— *Kouripoua*, Less., Voy. &c. par M. Duperrey, 1830, pl. 18.

On Cook's first voyage a Uranoscope with a single dorsal was procured at Tolaga, in latitude 38½°, New Zealand, the colours of which were briefly described by Solander in his 'Pisces Australiæ;' but as the details of structure were not given, and no figure was taken, it remained for future observers to furnish a proper character of the species. On the second voyage of our immortal navigator this Uranoscope was again obtained on the coast of New Zealand, at Queen Charlotte's Sound, in latitude 41°. The two pencil sketches above quoted were on this occasion made by George Forster, and in 1801 the species was described under the designation of *monopterygius* by Schneider in his posthumous edition of Bloch, from the manuscripts of J. R. Forster. The term *maculatus* is inscribed on G. Forster's sketches, and it is also noted that the native name of the fish is 'Bedee.' Just fifty years after Cook's second voyage, M. Lesson, one of the naturalists of La Coquille, commanded by Capt. Duperrey, discovered the same species, or one very nearly alike, in the Bay of Islands, where it bore the name of 'Kouripoua.' Under this, as a specific appellation, M. Lesson has figured and described the fish in the zoological part of Duperrey's voyage, which appeared in 1830; but he therein claims 1827 as the date of his first publication of the species. The third volume of the 'Histoire des Poissons' contains a full description of M. Lesson's specimen, under the name of *cirrhosus*. Though Cuvier was inclined to consider Lesson's and Forster's fishes to be the same, he separated them in the work just quoted, because no mention is made by Forster of the short mental barbel, and because "il donne à son poisson un sternum, c'est-à-dire un pédicule pectoral, à trois tubercules, qui est bien dans les Uranoscopes ordinaires, mais qui le précédent (*cirrhosus*) n'a pas." The latter objection is however founded on a mistake, for Schneider's text refers to the pelvic bones and not to the pectoral pedicle, his words being "*ventrales* 3 (*poll.*) *longæ, sterno osseo, 3-tuberculato insidentes.*" As to the barbel, it may easily escape notice unless looked for, being very short though thickish. George Forster's sketches of the fish are mere outlines, and aid little in supplying details omitted in the description. Indeed, when one considers the many branches of natural history attended to by the Forsters, and the extent of their collections, no surprise will be excited on finding their notes occasionally very brief. Cuvier goes on to say, that even if Forster's fish shall be found hereafter to be the same with *cirrhosus*, this appellation should remain, because neither *maculatus* nor *monopterygius* are sufficiently distinctive. But M. Lesson's name of *Kouripoua* appears to have the priority, and ought in justice to be adopted by those who consider Forster's fish to be a distinct species. I think they are the same, and have therefore restored Forster's term of *maculatus*, being nearly synonymous with the *maculosus* of the first discoverer of the fish, and having been given to the public contemporaneously with Schneider's unnecessary and indiscriminating designation of *monopterygius*. The appellation of 'Kouri-pooa' in the Polynesian language seems to denote that the natives observe an affinity either in form or habits between the Uranoscopes and *Synanceiæ*, the *Synanceia horrida* being called 'Ehohoo-pooa-pooa' at Otaheite.

The museum at Haslar contains a mounted Uranoscope brought from New Zealand by Mr. J. M. Hamilton, Assistant-surgeon of the Royal Navy, which I have no hesitation in considering to be of the same species with Lesson's and Forster's specimens. It corresponds with the figures of both, and except in some of the redder and more delicate tints which have faded, it agrees also with Solander's account of the colours of the recent fish, as well as with the markings of *cirrhosus* recorded in the 'Histoire des Poissons.' The principal difference I can detect, on carefully going over Forster's, Lesson's and Cuvier's descriptions step by step with the specimen before me, is the very slight one of the granulations of the plates on the head not being conspicuously arranged in lines radiating from nine centres like so many stars (Lesson and Cuvier). Forster uses the phrase '*caput papillis crebris scabrum ordinatis*.'

The top of the head in the specimen is quite flat from the occiput to the end of the snout, and across between the temples, and from the outer margin of one orbit to that of the other. The intermaxillaries descend very slightly when protruded. The soft edge of the snout is cut away in a shallow curve over the pedicles of the intermaxillaries, and between the orbits there is a square membranous space. The bony plates which cover the head are very irregular, and anastomose so with each other, that it requires some attention to make out the number mentioned by Cuvier, namely, two rows of four each, and a single rounded occipital plate on the mesial line. The two outermost plates of the posterior row, and the middle pair of the anterior row, show some granulated lines running forwards and radiating from centres, but all the other plates are rough, with minute rounded points crowded without order. The borders of the orbits are very slightly raised, and the superciliary processes belonging to the middle anterior pair of plates exhibit their granulations in lines. The first suborbitar projects two acute points over the limb of the maxillary; the second and third are considerably broader, but cover only a third part of the cheek. There is a plate of the same form with them, lying just behind the orbit, and looking like a fourth suborbitar; it is required, with its fellow, to complete the number four of the anterior row of cranial plates. All these suborbitars are granulated without order. The preoperculum is curved in the arc of a circle, and is of equal breadth throughout, its upper and lower ends equally obtuse being in the same vertical line. It is coarsely granulated on its upper end, with some faint granular streaks lower down. The operculum is more strongly marked by vertical granular lines, with a few coarser granular points at its upper corner. The roughness of the surface of these bones is concealed by the spongy integument, when the specimen is soaked for a short time in water. The suprascapulars appear in form of oblong plates, densely granulated, and sloping from the mesial occipital ridge, in conjunction with which they form the boundary of the nape. The humeral bone emits a strong spine, which is slightly curved at the point and not very pungent: it is half an inch long, though the tip only protrudes through the integument. The spongy skin of the recent fish will doubtless nearly conceal it. Forster describes it as '*spina valida*,' and Cuvier as 'très-courte et presque cachée sous la peau;' the discrepancy arising, I presume, from Forster having dissected his fish.

The lateral line curves gradually from the outer end of the supra-scapular towards the beginning of the dorsal, near the base of which it runs, approaching a little nearer in its course; when it arrives at the base of the caudal, it curves suddenly downwards to pass between the middle rays of the fin. Throughout its whole length short lateral branches diverge ventrad, each ending in a mucous pore. In M. Lesson's specimen only the posterior termination of the lateral line could be distinctly traced. The scales of the body are small and of an oblong form: there are none above the lateral lines, nor on the other parts enumerated as naked in the 'Histoire des Poissons.'

The lips are closely fringed with very short slender cirrhi just visible to the naked eye. The teeth are somewhat coarsely and thinly villiform at the symphyses of the jaws, the dental surfaces of the limbs of the intermaxillaries being very narrow, and on the lower jaw restricted laterally to a single series of teeth, which are more conical than the rest. The vomerine teeth are minutely villiform, being scarcely visible to the naked eye; and a cluster of three or four larger ones, crowded together, exists on the fore part of the palate bone, which contains no others.

RAYS:—D. — 19; A. 18; C. $9\frac{3}{5}$; P. 16; V. 1|5.

It is, as Cuvier suspected, the spinous dorsal which is deficient, all the rays of the existing fin being jointed; and immediately anterior to the first ray there are four obtuse points, like so many interspinous bones pressing up the skin.

In the dried specimen the ground-colour of the back is greenish gray, darkening to black immediately round the spots, which are yellowish white. The distribution of the spots corresponds with Cuvier's description of them. "*Uranoscopus maculosus.* Habitat Tolaga. Piscis supernè virescenti-griseus, maculis rotundis dilutè et sordidè flavicantibus, subtus e virescente albus. Caput supra cavernosum, pallidè e flavicante et griseo nebulosum. Oculi parvi: iris griseo et albido marmorata: pupilla nigra, supernè et infernè lobulo griseo notata. Pinna dorsalis subglauca, vittâ infra medium latâ, albidâ; radiis supra vittam fuscis, apicibus rubicundis. Pinnæ pectorales extus olivaceæ, maculis rotundis e virescente albidis, fulvoque marmoratis; internè obscuriores, basi colore pectoris; margines anteriores et posteriores albidæ. Pinnæ ventrales et pinna analis colore pectoris. Pinna caudalis e rubicundo grisescens, fasciâ ante medium interruptâ, latâ, sordide ex albido virescens: margo posticus rubescit." (Solander.)

Mr. Hamilton's specimen measures eight inches, being smaller than either Forster's or Lesson's.

POLYNEMUS PLEBEIUS (*Broussonnet*), Plebeian Polyneme.

Polynemus plebeius, Brousson. Ichth. Bl. Schn., p. 17. Cuv. & Val. iii. p. 380.

No. 38. Lieut. Emery's drawings.

This species probably inhabits all parts of the Indian and Polynesian seas. It has been taken in the Red Sea, at the Mauritius, Pondicherry, Java, Tanna and Otaheite. Lieut. Emery's drawing was made from a specimen taken on the north-west coast of Australia, and corresponds very closely with Broussonnet's figure. If the *Sele* of Buchanan-Hamilton be the same, the species attains a considerable size, for he states that in the estuary of the Ganges it weighs as much as 24lbs. Lieut. Emery's measured only 7¾ inches, and those sent to Cuvier were also of small dimensions.

Lieut. Emery's drawing represents the colours of the recent fish as being bluish gray on the back, fading towards the under surface into white, with a pinky tinge: no spots or streaks on the body. The ventrals, anal and caudal are pale sulphur-yellow, the dorsal and pectoral colourless. All the fins except the ventrals are closely dotted with minute angular specks of verdigrise-green.

The *Polynemus tetradactylus* (Shaw), Cuv. & Val. iii. p. 375, is an inhabitant of the north-east coast of Australia, having been discovered in Endeavour River on Cook's first voyage, and then named by Solander *P. quaternarius*. This species also ranges to the Indian Sea.

Upeneus Vlamingii (*Cuv.*), Vlaming's Upeneus.

Labrus calophthalmus, Soland. Pisc. Austr. p. 35. Parkins. fig., Banks. Libr.

Upeneus Vlamingii, Cuv. & Val. iii. p. 452.

This fish was taken off the island of Motuaro in Queen Charlotte's Sound, on Cook's first voyage. A figure partially executed by Parkinson exists in the Banksian Library, and there are a few notes of the original colours added in pencil, a copy of which we subjoin, together with some additional notices of the tints by Solander.

"The part marked 2 on the face is pale green; the belly pale crimson, spotted all over with yellow; the spots on the bases of the scales somewhat deeper. The streaks on the face, the spots on the back and on the dorsal and anal, the outer circle of the eye and the streaks on the tail, ultramarine with a cast of purple; the streaks on the face and spots on the back being the deepest." (Parkinson.) "Caput cæruleo-violaceum areis luteis. Dorsi et laterum maculæ subcastaneæ seriales. Oculi pulcherrimi. Iris in periphæriâ cyanea, propè pupillam miniata: annulus miniatus, latus, extrudens anticè unicum, posticè duo brachia, per annulum periphæriæ extensa. Cirrhi submentales longitudine capitis, basi incarnati, medio albidi, extus flavi. Habitat in oceano Australiæ propè Motuaro." (Solander.)

The *Scorpænæ* appear to be numerous in the Australian seas. The following, being described solely from drawings or imperfect notices, are merely given as doubtful species, for the purpose of directing the attention of naturalists visiting the coasts of New Holland or New Zealand to a careful comparison of such of the fish of this genus as they may procure.

Scorpæna cardinalis (*Solander*).

Scorpæna cardinalis, Soland. Pisces Australiæ, ined. p. 28.
——————, Parkinson, fig. 12, No. 10, Bibl. Banks.

On Cook's first voyage a *Scorpæna* having a strong general resemblance to *scrofa*, but wanting the black mark on the dorsal fin, was discovered at Motuaro in Queen Charlotte's Sound, New Zealand, of which a lengthened description was made by Solander, as above quoted, and a pencil sketch by Parkinson. As it seems to be a different species from any described in the 'Histoire des Poissons,' I have transcribed Solander's notes below, with the omission of two or three trivial passages. The *Scorpæna cottoides* of Forster, taken in Dusky bay, a more southern part of the same island, is evidently distinct from *cardinalis*, though there is a reference under Forster's rude sketch (pl. 190.) in the Banksian Library to the MSS. account of *cardinalis*. *Cottoides*, according to the sketch, has two spinous points directly over the eye, while in *cardinalis* there is one before and another behind the orbit: the comparison cannot be carried with confidence much further, because the body colours in which G. Forster's drawing was coarsely executed have faded so as to render the forms of the parts about the head uncertain; but J. R. Forster's notes, as quoted by Schneider, do not correspond with Solander's account of *cardinalis*. Cuvier compares Forster's fish with the *cirrhosa* and *venosa* of the 'Histoire des Poissons.'

Parkinson's figure is drawn of the natural size. The length of the head is rather less than one-third of that of the whole fish, caudal included: its height behind the eye is two-thirds of the length. Spinous points are shown on the nasal bones; one over the anterior and one over the posterior angle of the orbit, three or more on the lateral cranial ridge behind the eye, and some on the temporal ridge extending from the orbit to the upper angle of the gill-opening. There are two apparently on the preorbitar, one over the other, and the edge of the bone where it overlies the limb of the maxillary is irregularly serrated. A series of spinous points mark the ridge of the second suborbitar as it crosses the cheek. The angle of the preoperculum emits a lengthened tapering acute process, on the base of which there is a spinous point. The curved under limb of the bone has four angular points. The outline of the gill-cover is triangular, and there are two spines on the operculum, which do not reach the edge of the membrane. The upper spine appears to have a smaller one at its base.

The spinous part of the dorsal is much arched, and is greatly lowered before the 12th spine. The third spine, measuring in the drawing above an inch and a half, is very slightly higher than the adjoining one before and behind. The others decrease gradually to the 11th, which has scarcely a fifth of the height of the 3rd one. The 12th rises to the height of the 7th, and the 1st and 8th have half the height of the third. The soft part of the fin occupies as much space as the seven anterior spines, and is about as high anteriorly as the tallest of them, but lowers a little as it runs backwards. It is rounded slightly before and behind.

"Scorpæna capite nudo subtus mutico, corpore miniato, variegato, pinnis maculatis; pectoralibus infernè rotundatis, incrassatis. Habitat in oceano Australiæ propè Motuaro.

"Radii:—Br. 7; D. 12|10; A. 3|5; V. 1|5; C. 16 *.

"Diameter longitudinalis 18 uncias; perpendicularis $4\frac{1}{2}$, transversalis 3. Corpus lanceolato-oblongum, pulchrè variegatum. Caput trunco latius, magnum, obtusum, anticè depressiusculum, nudum, cavernosum, spinosum, hinc inde ramentaceum, subtus muticum et absque ramentis. Rostrum anticè obliquè declive, supernè gibbo obtuso præditum, supra hunc gibbum inter anticam partem oculorum carina angusta, inermis. Ramenta capitis plurima, cutacea, brevia; nonnulla supra orbitas oculorum; pauca in laterum angulis prominentibus; par maximum supra aperturam anteriorem narium, ovato-oblongum, planum, extus lacerum; reliqua linearia acuta. Spinæ capitis plurimæ acutæ; par conicum erectum supra gibbum rostri; duæ supra orbitam oculi, unica anticè altera posticè; plures supernè et in lateribus seriatim digestæ, basi compressæ, retrorsum spectantes, præcipue posterioribus quæ longiores, subulatæ.

"Maxilla superior obtusè retusa; inferior apice subtùs gibbo notata. Dentes in maxillis, palato et fauce. Maxillares subulati, conferti, numerosi intus flexi, interiores majores. Palati aceroso-subulati, aggregati, acuti, parvi. Faucium subulati, aggregati, acuti, intus vergentes, numerosi. Lingua glabra. Oculi vicini, magni, convexi, cute capitis communi tecti. Iris argenteo-miniata. Foramen narium posterius propè oculum, nudum, apertum; anterius in medio inter oculum et rostrum, tectum ramento magno, dilatato. Branchiarum laminæ nudæ, posticè angulatæ, angulis spinosis.

"Truncus oblongus, compressus, muticus, squamosus. Linea lateralis pone caput parùm descendens, dein recta, dorso paulo propior. Anus pone medium, pinnâ anali remotus. Vagina genituræ pone anum exserta in papillam ovatam, compressam. Pinna dorsalis bipartita: pars anterior spinosa, 11-radiata: pars posterior altior sed brevior, 11-radiata, radio primo spinoso. Pinnæ pectorales medium trunci non attingentes, latissimæ, rotundatæ, cute crassà indutæ, radiis inferioribus crassissimis extra membranam parùm productis. Pinnæ ventrales obtusæ, parùm pone pectorales insertæ, illisque paulo breviores. Pinna analis, radiis tribus spinosis, reliquis longioribus subæqualibus. Squamæ læves, integræ, mediocres adherentes.

"*Color.*—Totus piscis pulchrè miniato-aurantiacus, maculis majoribus rubris; minoribus albis et numerosioribus, parvis fusco rubentibus variegatus: subtus pallidior maculis majoribus albidis ornatus. Pinna dorsalis dorso concolor. Pinnæ pectorales saturatius

* The numbers of rays are those given by Solander, the notation solely being changed. It may be proper to remark, that when Solander began his notes on the productions of New Zealand, he supposed that he was on the coast of a southern continent.

miniatæ, subtessellatæ maculis serialibus majoribus; exterioribus nigricantibus. Pinnæ ventrales et analis pallidæ, adspersæ maculis rubris, in pinnâ anali majoribus. Pinna caudalis maculis subserialibus majoribus ornata, posticè aurantiaca." (Solander.)

Another New Zealand *Scorpæna* is noticed in Solander's 'Pisces Australiæ;' but as he describes merely its colours, and there is no drawing of it extant, nothing is known of its form. He designates it *Scorpæna plebeia*, probably from the contrast which its duller general tints make with his *cardinalis*, and describes its colours as follows:—

"Scorpæna plebeia. Piscis dilutè e cinereo virescens, nebulis fuscescentibus. Caput infra, pectus et abdomen albida, cum pauxillo rubedinis. Iris e griseo argentea, nebulis fuscis. Pupilla nigra. Pinna dorsalis colore dorsi, apice rubicunda. Radii partis posterioris albido et purpureo pallidè annulati. Pinnæ pectorales e rubicundo et flavescenti pulchrè tessellatæ, areâ propè basin altius coloratâ. Pinnæ ventrales saturatè et vividè incarnatæ, in medio albæ. Pinna analis ex albido incarnata, nebulis pallidè violaceis. Pinna caudalis rubicunda, maculis fuscis subfasciata. Habitat Tolaga." (Lat. $38\frac{1}{2}°$ S., long. $181\frac{1}{4}°$ W.)

Considerable variety exists in the extent to which the scales spread over the head in the *Scorpænæ*. Cuvier says, "à peine voit-on sur les individus desséchés quelques petites écailles sur le derrière du crâne et le haut de l'opercule. Il existe d'autres poissons (les *Sebastes*) de cette famille, dont la tête moins hérissée, a des écailles sur toutes ses parties; au museau, au maxillaire, à la joue, et à toutes les pièces operculaires; en sorte qu'ils se rapprochent de plusieurs perches à dorsale unique." The want of the temporal ridge and its spines is the only positive character of those here mentioned which I have observed on comparing the *Scorpænæ* and *Sebastes*, which serves to distinguish the latter. The *Scorpæna Novæ Guineæ*, Voy. Astrolabe, pl. 12. f. 1, has the whole cheek and gill-cover just as scaly as the *Sebastes Capensis*, fig. 5 of the same plate. The *Scorpæna bufo* (of which a specimen exists in the Haslar Museum well characterized by its dentated nasal spines, and the white drops in the axilla of the pectoral) has the cheek entirely covered with scales nearly as large as those on the body, and also patches of scales on the gill-cover. The Van Diemen's Land *Scorpæna miles*, described by me in a paper read before the Zoological Society in June 1839, has many scales on the head, but otherwise is very similar in form to *porcus*, which has the same parts naked. These scales are concealed by the spongy integument of the recent fish, and may have been overlooked if they actually existed in the following species drawn by Lieut. Emery.

Scorpæna burra (*Nob.*), Crimson and olive Scorpæna.

No. 29. Lieut. Emery's drawings.

The fish from which the drawing above quoted was made, was taken at Depuch island, and measured five and a half inches in length.

In the general form of the head, particularly in the obtuse snout, arched from the eye, the drawing resembles *cardinalis*, but the spines on the sides of the head are much less conspicuous than in that species. The profile is moderately convex from the mouth to the dorsal fin; the eye rises above the general curve, without any denticulations being shown on the superciliary ridge, though the orbit is fringed above with very short cirrhi, and one large one rises directly from its middle, nearly as high as that of *grandicornis*, but of a tapering form, with an acute tip, and beaded or warty below. There is a short spine on the nasal bone, and three or four pretty prominent angular points on the lateral occipital ridge. There are two short spines on the operculum, but no others are clearly marked on the side of the head; which is scaleless, and is veined by lines of a deeper colour than the general tint, that ramify like a blood-vessel. The membrane beneath the lower jaw swells out and is reticulated by fine crimson lines, which give it a scaly appearance. There are many simple tapering cirrhi depending from the lips, the sides of the head, and all parts of the body, not more numerous on the lateral line than elsewhere.

The dorsal is considerably arched, particularly anteriorly. The fourth spine is the tallest, the twelfth is scarcely one-fourth lower, while the first and eleventh are only half as high. The membrane slopes much behind the four anterior spines. The soft part of the fin is much rounded, and rises one-third higher than the tallest spine. The anal is shaped like the soft dorsal: its second spine is represented as strong, but the first is omitted, probably from its shortness: seven rays in all are shown. The other fins are also greatly rounded.

The head and body are crimson, which fades to reddish white on the branchiostegous membrane; the side of the head is veined with deeper lines. There are ten round red drops on the gill-membrane. All the cirrhi are green, and the body is marked by a few irregular olive or oil-green blotches: the largest is near the base of the anal, and there are three or four smaller ones on the sides: a rhomboidal one is placed near the shoulder, half of it extending to the spinous dorsal, and taking in the third, fourth, fifth and sixth spines. There is an oval one further back on the same fin, crossing the middles of the seventh and eighth spines. A very irregular blotch partially covers the anterior third of the soft dorsal descending a short way on the back, and there are two on the posterior border of the fin. The olive colour forms two broad transverse bars on the pectoral, one near its base, and the other about its middle. There are three narrower bars on the caudal fin, a basal, middle, and subterminal one. The crimson anal is crossed by three narrow white ribands, and its broad border, occupying nearly a third of the depth of the fin, is minutely speckled with yellowish green. The ventrals are crossed by five crimson bars alternating with four yellow ones, and the first ray is streaked with vermilion.

Scorpæna panda (*Nob.*), Saddle-skull Scorpæna.

No. 9. Lieut. Emery's drawings.

The drawing was made from a specimen procured at Abrolhos, and measuring sixteen inches and a half in length. It differs from any described Scorpæna in the form of the head and size of the scales covering the body, as well as in its colours.

The body has the usual generic form: its height is rather less than one-fourth of the total length of the fish, caudal included. The head is short, its length scarcely equalling the height of the body, and its height being one-fourth less. The orbit projects upwards, and behind it there is a saddle-shaped depression, followed by an occipital rise much like that of a dried example of *Synanceia horrida*. The orbit is surrounded by irregular angular projections, three above and as many behind. The occipital rise is margined laterally by a curved ridge, joining another waving one which flanks the base of the rise, and reaches the upper angle of the gill-opening. There are also apparently spines and ridges on the sides of the head, but not sufficiently intelligible to be described. The scales of the body are unusually large for a Scorpæna, there being only thirty-five in a row between the gill-opening and caudal fin, and about sixteen in a vertical line. There are none on the head.

The dorsal shows only eleven spines, but it is probable that a short one has been omitted at the commencement of the fin. The second of those seen is the tallest, overtopping the one before and behind it by a fourth part. The succeeding ones diminish rather rapidly, the penultimate one not having one-fifth of the length of the tallest: the last one rises to the level of the first or third. The membrane slopes deeply behind the anterior spines. The soft part of the fin, which is rounded, overtops the tallest spine by about a fifth part. The anal is of the same height with the soft dorsal, but is less broadly rounded: its third spine is stronger and longer than the second one. The pectorals, ventrals and caudal are also rounded.

Rays :—D. 11(12?)|10; A. 3|6; C. 15; P. 16; V. 1 5.

The head and body have a nearly uniform vermilion tint, the branchiostegous membrane alone being paler. There are two dark hyacinth-red bands on the side, the anterior one descending from nearly the whole of the spinous dorsal and tapering away behind the pectoral; and the other, rather narrower, running from the soft dorsal nearly to the anal, tapering also as it descends. The body is spotted pretty regularly with round drops of dark orange-brown, which do not extend to the belly. Smaller drops of the same colour are scattered over the sides of the head, lower jaw, and branchiostegous membrane, being intermixed in the two latter localities with whitish spots. All the fins are reddish brown, and except the ventrals and spinous part of the dorsal, they are all spotted on their lower halves like the body, three or four rows on each. There are also two or three rows of paler spots on the upper part of these fins.

Scorpæna ergastulorum (*Nob.*), Port Arthur Scorpæna.

None of the *Scorpænæ* of the southern seas described in the 'Histoire des Poissons' are said to have the black mark on the posterior third of the spinous dorsal which characterizes the Mediterranean *scrofa*. That spot is however strongly marked in the drawing of a Scorpæna made under Dr. Lhotsky's direction, at the penal settlement of Port Arthur, in Van Diemen's Land.

This species resembles *porcus* in general form. Its spinous dorsal is moderately arched, and not deeply notched at the eleventh spine. The fourth spine is the tallest, and the soft rounded part of the fin rises to an equal height with it. The nine inferior rays of the pectoral are represented as simple, the caudal as scarcely rounded. The second anal spine is rather the longest of the three, which come nearer to the length of the soft rays than usual.

A spine and apparently a short cirrhus are represented on the nasal bone: four spines on the preorbitar, four on the upper margin of the orbit, one of them over the anterior canthus and three on the posterior third of the margin: two prominent ones on the lateral occipital ridge, four on the temporal ridge: a series of seven on the suborbitar ridge, and three strong angular points on the lower limb of the preoperculum. The two opercular spines are longer and more acute than any of the others, and the lower one is curved upwards. There is a close series of conical points (cirrhi?) on the lateral line. The temples and upper halves of the cheek and gill-cover are represented as scaly. The scales of the body are rather small.

The prevailing colour of the fish is scarlet, obscured in many places by large blotches of purplish or brownish red, particularly along the base of the dorsal, over the pectoral, and on the top of the head. These blotches pass insensibly into the ground-colour, and do not produce defined markings. The scarlet of the fins has a lakish tinge, and passes into carmine towards their edges. There is a brown mottled patch on the pectoral, at the base of the upper rays, and the jointed rays of all the fins but the pectorals are marked with reddish brown dots, disposed in rows. There is also some indistinct brown and reddish speckling on the membranes of the vertical fins, and an oval black spot crosses the ninth, tenth and eleventh dorsal spines.

Rays:—P. 15; D. 12|9; A. 3|5; V. 1|5.

The same black dorsal mark exists on a New Zealand *Scorpæna* taken on Cook's first voyage, and described as follows by Solander:—

"Scorpæna cruenta. Habitat in oceano propè 'Cape Kidnappers.' Corpus saturatè sed obscurè rubrum, nebulis subfasciatis paucis pallidè lutescentibus pictum, subtus dilutè sanguineum nebulis albis. Iris rubro-argentea. Pinna dorsalis; pars prima obscurè rubra, rivulis paucis subpellucidis, posticè nebula nigra oblonga; pars posterior anticè, propè basin, maculâ intensè sanguineâ notata, alias rubicunda maculis nigricantibus adspersa. Pinna ventralis sanguinea, nebulis pellucidis. Pinna analis sanguinea, maculis paucis nigris. Pinna caudalis rotundata, rubra, maculis nigris in quatuor fascias per radios dispositis ornata. Membrana connectens immaculata."

[To be continued.]

XXVI.—*On the genus* Scarabus, *a small group of* Pulmobranchiate Mollusks *of the family* Auriculacea. By Mr. Lovell Reeve, A.L.S.

[With a Plate.]

To the Editors of the Annals of Natural History.

Gentlemen,

Having collected together an interesting series of *Scarabi*, as examples of that genus, for the forthcoming number of my 'Conchologia Systematica,' I send you my plate of them accompanied with the following notices, not intended for publication there, which you are at liberty to make use of if you think proper. The fact of there being so few species of this genus yet described, and even these referred to by authors with no little inaccuracy, induces me to think that a few observations, though brief, will be esteemed of some conchological interest. No descriptions are given, nor are any of the localities mentioned; I am unwilling that this paper should be accepted as a monograph, as my friend M. Petit de la Saussaye is zealously employed at this moment in preparing a complete history of the family to which the genus *Scarabus* belongs.

SCARABUS, De Montford.

The genus *Scarabus* is one of the few that I have adopted out of the many proposed by De Montford in his 'Conchyliologie Systématique.' The earliest figure which I am able to trace is one of the *Scarabus Petiverianus* given by Petiver under the title of *Cochlea Bengalensis* in his 'Gazophylacia Naturæ;' another species, the *Scarabus imbrium*, figured by Chemnitz, was then described by Linnæus amongst the *Helices*, and probably supposed to be the same. Bruguière included it in his miscellaneous assemblage of *Bulimi*, and it was removed with others by Lamarck for the formation of the genus *Auricula*. Lamarck, however, like his predecessors, appears to have referred all the varieties then known to one particular species, *Auricula scarabæus* (*Helix scarabæus*, Linnæus, *Bulimus scarabæus*, Bruguière). Not so De Férussac: a variety which had been figured by Chemnitz was very properly distinguished by this author by the name of *Scarabus plicatus*; he appears indeed to have been the first to appreciate the genus in question. Two other species were then introduced by Lesson in his 'Zoologie de la Coquille,' and we are indebted to this naturalist for establishing the importance of the genus by further demonstrating a difference in their organization and habits. The *Auriculæ* are partially aquatic, and are for the most part found in wet and marshy places on the banks of lakes and rivers, or even on the sea-shore: the *Scarabi*, on the contrary, are inhabitants of a dry soil, located at the roots of trees in the very centre of woods and forests.

The following are eleven species, all of which, with one exception, I have succeeded in identifying.

1. Scarabus clausus, Nobis.
   Helix clausa, Wagner.
   Helix tomogera, Moricand.
   Auricula clausa, Michaud.
   Tomogerus clausus, Spix.

The aperture of this shell is nearly closed by the strong dentition which is characteristic of the genus. (Plate IV. fig. 1.)

2. Scarabus trigonus, Troshel, Wiegmann's Archiv, 1840.

This shell, recently described by Dr. Troshel of Berlin, is of very remarkable growth, the last whorl being suddenly contracted to the form of a sharp angle. The species altogether is highly characteristic, and cannot fail to be recognised. (Fig. 2.)

3. Scarabus plicatus, De Férussac, Prodrome, p. 101; Chemn. Conch., vol. ix. pl. 136. f. 1252 and 1253.
   Helix scarabæus, var. Chemnitz.
   Auricula plicata, Deshayes.

Chemnitz's figure of this species is cited as a variety both of the *Helix scarabæus* of Linnæus, and the *Cochlea Bengalensis* of Petiver. It may be distinguished however from both by the angular direction of the last whorl, though it is far less characteristic than in the *Scarabus trigonus*. (Fig. 3.)

4. Scarabus undatus, Lesson, Voyage de la Coquille, Zoologie, vol. ii. p. 336. pl. 10. f. 6.
   Auricula scarabæus, var. Deshayes.

I only know of two specimens of this shell, both sufficiently distinguished by the waved lines which irregularly cross each other on the back. I believe this character exists only in the epidermis, which is unusually thick, but am satisfied of the identity of the species by a distinct peculiarity in the general formation of the shell. Deshayes does certainly not exhibit his usual accuracy in determining the specific identity of the *Scarabi*; both this species and the *Scarabus castaneus* are given as synonyms of Lamarck's *Auricula scarabæus* (*Scarabus imbrium*). (Fig. 4.)

5. Scarabus Lessoni, De Blainville, Dict. Sci. Nat., pl. 48. f. 32; Lesson, Voyage de la Coquille, Zoologie, vol. ii. p. 334. pl. 10. f. 4.
Auricula Petiveriana, var. Deshayes.

Deshayes appears to have quoted this species as synonymous with the former, an error which he might easily have avoided by comparing Lesson's figure of it with the old *Cochlea Bengalensis* of Petiver. It approaches rather to the *Scarabus imbrium*, the type of the genus, and no doubt was confounded with that species before it was distinguished under the above title by De Blainville. (Fig. 5. and 8.)

6. Scarabus lekithostoma, Nobis, n. s.

Besides its general peculiarity of form, this shell is further distinguished by the colour of the mouth, which is a bright yelk-yellow. (Fig. 6.)

7. Scarabus Petiverianus, De Férussac, Prodrome, p. 101; Petiver, Gazophylacia Naturæ, pl. 4. f. 10.
Cochlea Bengalensis, Petiver.
Auricula Petiveriana, Deshayes.

A species distinguished from the rest of the genus by the rotundity of the aperture, and I believe the most rare of the series. I only know of one specimen at present. (Fig. 7.)

8. Scarabus striatus, Nobis, n. s.
Auricula scarabæus, Quoy, Voyage de l'Astrolabe, Zoologie, vol. ii. p. 162. pl. 13. f. 24.

We can hardly be surprised at the little attention given to the *Scarabi* by M. Quoy, for this is the only species found by him during his Voyage in the Astrolabe. Not having sufficient to make the genus of interest, he must have adopted the old Linnæan specific without comparison. In all the specimens I have seen of this shell, the longitudinal striæ so perfectly delineated in his figure are highly characteristic. (Fig. 9.)

9. Scarabus castaneus, Lesson, Voyage de la Coquille, Zoologie, p. 336. pl. 10. f. 7.

This is the only species I have not succeeded in identifying: the figure given by Lesson, here copied, represents a clear chestnut-coloured oblong shell, approaching nearest in form to the *Scarabus pyramidatus*, but perfectly distinct as far as I am enabled to judge. (Fig. 10.)

10. Scarabus imbrium, De Montford, Conch. Syst., vol. i.; De Férussac, Prodrome, p. 101; Chemnitz, Conch., vol. ix. pl. 136. f. 1249 and 1250.
Helix scarabæus, Linnæus.
Helix pythia, Muller.
Bulimus scarabæus, Bruguière.
Auricula scarabæus, Lamarck.

This is as it were the normal species of the group, and may be recognised by its large size and slight pyramidal form. (Fig. 11.)

11. Scarabus pyramidatus, Nobis, n. s.

The *Scarabus pyramidatus* is the most oblong of the different forms; the mouth is of a yellowish colour and highly enamelled. (Fig. 12.)

I am indebted to the Rev. Mr. Stainforth and Wm. Walton, Esq., for the use of the specimens which have furnished the foregoing notices.

Lovell Reeve.

8 King William Street, Strand.

XXVII.—*The Birds of Ireland.* By Wm. Thompson, Esq., Vice-Pres. Nat. Hist. Society of Belfast.

[Continued from p. 145.]

No. 12. *Families Cuculidæ, Meropidæ, Halcyonidæ.*

The Cuckoo, *Cuculus canorus*, Linn., is well known throughout Ireland as a regular spring visitant.

It has been remarked by Sir Wm. Jardine and Mr. Macgillivray, with respect to Scotland, that localities of almost every character are visited by this bird, and so it is in Ireland, the wild and treeless wastes on different portions of the western coast equally attracting it with the most highly cultivated and best wooded districts. It was remarked by Mr. R. Ball, when visiting the largest of the South Islands of Arran (near the entrance to Galway Bay), in company with the late lamented Dean of St. Patrick's, in June 1835, that cuckoos were particularly abundant:—the whole surface of the island is either rocky or covered with a short rich pasture, and is altogether destitute of trees, except at one spot, where some half-dozen appear.

The vernal appearance of the cuckoo in the north of Ireland is as early as some authors report it to be in the south of England. My notes bear witness to its arrival in the neighbourhood of Belfast in seven consecutive years—from 1832 to 1838—as follows: April 16th, 20th, 21st, 10th, 22nd, 26th, 30th,—and on the 23rd in 1840 *. The adult birds generally leave the north of the island at the end of June: on the 1st July 1832 I saw two, and heard their call, near Dunfanaghy, in the north-west of the county of Donegal. The stay of the cuckoo was remarkably prolonged in 1838,—in which year the period of their arrival was also later than ever known—one having been heard at "The Falls" near Belfast on the 7th July. The young birds of the year generally remain till towards the end of August; so late as the 27th of which month they have been observed in the county of Antrim. The Bishop of Norwich, in his 'Familiar History of Birds,' records an instance of about forty cuckoos being congregated in a garden in the county of Down from the 18th to the 22nd

* In McSkimmin's 'History of Carrickfergus' (1823) it is remarked that —"During 20 years' observation the earliest it has been heard calling was the 17th of April, and the latest the 30th of June."

of July, and with the exception of one or two, which were smaller than the rest, taking their departure at that time. It is not stated whether they were adult or immature birds, and the time mentioned is between the periods of departure of the old and young ; but from one or two remarks made, the inference is, that the latter are alluded to. My only note upon migration is in connexion with the same county; an adult bird having been shot at the migratory period a few years ago when flying singly and in a southerly direction over the sea, about two miles off Dundrum.

The singular economy of the cuckoo in depositing its eggs in the nests of other birds has been very fully treated of, from personal observation, by the celebrated Dr. Jenner*, Mr. Blackwall†, Mr. Weir‡, and others. I have not anything novel to offer on the subject, but will introduce a few observations made in Ireland. In the north of the island, as in Scotland§, the nest of the titlark (*Anthus pratensis*) seems generally to be the receptacle of the cuckoo's egg. George Ensor, Esq., of Ardress, county of Armagh, in a communication to the 'Magazine of Natural History' (vol. vi. p. 83), mentions a tenant's son having taken home a young cuckoo from a titlark's nest. "Two wrens who had a nest with eight eggs in the eaves, and just above the window fronting the cage in which the cuckoo was placed, made their way through a broken pane, and continued to feed it for some time." The cuckoo was at length taken away, when "the wrens repaired to their own nest, and brought out the eggs that had been laid :"—it is not stated how long they were absent from it. At Rockport, near Belfast, it was remarked, that when a young cuckoo had attained such a size that its foster-parents could not reach up food to it, they alighted on its back, and thus fed it. This proceeding was repeatedly observed from the windows of the house near to which the nest was situated. The cuckoo is occasionally heard to call through the night, when it is fine, though there may be no moonlight. When lying awake on a dark morning (May 8), I once noted its call to commence at half-past three o'clock.

In April 1834 I made the following communication to the Zoological Society of London :—

"May 28, 1833. On examination of three cuckoos today, which were killed in the counties of Tyrone and Antrim within the last week, I found them all to be in different states of plumage. One was mature ;—another (a female) exhibited on the sides of the neck and breast the reddish-coloured markings of the young bird, the remainder of the plumage being that of maturity ;—the third specimen had reddish markings disposed entirely over it, much resembling the plumage described by M. Temminck as assumed by 'les jeunes tels qu'ils émigrent en automne' (vol. i. p. 383), but having a greater proportion of red, especially on the tail-coverts, than is specified in his description of the bird at that age. This individual proved on dissection to be a female, and did not contain any eggs

* Philosophical Transactions, vol. lxxviii. † Researches in Zoology.
‡ Macgillivray's British Birds, vol. iii. § Jardine, Macgillivray.

so large as ordinary-sized peas. The stomach, with the exception of the presence of some small sharp gravel, was entirely empty, and was closely coated over with hair."

" 'Attention was called to this, that the hair with which it is lined might be observed. From its close adhesion to the inner surface of this stomach, and from the regularity with which it is arranged, Mr. Thompson was at first disposed to consider this hair as being of spontaneous growth; but part of the stomach having been subjected to maceration in water, and afterwards viewed through a microscope of high power, the hairs proved, to the entire satisfaction of Mr. Owen and himself, to be altogether borrowed from the larvæ of the tiger-moth, *Arctia Caja*, Schrank, the only species found in the stomachs of several cuckoos * from different parts of the north of Ireland, which were examined by Mr. Thompson in the months of May and June 1833.' " Proceedings Zool. Soc. 1834, p. 29.

An observant friend states that he found the remains of coleopterous insects in the stomach of a cuckoo examined by him, but whether at a time when its favourite caterpillars are not to be procured, he could not remember. An intelligent bird-preserver has remarked, that a kind of tough gelatinous fat is attached to the skin of the neck in the cuckoo, such as he has not seen in any other bird.

I have several times known young cuckoos to have been kept for some months, and in good health, until winter set fairly in, when, with two exceptions, they died. Of the survivors, one lived for more than a year at Cranmore, near Belfast, the residence of that well-known naturalist John Templeton, Esq. But it will suffice to give the particulars respecting another which was kept for a longer period at the same place, and of which the following account, greatly exceeding in interest any I have read, appears in the MS. journal of Mr. Templeton :—

"January 10, 1822. Last night the cuckoo which E. got from Mr. Montgomery on the 26th of July, 1820, died, in consequence of C. having hurt it with her foot on Tuesday last [8th]. Thus ended the days of this innocent little bird, whose engaging manners were the delight of the whole family and the admiration of strangers. It was fed generally on hard boiled eggs, and occasionally with caterpillars: it would sometimes eat forty or fifty at a time of those of the *Papilio brassicæ*; it however shewed a decided preference for rough ones, as those of the *Papilio urticæ*. A seeming treat was a little mouse about one quarter grown, which it would hold in its bill and beat against the ground or anything hard until the animal became soft, when it exhibited great powers of extending its throat and swallowing. What however was most extraordinary, it was never known to take a drink; though when presented with a drop of water at the end of a finger or straw it would sip it, and seemed to delight, when seated on its mistress's or other person's hand, to put its bill to their mouths and sip saliva. It delighted very much in heat, and sitting in the sunshine; and as its feathers were so

* The stomachs of all these were coated with hair like the one described.

much broken by its striking them against the furniture that it could fly but very imperfectly, it was apparently very thankful to any person who would help it up on the first sash of the window. At other times it sat upon the fender, turning itself in various directions and spreading its wings and feathers to receive the heat, of which it could bear a temperature equal to 100 degrees for a considerable time with seeming satisfaction. During cold weather it slept at its mistress's bed-side, covered with a piece of flannel, which was well warmed previous to its going to rest. With this attention it generally remained quiescent until morning; but on feeling cold sometimes presumed so far as to creep under the bed-clothes. It was only to those from whom it had received some hurt or persecution that it expressed dislike or fear, which it did by raising its neck-feathers and putting itself into an attitude of defence. It never uttered the cry of the male—cuckoo—but sometimes, when persons in the room were laughing, it would apparently join, and emit a noise somewhat like the barking of a little dog. At all other times the only sound it made was a kind of low chattering, expressive of pleasure when it got into a warm place, or on seeing its mistress after she had been absent for some hours. It received the unlucky tramp which finally killed it, by having lost too much the apprehension of injury."

From Miss Templeton I have learned the following particulars respecting this cuckoo:—It moulted only a few feathers the first year about Christmas: the following year, about the same period, moulting commenced, and the bird became so unwell that fears for its life were excited. Some of the adult plumage was then exhibited, but before there was time for this to be perfected the poor bird met with its accidental death. This cuckoo was never subjected to the confinement of a cage, but was kept in the parlour through the day, and taken to its mistress's bed-room at night. A hairy species of caterpillar found upon the oak was its favourite food, being better liked than the hispid one of the nettle butterfly; but of either of these it would eat voraciously, and fully three times as many as of the smooth caterpillar of the cabbage:—the last it would not consume at all if the others were to be had. Every caterpillar was viscerated by the bird previous to being swallowed, as likewise were the mice when young enough for this process: these were always swallowed head foremost, and for a considerable time afterwards their tails appeared dangling from the cuckoo's bill. When the season was too far advanced for caterpillars to be procured, this bird was fed on raw flesh-meat, and seemed to gain much strength in consequence: with this and hard-boiled eggs it was supplied throughout the winter. It never consumed less in a day than a couple of eggs, in addition to a little of some other food. It is described as appearing to be deficient in the power of picking up little fragments of anything, such as bits of egg, &c., and to the last gaped to be fed with all but caterpillars, or in other words, its natural food. It was remarkably sharp-sighted, and if a caterpillar had escaped would perceive it from the opposite side of the room, and with the utmost rapidity dart at and seize it.

This bird was presumed to be a female from its note: it was originally taken from a titlark's nest. Montagu, in the supplement to his 'Ornithological Dictionary,' gives so full and interesting an account of a cuckoo which he kept, that a portion of the above is but a counterpart of his narrative. It seemed to me, however, that all particulars respecting Mr. Templeton's bird were well worthy of being recorded.

In Holland I have heard the call of the cuckoo in the king's park at the Hague towards the end of May, and in Switzerland, late in June. Its well-known cry was most gratifying to my ear, when on the 16th of May last riding over the bare and wild hills and through the forest between Constantinople and Belgrade *. When about Navarino on the 28th of April, a small flock of seven or eight birds which were believed to be cuckoos flew near to me, proceeding in a northerly direction, but the call was wanting to prove the species.

Yellow-billed American Cuckoo, *Coccyzus Americanus*, Bonap.†

The first notice of the occurrence of this species in the British Islands, and indeed in the Eastern hemisphere, is due to Mr. R. Ball of Dublin, who contributed a note upon the subject to the first number of the 'Field Naturalists' Magazine.' He states, that when at Youghal (co. Cork) in 1825, the butler of a neighbouring gentleman brought him a specimen of this bird a few minutes after its being shot, and when still warm and bleeding. In the same communication, dated from Dublin Castle, Oct. 20, 1832, Mr. Ball mentions a second example as having been recently killed near Bray, a few miles from Dublin. About the same period ("autumn 1832") one was shot on the estate of Lord Cawdor, in Wales. Mr. Yarrell mentions his having received a communication respecting the occurrence of another, in Cornwall, but no date is given. ('Br. Birds,' vol. ii. p. 190.) These are, I believe, all the recorded instances of the species having been met with in the British Islands. The last two parts of Temminck's 'Manuel,' published in 1835 and 1840, do not contain any notice of its appearance on the European continent.

The specimen obtained near Bray was shown to me by Mr. Glennon, bird-preserver, Dublin, and I agree with Mr. Ball in considering it identical in species with his own. This was, with that gentleman's usual liberality, entrusted to me when about to visit London in the spring of 1835, when I compared it with the specimen presented by Lord Cawdor to the British Museum, and found them to be of the same species. Before leaving home I had purchased in Belfast a yellow-billed American cuckoo from a person who had shot it at Long Island (United States), and at a meeting of the Zoological Society exhibited this bird and Mr. Ball's for the purpose of showing their specific identity.

* The Belgrade of Lady Mary Wortley Montagu.

† See Temminck's 'Manuel,' part 3. p. 277, for remarks both on the generic and specific names.

It was considered desirable to look as critically as possible to these birds on account of the singular fact of their appearance in this hemisphere. Ornithologists can hardly believe that they crossed the Atlantic. Temminck conjectures that this cuckoo must breed in the north of Europe, whence the individuals migrated to the British Islands. But our knowledge of their occurrence here only, and in the more western parts (Ireland, Wales, and Cornwall), in addition to the fact, that at the very period of their being met with the species is (as we learn from Wilson and Audubon) in course of migration in the western hemisphere, seems to me presumptive evidence of their having really crossed the ocean. So far north as Labrador, Audubon has seen this bird in summer.

Roller, *Coracias garrula*, Linn.—See 'Annals,' vol. vii. p. 478.

The Bee-Eater, *Merops Apiaster*, Linn., has very rarely been met with in Ireland.

Dr. J. D. Marshall of Belfast, in a communication to the 'Magazine of Natural History' (vol. ii.) dated July 1829, stated that one "was killed in the county of Wicklow a few years ago." Dr. R. Graves of Dublin, in a letter addressed to a mutual friend in Belfast, mentioned in November 1830, that he had known three bee-eaters to have been obtained in the interior of Ireland, one of which was shot by Mr. Tardy, an eminent entomologist in the metropolis, who on opening the stomach found it to contain many bees. It is doubtless the same individual that is alluded to by Mr. Vigors in the 'Zoological Journal' (No. 4. p. 589) as being in the possession of the last-named gentleman; but in this communication it is stated to have been shot "on the sea-coast, near Wexford, in the winter of 1820"(?) In March 1833 I saw one of the specimens alluded to by Dr. Graves, in his own collection.

As noticed in the 'Magazine of Natural History' (vol. ii. p. 18, new series), I had the opportunity of examining in a recent state, the only one of these birds yet recorded as obtained in Scotland. It was stated to have been shot on the 6th of October, 1832, by Capt. James McDowall, 2nd Life Guards, at his seat near the Mull of Galloway; and it was sent to Belfast by my friend Capt. Fayrer, R.N., to be preserved, and set up for that gentleman.

I have had the gratification of seeing the bee-eater in scenes with which its brilliant plumage was more in harmony than in the British Isles. It first excited my admiration in August 1826, when visiting the celebrated grotto of Egeria, near Rome. On approaching this classic spot, several of these birds, in rapid swift-like flight, swept closely past and around us, uttering their peculiar call, and with their graceful form and brilliant colours proved irresistibly attractive. My companion, who as well as myself beheld them for the first time, was so greatly struck with the beauty of their plumage and bold sweeping flight, as to term them the presiding deities over Egeria's Grotto. Rich as the spot was in historical and poetical associations, it was not less so for its pictorial charms—all was in admirable keeping;—the picturesque grotto with its ivy-mantled entrance and gushing spring; the gracefully reclining, though headless white marble statue of the nymph; the sides of the grotto covered with the exquisitely beautiful maiden-hair fern in the richest luxuriance; the wilderness of wild-flowers around the exterior, attracting the bees on which the *Merops* was feeding; and over all, the deep blue sky of Rome completing the picture.

In the 8th volume of the 'Annals' (pp. 127 and 128) will be found a particular notice of some bee-eaters which in a very different scene afforded much gratification to all who beheld them, as they perched during migration on the stern-rope of H.M.S. Beacon, when near the Morea, at the end of April 1841.

The Kingfisher, *Alcedo Ispida*, Linn., is at least occasionally to be met with in suitable localities throughout the island. It is a species nowhere numerous. As many of these birds would seem to be distributed over districts favourable for their abode in Ireland, as in any other country.

The kingfisher is said generally by British authors to be partial to clear streams, but to the correctness of this remark its haunts around Belfast will not bear testimony. Here are streams, which, though not on a grand scale, partake more or less of every natural character, and gently flow or wildly rush through scenery the most varied; yet the deep, muddy, and sluggish Lagan is its favourite haunt. About waters of every description it may sometimes be seen, not excepting the deep and unpicturesque brick-pits, about which no tree or shrub appears.

There is decidedly a partial migration or movement of these birds. To ponds at our own residence in the country, contiguous to the mountains, and elevated 500 feet above the sea, they came regularly every year about the same time in the month of August, and remained generally for about six weeks—once only were they seen in winter. Their first appearance in the year 1831 was on the 4th of August; in 1833 on the 14th; 1834 the 14th; and 1835 the 17th of that month*. Although more frequently solitary, two were occasionally seen in company, and in one instance three, of which a couple were, from being less brilliant in plumage, and slower in flight than the other, believed to be young birds. Their usual haunts are the willowed banks of ponds, one of which is not more than thirty yards distant from the dwelling-house. At little more than this distance we were once amused on observing from the windows a kingfisher perched on the handle of a spade, and looking a miserable object from its being "all droukit" with heavy rain. It did not betray any shyness, though several persons passed within about a dozen paces,

* Intelligent persons resident on the banks of the Lagan, near Belfast, state that kingfishers appear there in the autumn and remain until March, when they disappear. This accords with the observation of Mr. Weir, who, writing from Linlithgowshire, remarks—"In my neighbourhood kingfishers are never seen before the beginning of September, and they usually disappear about the end of March. They then retire to the river Avon, where they breed." Macgillivray's Brit. Birds, vol. iii. p. 679.

but remained on this graceless perch* for about an hour, until it was driven away by the owner of the spade going to resume his work. This trivial circumstance is mentioned in connexion with the chosen haunts of the kingfisher at this locality, as some writers have described it to be a wild and unapproachable bird, avoiding the vicinity of human dwellings. I have never found it so. A relative, who has bestowed much attention on the species, has been surprised by frequently observing it alight in beds of reeds unapproachable to him from growing on oozy banks, whence he could not again raise it either by shouting or the throwing of stones. But when much persecuted it fortunately becomes wild, as its splendid plumage renders it a valued object of pursuit to the juvenile shooter. To my great regret I was myself once guilty of the death of a kingfisher, but under extenuating circumstances. During frost which succeeded a heavy fall of snow, I was in pursuit of woodcocks and snipes along the partially wooded banks of a rivulet, when a small bird of a peculiar appearance was sprung two or three times as we advanced, and always within shot; at last I fired at it, and to my astonishment, on going to the spot where it fell, found that it was a kingfisher. All sportsmen must have remarked the changed aspect of birds rising against a snowy background, but would hardly be prepared, as in this instance, to see a kingfisher lose all its brilliancy, and assume a hue, dark and sooty as the water-ouzel; yet such was the fact. Had it not appeared under false colours, the trigger would have been untouched. Its mode of flight should certainly have indicated the species; but over this, unfortunately, the negative character of the absence of its wonted beauty prevailed. Besides, it is not the snow-clad landscape that should bring to mind the kingfisher, whose vesture under ordinary circumstances rather suggests the torrid zone than the arctic circle.

Mr. Yarrell observes that the kingfisher is "a difficult bird to shoot on the wing;" but from its usual flight being direct, like that of the water-ouzel and quail, I should call it easy:—this will, however, depend on the individual shooter—it is to be hoped that those who follow the bird with evil intent will find that it is "difficult" to be shot. Occasionally, both in summer and winter, I have seen a couple of kingfishers, apparently in playful mood, describing graceful curves after the manner of the sandpiper (*Totanus Hypoleucos*), as they flew gently over the surface of the water. Their splendid plumage was at the same time displayed to the most advantage, and they gave forth their peculiar shrill and piping call. This resembles more that of the sandpiper than any bird with which I am acquainted, but may perhaps be termed louder, hoarser, and not so shrill.

This species has already been mentioned as resorting to an upland locality in the month of August, and remaining there through September; after which period and through the winter it is to be met

* I have seen the kingfisher perched on the not more picturesque brickbat, and on the mud of the river.

with about the streams and rivers of the lower grounds, and occasionally about the estuary of Belfast-bay. A couple of them were remarked by my observant friend Mr. James Garrett, throughout the month of January 1836, to frequent the river Lagan where subject to the flow of the tide, and he has known them in pursuit of food to be immersed for a few seconds beneath the surface of the water; about another river where it enters the bay, three or four have been seen in company: in shallow pools of sea-water this bird has been remarked at ebb-tide fishing in its most picturesque manner—suspended above the water, and darting down upon its prey. This mode must necessarily have been resorted to here, where there was no branch of a tree or perch from which the bird could be on the look-out; but on rivers with wooded banks it occasionally fishes in the same manner. My brother notes his having seen the kingfisher dart down upon its prey from a branch fully six feet above the water. I remember being once entertained by observing one of these birds perched on a branch overhanging a pond, and about a foot above it, whilst trout, one and all too large for its mastery, kept leaping up immediately beneath as if in defiance of their enemy. A gentleman once informed me, that beside the nest of a kingfisher he had found the perfect skeleton of a fish, which induced him to believe that the bird does not swallow the fish whole, but picks the flesh off. That such however is not the case, the stomachs of the few—six in number—which I have myself examined, sufficiently attested, as they all contained fish-bones, and these only. The two before alluded to as frequenting the Lagan within flow of the tide in January 1836, fell victims to the gun at the end of that month, and were found on dissection to have their stomachs filled with "shrimps" about an inch in length.

In the winter of 1830–31, a bird-preserver in Belfast received so many as seven kingfishers in the course of a month—of these, three were shot at the Lagan*, one near Downpatrick, and two or three at the Six-mile Water, a fine clear trout stream, and one of the tributaries of Lough Neagh. Within about a month on another occasion, from the middle of October to that of November, I saw seven of these birds which had been sent to taxidermists in the town just mentioned—of these one was from the last-named river, as were single specimens from the Inver, at Larne, and the Milewater, in the county of Antrim; one from Killileagh (co. Down), and three from Coleraine (co. Londonderry). Mr. R. Davis, Jun., of Clonmel, has informed me, that during one week in January 1841, he received six examples of this bird—the extreme cold of that month will be remembered†. All these are remarkable cases.

* On the 21st September, 1833, kingfishers were said to be plentiful about this river; four were seen together on a bank of gravel, and on being frightened away flew in company up the stream; about a mile below where they were first seen, my informant proceeding onwards saw two more: for so many to appear within so limited a space is extraordinary.

† "In severe winters they sometimes become so tame that they even venture within a few feet of the door of Bathgate Mill, which is situated in the immediate vicinity of houses." Mr. Weir in Macgillivray's Brit. Birds, vol. iii. p. 679.

My friend Richard Langtry, Esq., when grouse-shooting at Aberarder, in Inverness-shire, in the season of 1840, met with a kingfisher several times, from the middle to the end of September, about a wild mountain-rivulet at a considerable elevation, and whose banks were destitute of wood or any cover. In the middle of August I once saw three of these birds in company at the Pontine marshes between Rome and Naples.

Mr. Waterton, in his 'Essays on Natural History,' treats of the kingfisher in a most pleasing manner.

[To be continued.]

XXVIII.—*Organographic and Physiologic Sketch of the Class Fungi*, by C. Montagne, D.M. *Extracted from* 'Histoire physique, politique et naturelle de l'île de Cuba,' par M. Ramon de la Sagra, *and translated and illustrated with short notes by the* Rev. M. J. Berkeley, M.A., F.L.S.

[Continued from p. 116.]

Pyrenomycetes, Fries.

This family is one of the largest in the class Fungi. Its essential characters are, 1st, a mucilaginous, deliquescent, rounded, never disciform nucleus, containing little convergent utricles (*asci*) mixed with continuous or septate threads (*paraphyses*), and containing sporidia; 2ndly, receptacles, either real (*perithecia*) or formed by the matrix or stroma, destined to contain the nucleus. These fungi are to the *Discomycetes*, what *Verrucariæ* are to *Lecidineæ* amongst Lichens.

It would be difficult to conceive the prodigious variety of forms which the perithecium and sporidia assume in the descending series of genera and species in this family from the genus *Hypoxylon* to *Sacidium*.

I regret that I have not space to consider these as fully as in the foregoing families. I must confine myself to what is indispensable to give a general notion of the group.

The family of *Pyrenomycetes* is divided naturally into two principal tribes (Fr. Fl. Scan., p. 345): 1. *Sphæriaceæ* characterized by the presence of asci; 2. *Perisporiaceæ* by the absence of true utricles, which are, however, sometimes represented by little transparent sacs. We will examine in succession the stroma, perithecium, sporidia, &c.

The perithecia, simple, scattered or aggregate, are sometimes connected by a byssoid web or by a carbon-like substance, which is called *stroma*. This when present is extremely variable in form; it is vertical and centripetal, or horizontal and centrifugal. The vertical stroma (*caulescens*) is orange or black, carbonaceous, corky, fleshy or woody, coriaceous, flexible or brittle, smooth or pubescent, even and polished, or else rough and warty, generally cylindrical, branched and dichotomous or simple, and then inflated with a capitate or clavate apex. In this last case it is called stipitate, and the stem (*stipes*) is distinguished from the inflated portion which is called *clavula*. The stroma when horizontal assumes also different forms, but these, as we may easily suppose, are less various. Nevertheless, the little cushions or discs which it forms upon the bark, or between the bark and the wood, or even upon the naked or decomposed wood, are byssoid, pulverulent, fleshy or carbonaceous and brittle. Frequently the matrix supplies its place. Its colour is as variable as that of the vertical stroma. In the genus *Thamnomyces* it is from the matrix that the cells or perithecia are formed. In *Dothidea* it is in the cavities of a *pseudostroma* furnished by the matrix that the nuclei are immediately enclosed. Some genera have a cup-shaped stroma (*Atractobolus, Cordierites*, Mont.). The stroma is frequently obliterated or wanting, in which case the species is reduced to a perithecium. This is entire or dimidiate and hemispherical, with or without an ostiolum. In *Sphæriæ* there is constantly an ostiolum, which assumes however various directions. According as the perithecia are divergent, erect, convergent or horizontal, they are said to be peripheric, hypopheric, amphipheric or peripheric. They are more or less immersed in the stroma, being sometimes quite concealed, sometimes free and resting on it merely with their base. They are monostichous or polystichous, according as they are placed in a single curve, or several more or less concentric layers. In certain genera they are disposed circularly round a central axis (*Cytispora*). The perithecia are dimidate, astomous, and reduced sometimes to a simple disc as in *Sacidium*. When they are furnished with an ostiolum, it is papillary or rostrate, and traversed by a canal which places the nucleus in contact with the air, and at length makes way for the sporidia. But the ostiolum is wanting in many whole tribes, and then the dehiscence of the perithecium takes place by means of a simple pore, or, as in *Dicheneæ*, by one or more irregular clefts. In *Apiosporeæ* it is indehiscent, that is to say, it does not burst spontaneously. In *Eustegia* the dehiscence is transverse.

Many *Pyrenomycetes* have the perithecia covered with a more or less close and dense byssoid down, the remains of the veil which clothed them when young, or of the stroma in which they were developed ; others have their whole surface or base rough with hairs. The walls of the perithecia vary much as to consistence, though this bears in general some proportion to that of the stroma. They are hard, horny, corky, carbonaceous or else thin membranous, papyraceous, and capable of collapsing after the evacuation of the nucleus. In general they are composed of one or more layers of thick cells, so condensed in the carbonaceous species that there are scarcely any intercellular passages.

The nucleus, which is either of an opal-white or coloured, is composed of simple or branched continuous or jointed threads, between which are placed the asci. They are generally convergent, and contain a greater or less number of sporidia arranged in one or two rows, but frequently without any fixed order. These organs are seated in a mucilaginous, frequently opaline and transparent, highly hygroscopic medium, together with which they escape from the perithecium. The paraphyses, and even the asci, are wanting in many genera. Though sometimes linear, they are generally more or less clavate. In some species of *Hypocrea* the tips are surmounted by a cup-shaped appendage, which Corda* and myself indicated at the same time, without being able to give any account of its functions. They are generally transparent, indehiscent, and according to Mr. Berkeley (*On exist. of a second membrane in the asci of Fungi*) composed of two membranes at first united, but at a later period separate, and remaining so till the maturity of the sporidia. Asci are wanting in a great number of species. In some genera this defect is normal. But in some species belonging to genera where they are usually found, they are absorbed, as may be expected by persons versed in vegetable physiology, but even then the sporidia are frequently still found disposed in rows in the jelly of the nucleus. (Corda, *l. c.* t. 9. f. 122. 5, 6.) These remarks are equally applicable to the paraphyses. The Perisporiaceous *Pyrenomycetes* also have not normal asci; they are represented by hyaline subglobose sacs. Generally these organs, which are styled peridiola, are pyriform and contain sporidia. Asci and peridiola are clearly the same organ, and differ only in form and position. Fries † remarks that the form of the asci varies considerably at different ages of the same species, and consequently we must be very circumspect in resting on them as distinctive of species.

Sporidia occur of every form between linear and spherical. They are simple, bi- or pluri-locular as in *Verrucariæ*; but in some species the septa are soon absorbed. They often contain sporidiola which are usually globose. The simple sporidia and sporidiola have the same organization as the spores of fungi of the preceding families. In *Sporocadus*, Corda, which is the same as *Diplodia*, Fr., the bilocular ‡ and naked sporidia are fixed in the bottom of the cell by a short peduncle, which appears again in *Schizothecium*, Corda. In *Sphæronema* they escape with the jelly of the nucleus and form a little globule, which remains for a long time fixed at the tip of the perithecium. In *Næmaspora* and *Cytispora* they ooze out in the form of flat or cylindric tendrils. Their colour is black or dingy (e. g. *Hypoxylon*) or white. They are opake or pellucid, and are sometimes surrounded when young by a mucilaginous coat, which is occasionally tolerably thick. I have observed this peculiarity in my *S. pseudo-bombarda*, and Mr. Berkeley in *S. pedunculata*, Dicks. Not only are the sporidia arranged in the asci in one or more rows, but they are sometimes so connected, as even after dispersion to exhibit the form of short necklaces. This mode of arrangement, which

* Corda, Ic. Fung. iv. tab. 9. f. 129. 13 *i.*—Mont., Ann. Sc. Nat., ii. sér. t. xiii. t. 6. fig. 2, *s*.

† A little experience however will almost prevent the possibility of error. No experienced mycologist will be likely either to describe immature asci and sporidia as distinctive, or, on the other hand, be deceived by the absorption of the asci or of the sporidia themselves while the sporidiola remain.—M. J. B.

‡ In some of Corda's *Sporocadi* = *Hendersonia*, Berk., the sporidia are pluri-locular.—M. J. B.

is observed in *Hypocrea ophioglossoides* [and *Perisporium vulgare*], is found again in *Antennaria*, which has no asci. They are generally four or eight in each ascus; in* *Hypocrea Robertsii* and *phyllogena*, nob., they are much more numerous.

M. Corda (Ic. Fung., ii. p. 27. t. 13. f. 97. 21, 22.) relates a curious fact regarding the germination in this family. He says that he has seen in *Perisporium vulgare* that it does not consist, as in other cellular plants, in a simple elongation of one of the two poles of the *episporium*, but that this, after the fashion of the seeds of higher plants, bursts to make way for the primordial filament. If there is no optical deception, and this observation is confirmed, it is certainly one of great interest.

I cannot better end my general remarks on this family than by quoting a passage from Fries, Syst. Myc., ii. p. 315:—"*Ubique terrarum ubi adest vegetatio, simul adsunt Pyrenomycetes, ut vix alia existat stirpium familia frequentior obvia, cum omnis stirps perfectior, omnesque partes morientes, Pyrenomycetes alant.*" The bark, wood, stems and leaves of herbaceous plants, the leaves of trees, the dung of animals, are the matrix (in other respects useless to man) on which they love to grow. Some species grow on dead animals; chiefly on caterpillars (*Hypocrea Robertsii* and *entomorrhiza*†). Some grow on other fungi (e. g. *Hypocrea ophioglossoides* and *capitata*).

On one side the *Pyrenomycetes* are closely allied to *Discomycetes* by their fructification, equally with which their vegetation is centripetal; on the other in the form of their perithecium with certain Lichens, as *Verrucariæ* and *Trypteheliaceæ*; but they differ essentially from the first by the character which brings them near to the second, and from these by the absence of all trace of thallus.

Fries established two grand divisions in this family, *Sphæriaceæ* characterized by elongated asci (*asci perfecti*), and *Perisporiaceæ* which have the sporidia naked or enclosed in little pouches (*peridiola*). The *Sphæriaceæ* are divided into, 1. *Sphæriæ*, whose perithecia have a prominent ostiolum; 2. *Dothioræ*, in which there is only a simple pore; 3. *Dicheneæ*, in which dehiscence takes place by one or more clefts, or by an orbicular dilatation. The *Perisporiaceæ* are subdivided in the same manner: 1. *Perisporiæ*, with an ostiolate perithecium; 2. *Apiosporeæ*, in which it opens irregularly or bursts; 3. *Cytisporeæ*, in which there is no true perithecium, or if there be, it is concealed in the matrix.

Discomycetes, Fr.

This family, recently established by Fries (Fl. Scan., p. 341) at the expense of the *Hymenomycetes* with a closed receptacle, and of *Pyrenomycetes* with an expanded or disc-bearing receptacle, is characterized by a sort of hymenium, at first nucleiform, then expanded

* And I believe generally in *Hypocrea*, which I conceive to be the grand distinctive mark.—M. J. B.

† The famous "guêpes végétantes" are living wasps attacked I believe by a species of *Hypocrea*. The specimens which I have had an opportunity of examining were not quite mature.—M. J. B.

into a solid disc, which is superior and sometimes spread over a convex capitiform surface, but always limited. The hymenial disc, whatever be its conformation, is composed of erect, elongated, persistent asci mixed with paraphyses, and enclosing a determinate number of sporidia (4, 6, 8), which, when mature, are discharged elastically under the form of a dusty cloud.

Their hymenium is supported by a receptacle (*excipulum*), whose form and consistence, which are very variable, furnish their primary distinctions. We will now trace their variations in the whole series. Its substance, which is like wax in *Helvellæ*, is gelatinous in *Bulgariæ*, corky in *Dermeæ*, coriaceous in *Patellariæ*, horny in *Phacidia*. Its forms are not less variable. It is in the first that it attains its maximum of development. Some of its species so much resemble certain *Hymenomycetes*, that we are obliged to have recourse to microscopical analysis to determine accurately their place. Thus the receptacle, though pileiform and always limited, is irregularly alveolate in the Morel, folded and sinuous in *Gyrocephalus*; it is smooth, mitriform and lobed in *Helvellæ*, campanulate in *Verpa*, clavate in *Geoglossum*, capituliform in *Mitrula*, *Leotia* and *Vibrissea*, and cupuliform in *Pezizæ* and *Patellariæ*. In the first of these genera it has always an elongated stem which is either smooth or furrowed. In the latter the cup is stipitate or sessile.

The receptacle is always open in *Helvellæ*, with the exception of the *Pezizæ*, where it is at first closed, as also in *Cenangium*, *Excipula*, &c. It is also constantly open in *Bulgaria*. In *Dermeæ*, which comprise six genera, it is at first closed in the three last (*Hirneola*, *Dermea* and *Lachnella*), and always open in the three others, as also in the genera *Sarea* and *Patellaria* of the following tribe. In *Phacidiaceæ* the receptacle opens by a single longitudinal fissure (*Hysterium*), or by several either radiating from a common centre as in *Actidium*, or irregularly disposed as in *Rhytisma*. Finally, in *Leptostroma* this organ is reduced to an orbicular scale, whose fall exposes the sporigerous disc. In *Stictideæ* the receptacle is obliterated or wholly wanting; it is the matrix, in which the fungus is developed, which supplies its place. Nevertheless, even in this case, we observe sometimes the rudiment of an excipulum, sometimes merely a layer of cells, named by some subhymenial tissue, Lév., by others placentary stratum (*Placentar-schichte*, Corda).

The hymenium of *Discomycetes* is irregularly spread out, and follows all the sinuosities and folds of the receptacle in *Helvellæ* and *Bulgariæ*, or else it is orbicular and disciform as in *Pezizæ*, *Patellariæ*, and some *Phacidiaceæ*; or elongated as in many *Hysteria* and *Stictideæ*. Whatever form it assumes, the hymenium is always composed of a certain number of membranous, transparent, very thin, elongated, cylindrical or clavate cells, placed parallel the one to the other. These cells, called asci, are fixed by one of their extremities to the receptacle, the other being free and rounded; they contain generally an even number (4, 6, 8) of rounded, oval or elongated bodies formed of one or more cells called *sporæ*, which, as already said, are destined to propagate the species. Between the asci other tubular cells which resemble them are usually found, but in which no spores are developed; these are called *paraphyses*. It is very probable that these are only abortive asci; they are found in *Lichens*, *Byssaceæ* and *Hymenomycetes*; we have mentioned also their presence in *Pyrenomycetes*.

Corda has observed and figured in *Geoglossum hirsutum* (Ic. Fung., ii. p. 35. t. 15. f. 124. 4. *g, g*.) a third kind of utricles fashioned like the asci, but containing instead of spores irregular granules floating in a very fluid mucilage. The ascomorphic cells, in consequence of their great analogy in form and structure with the anthers of Mosses (*antheridia*, Bisch.), seem to him to be destined to perform here the functions of those organs, viz. to fecundate the spores. The same mycologist has also remarked that the hymenium of the genus *Agyrium* is covered, like the proligerous disc of Lichens, with a compact layer of cells, between which there are very visible vacant spaces. This is, I think, very improperly termed proligerous disc, for it appears rather to be due to the remains of a kind of veil. In *Agyrium rufum* we find instead of paraphyses a cellular tissue analogous to that of the placentary or subhymenial tissue, between the cells of which the asci are seated.

Amongst *Discomycetes* there are genera and species in which the asci are invariably fixed upon the receptacle, and others in which at a certain period they are normally detached, and are discharged together with the spores which they contain (*Ascobolus*, *Lachnella*). These organs are variable in form, but within certain limits. They assume every form between that of cylindric and rhopaloid. Fries calls them moniliform in his genus *Orbilia*, with which I am not acquainted.

The sporidia (or spores) are much more variable than the asci. Thus they are spherical, ovoid, oblong, elliptic, much elongated and obtuse at either end (baculiform), as in *Propolis* and *Spathularia*, or else acute (fusiform, acicular), as in *Geoglossum*. As regards structure, they consist of a single cell, or else they are divided transversely, as in *Geoglossum* and *Cryptodiscus*, or at the same time longitudinally and transversely, as in *Melittosporium*; in many cases by septa, which render them plurilocular or compound. Their normal number varies between four and eight, but this number is always even. They are formed, like those of other families, of a thin, elastic, transparent episporium, whose cavity is filled, according to Corda, with a white, limpid, hyaline, gelatinous substance, in which are suspended some drops of an oily matter. He has followed and described (*l. c.* iii. p. 39) the morphosis of these organs in *Peziza Acetabulum*; we can only refer the reader to the passage. At the maturity of the fungus, the sporidia in many species are ejected forcibly from the asci by a sort of contractile power in these organs, in order to their being dispersed in the air in the form of smoke or a cloud. This dispersion of the sporules takes place at intervals, so that the ascus empties itself completely by several successive jerks. This must take place by a pore in the summit of the ascus, though the microscope has not yet proved its existence. All the genera of the family do not present the phænomenon just mentioned, nor all the species of the same genus. In *Ascobolus,* it is the asci themselves which are ejected.

The *Discomycetes,* which Corda still keeps amongst the species of the following family, but which M. Léveillé, like Fries, separates from them under the name of *Thecospori,* have a receptacle composed of cells which are sometimes polyhedrous and rounded, sometimes more or less elongated, which, by their contiguity or various interlacing, give to the tissue which results from them a very varied consistence. They grow on the earth, or wood and leaves in the course of decomposition. Their vegetation is centripetal, as in *Pyrenomycetes,* with which many tribes were not long since confounded. There is, however, this essential difference, that the receptacle, though at first it may have been closed, at length opens and becomes discoid. Their normal form is then that of a cup; but if we suppose that this cup, in a high grade of development, should become reversed, we shall have the mitre-like form of *Helvella,* the pileate or hemispherical shape of *Leotia,* or finally, that of capitate in *Morchella.*

Many species amongst the *Morels* and *Helvellæ* are eatable *. Some are adorned with the brightest colours, and are the pride of our forests. It is to the beauty of *Peziza coccinea* that Persoon attributed his study of Fungi, as he himself assured me. These fungi are generally European; many, however, occur in the southern parts of the new world, for they belong chiefly to the temperate zones. This is especially true of *Helvellæ,* for we possess many *Pezizæ* from tropical America, and have one to describe from Cuba.

[To be continued.]

XXIX.—*On two new species of Trogon and a new species of Toucan from the Cordillerian Andes.* By John Gould, Esq., F.L.S., &c.

To the Editors of the Annals of Natural History.

Gentlemen,

Aware of the extensive circulation of your valuable Journal among scientific men both at home and abroad, and consequently of its importance as a means of making known new species in the various branches of the delightful science to which its pages are devoted, I beg to enclose for insertion in it the specific characters and descriptions of two new Trogons and a new Toucan, neither of which have appeared in my illustrated Monographs of those groups; figures of them will however shortly be published in my 'Icones Avium.'

* During many months of the year the staple food of the Fuegians is a fungus of this family, figured by Darwin, and to which, in a paper read before the Linnæan Society, I have given the name of *Cyttaria*. It is allied to *Bulgaria*, with the form of *Sphæria concentrica*, and honey-comb appearance of a Morel.—M. J. B.

They are all from the Cordillerian Andes, a country the rich zoological productions of which are daily becoming more known to us.

Of the two former birds, one is an additional example of the genus *Trogon* as at present restricted, and may be characterized as

Trogon personata.

Trog. vertice, corpore superiore, et pectore splendidè aureo-viridibus; loris, plumis auricularibus, et gutture nigris; rectricibus caudæ duabus intermediis ex aureo virescenti-fuscis, ad apicem nigris; utrinque proximâ pogonio interno et apice nigris, pogonio externo ex aureo virescenti-fusco; rectricibus externis nigris, lineis albis crebris et undulatis minutè fasciatis, ad apicem latè niveis; alis nigris, tectricibus et secundariis lineis cinereis minutis et irregularibus crebrè fasciatis; abdomine et corpore subtùs coccineis; colore coccineo a viridi disjuncto lunulâ albâ; rostro aurantiaco.

Fœm. capite, pectore, et corpore superiore fuscis; rectricibus caudæ duabus intermediis sordidè castaneis; gutture et plumis auricularibus nigris; abdomine et corpore subtùs coccineis, hoc colore a fusco pectorali disjuncto lunulâ albâ.

Male. Crown of the head, all the upper surface and chest rich golden green; lores, ear-coverts and throat black; two middle tail-feathers golden greenish brown, and tipped with black; the next on each side have the inner web and tip black, and the outer web golden greenish brown; the outer feathers black, crossed by numerous fine irregular bars, and largely tipped with pure white; wings black, the coverts and secondaries finely pencilled with irregular zigzag markings of light gray; primaries margined externally with light gray; abdomen and under surface scarlet, separated from the green of the chest by a narrow crescent of white; bill orange-yellow; feet yellowish brown.

Female. Head, chest and upper surface brown; two middle tail-feathers dull chestnut-brown tipped with black; the two next on each side black on their inner webs and at the tip, and dull chestnut-brown on their outer webs; the remaining feathers black on their inner webs at the base, largely tipped with white, the intermediate portion being crossed by alternate irregular bars of black and white; wings as in the male, the coverts and secondaries freckled with yellowish brown instead of gray, and ear-coverts black; abdomen and under surface scarlet, which colour is separated from the brown of the chest by a crescent of white; bill and feet yellowish brown.

Total length, 11 inches; bill, $\frac{7}{8}$; wing, $5\frac{1}{4}$; tail, $6\frac{1}{2}$; tarsi, $\frac{5}{8}$.

Hab. The Cordillerian Andes.

In size and in its markings this species is very closely allied to *Trogon atricollis*, but differs from it in having the under surface rich scarlet instead of fine orange.

The other belongs to that section of the *Trogonidæ* to which Mr. Swainson has applied the term *Calurus*, and which comprises by far the most splendid members of the family. I propose to name it

TROGON (CALURUS) AURICEPS.

Trog. capite toto et gutture splendidè aureo-viridibus; corpore superiore, pectore superiore, alis, tectricibusque caudæ superioribus saturatè viridibus; caudâ nigerrimâ; pectore inferiore, abdomine crissoque e sanguineo coccineis.

Male. The whole of the head and throat rich golden green; all the upper surface, chest, wing and upper tail-coverts rich deep green, changing into a brilliant golden according to the direction of the light; wings and all the tail-feathers jet-black; breast, abdomen and under tail-coverts of the richest scarlet, inclining to crimson; feathers of the tarsi black; bill yellow; feet reddish brown.

Female or young Male. Head, throat, chest and upper surfaces as in the male, but less; wings black, the primaries and secondaries broadly margined on their external webs with sandy buff; tail dull black, the outer feather irregularly margined externally and tipped with pale buff; abdomen and under tail-coverts scarlet; bill brown; feet reddish brown.

Total length, $14\frac{1}{2}$ inches; bill, $1\frac{1}{4}$; wing, 8; tail, 8; tarsi, $\frac{3}{4}$.

Hab. The Cordillerian Andes.

This noble bird is more nearly allied to *Trogon* (*Calurus*) *pavoninus* than to any other species; but from which it differs in the bright yellow colouring of the bill, in the greater length of the wing-coverts, and in the more jet-black colouring of the wings and tail-feathers; the present is also a larger bird than *pavoninus.*

The Toucan belongs to that section of the family of *Ramphastidæ* for which I have proposed the generic or subgeneric name of *Aulacorhynchus*, and may be termed

PTEROGLOSSUS (AULACORHYNCHUS) CASTANEORHYNCHUS.

Pt. rostro castaneo-rubro, apicem versus pallidiore; mandibulâ inferiore in medio, et culmine nisi ad basin nigro undulatis; vittâ basali stramineâ, angustâ apud nares, exindè per latera rostri ductâ, et latiore gradatim; corpore superiore fuscescenti-viridi; alis saturatè viridibus; uropygio coccineo; corpore subtùs viridi; lateribus cæruleo tinctis; caudæ rectricibus quatuor intermediis ad apicem latè castaneis.

Bill chestnut-red, becoming paler towards the point, clouded with black on the middle of the lower mandible and along the culmen, except at the base; at the base of the bill is a band of straw-white which increases in breadth as it proceeds downwards; crown of the head and upper surface brownish green; wings dark green; rump crimson; four middle tail-feathers deep bluish green, largely tipped with chestnut-brown, the remainder green; all the under surface green, stained on the flanks with light blue.

Total length, 18 inches; bill, $4\frac{1}{4}$; wing, $5\frac{5}{8}$; tail, 7; tarsi, $1\frac{1}{2}$. *Hab.* The Cordillerian Andes.

Nearly allied to *Pteroglossus* (*Aulacorhynchus*) *hæmatopygus*, from which and from all other members of this section of its family it differs in its much larger size.

XXX.—*Information respecting Scientific Travellers.*

Mr. E. Forbes.

We have letters from our friend E. Forbes, Esq., dated from the coast of Lycia in February last. In consequence of the Beacon having remained on that coast for the purpose of procuring the antiquities discovered by Mr. Fellows at Xanthus, Mr. Forbes had given up his intention of wintering on the Red Sea, and was thus enabled to pursue his researches in the Archipelago and Asia Minor in the fullest and most satisfactory manner. At the date of his letters he was about to make an excursion into the interior of Lycia and Pamphylia in company with Lieut. Spratt and the Rev. E. Daniell, whose united labours will doubtless throw much new light on the geography, antiquities and natural history of that little known region. After this tour they were to make a detailed survey of Rhodes, and then to join the Beacon on the coast of Crete, where she will spend the summer. Mr. Forbes's observations on the winter vegetation of Lycia are given below at page 251.

In a letter to us, dated Xanthus, Asia Minor, February 28, 1842, he thus writes:—

"My work has been entirely among the Cyclades and on the south-west coast of Asia Minor. During the summer I made the circuit of the islands, a tour of very great interest, which enabled me to use the dredge with much effect, dredging in a very great number of localities and on as many sorts of sea-bottom as possible. I have since conducted a line of dredgings across the Archipelago and down the coast of Lycia, and have succeeded in obtaining the inhabitants of depths hitherto unexplored, even from 100 to 220 fathoms. The ground at those depths is very uniform, and there is a deposit of white sediment, probably of great thickness, extending throughout the eastern Mediterranean, the animals living on which do not vary in localities 300 miles apart. At a depth of 200 fathoms I have found mollusca of the genera *Tellina*, *Corbula* and *Arca alive*, Annelides allied to *Serpula*, several Crustacea and Starfishes of the genus *Ophiocoma*. Zoophytes are found in nearly as great a depth. The mud from above 200 fathoms is full of the shells of *Pteropoda* and other floaters. Of fishes I have taken a little Goby frequently in depths between 60 and 100 fathoms. The distribution of fishes here is as uniform as that of the lower animals, the same species turning up on the south coast of the Morea as in that of Rhodes. I have made drawings of about a hundred species with a view to exhibit their colouring when alive or fresh taken; of the greater number of these I have either skins or specimens in spirits. My inquiries for freshwater fishes have hitherto been unsuccessful. The river Xanthus is said to contain them, but though I have offered to reward anybody who would bring me some, I have not been able to procure any.

" As however I mean to remain in this country while the ship is at Malta refitting, I hope during my excursions into the interior to succeed better. Among the other Vertebrata I have done but little, saving the collecting of reptiles. Marine operations have so taken up my time, that the preservation of birds and mammalia has been out of the question.

" Among the former, however, I have just procured a beautiful Kingfisher, probably the *Alcedo Smyrnensis*; among the latter, I am now busy collecting information regarding those inhabiting the mountains of Cragus and Taurus. Geology and botany have not been neglected, but for my chief botanical harvest I look forward to this season. Cerigo, Santorini, Rhodes and Lycia have yielded me a rich harvest of fossils. Among the results of my dredging are the recent analogues of several tertiary species of shells supposed extinct."

Extracts from another letter of Mr. Forbes, dated Macri, Asia Minor, February 1842:—

" I am now in a new continent, one I had not rambled in before, and one, the scenes and wonders of which, I assure you, surpass most of those I had before admired in Europe. In the month of October I first set foot in Asia, a day or two after having been at Patmos, where, of course, I visited the traditional scene of St. John's exile and meditations. The supposed cave where the great poet of Christianity wrote his grand work is almost hidden under the mass of gewgaws heaped upon it by the Greek monks who live in the monastery built over it. The monastery is not, however, an unworthy one, since for many ages it has been the chief school of the Archipelago. When I visited it, a large deal table with wooden forms ranged round it, under a shed open to the air and facing a delicious view of the sea and the distant islands, was the only furniture of this primitive university.

" Cnidus was the first footing afforded me in Asia, and the first of the many ruined and once famous cities which I have been destined to visit. Telmessus, where I now am, was the next, a site, every stone of which is familiar to me, in consequence of its having unexpectedly become the Beacon's head-quarters. When I arrived here I had no expectation of remaining, and was glad to make the best of my time, starting off with one of our officers on an exploring tour into the interior. Our route was one never before travelled by tourist, and as our objects were antiquarian as well as scientific, the interest was doubled; not to mention the great pleasure of seeing the present inhabitants of the country in an unsophisticated state—a people possessed of more good qualities than any I had previously met, yet sadly libelled by geographers and travellers, who frighten all visitors from these shores by their bugbear tales of the ferocity of the natives. During our inland excursion we discovered several of the lost cities of Lycia, among others Choma and Balbura. I never thought city-hunting could have given me so much pleasure as it has done, but it really is quite as exciting as the hunting of new plants and animals. If I lived in this neighbourhood I should turn antiquary before three months had rolled away. The ruined cities of Lycia are wonderfully beautiful; situated in the midst of the grandest alpine scenery, amid mountains rising almost from the sea-level to the great elevation of 10,000 feet, with stupendous precipices towering on all sides, and great forests and extended plains of infinite variety; every cliff carved into temple-tombs, such as you read of in accounts of Petra, and every hill-side covered with ruins of great theatres and temples. You may easily picture to yourself the interest and delight of travelling in such a country—one, too, almost unexplored, having been only made known to us within the last four years by Fellows.*

"I mean to complete the exploration of Lycia, and to add to it Pamphylia, Phrygia, and Caria. I hope to discover Derbe, Lystra, and some other missing cities."

Extracts from a letter dated Xanthus, Asia Minor, February 28, 1842:—

"I am now *en route* into the interior, with a view to the exploration of the antiquities, geography, and natural history of the unexplored parts of Asia Minor. I shall return to meet the Beacon in May, and I hope then to proceed to Candia. In autumn I shall probably go to Egypt before returning to Edinburgh.

"I shall not trouble you with an itinerary of my travels; suffice to say, that I have rambled, or rather cruised, in the Beacon's Tenders through the Archipelago, and last autumn I accompanied one of our surveyors on his cruise to complete the survey of the Lycian coast. In January the Beacon found us here, having been sent down by Government to remove the marbles discovered here by Fellows. For the last three months we have been excavating marbles; some splendid things have turned up, which will greatly delight you when you see them. One set, representing the wars of the Amazons, is especially beautiful, and, to my mind, equal to the Elgin marbles both in the design and execution. Another frieze, of many pieces, is also of great interest and beauty; it represents the siege of a city, and, independent of the beauty and spirit of the combatants (in very high relief), includes representations of the most curious kind, of the fortifications and buildings of an ancient Lycian city. Some statues of great merit (but headless) have also been dug up. The crowning sculptures, however, are a set of bas-relief of exquisite beauty, in which the peculiar art of the Persians, as seen in Persepolitan sculptures, is combined with the freedom and execution of the Greeks. In all there is a ship-load, and the only difficulty to be overcome now is the shipping of them.

"This country is delightful, and is covered with ruins of the grandest kind. Every little excursion any of us have made into the interior has ended in the discovery of some lost ancient city. The

* We are happy to state that Mr. Fellows has just returned, enriched with new stores of information upon the antiquities of the interesting country which he has visited for the third time.

present inhabitants are a fine, frank, hospitable race of Turks—as good a people as ever I came across."

Another letter, dated Macri, February 28, 1842:—

"I have now dredged right across the Archipelago, from Cerigo to Lycia. For two months I accompanied our little schooner on these coasts when she was deep-sounding, and dredged every day that a dredge could go down, keeping a register of the produce. The water is very deep, and the results were highly interesting, since nobody, I believe, has dredged so deep before, viz. from 100 to 220 fathoms. This I was enabled to do successfully by means of Ball's little dredge; and, that the results might be strictly accurate, the depth was in each case ascertained, not only by the length of the rope, which is very fallacious, since currents affect it, but also by the patent sounding machine, which gives the depth to a foot. Of course, if all the results had been negative, such a series as I have collected, so strictly tested, would be invaluable; but they have not been negative, and if I am not mistaken, will throw great light on geology. Strange to say, the most characteristic species of shells in those depths are species known only in a fossil state hitherto.

"You will be surprised when I tell you, that, generally speaking, the Mediterranean is not nearly so prolific in marine animals as our coasts, and that they are mostly smaller than those of our seas. Large species of the *Articulata* and *Radiata* are extremely scarce, and, the large shell-fish are very few in number. The results indeed, taken all in all, of my marine geological work have greatly surprised me, and turned out quite contrary to my expectations. As to floating animals, they are very scarce; and medusas are, literally, few and far between.

"As to land animals, I find it difficult to give time to them, except the lower classes; but now I think I have succeeded in making one of our sailors a skinner of beasts. I am always on the look-out, especially here (Macri), which is much better than in the islands. Reptiles are always preserved, and I catch all I can The larger ones, such as the land and river tortoises, I defer taking till near my return, as I shall then endeavour to bring a live supply for your anatomical researches. Of fishes I have now above 100 drawings, to show their colouring when fresh, and a good many specimens. I draw everything, and have a great stock of pictures on hand. As Malta is an excellent place for fish, I hope, before returning, to get a number there for dissection. In fossil geology I have made considerable collections, and lots of notes.

"The manner in which, through unexpected circumstances, we have been, as it were, shut out of the world, has prevented me from writing the papers I intended for the Wernerian and Botanical Societies. Indeed I find it absolutely necessary to defer writing till my return, as I shall have to consult books and collections on many points."

Mr. Jerdon.

By letters from Mr. Jerdon, dated 16th February, 1842, we learn that that gentleman is still prosecuting his ornithological researches;

he has added several species to the Catalogue already published, and has corrected and verified many of his previous observations*. He is now about to publish a series of *fifty* coloured lithographic drawings of the birds of the peninsula of India, to be entitled 'Illustrations of Indian Ornithology;' the drawings to be of the size of those accompanying the Catalogue, but the colouring to be more highly finished. They will be struck off both on royal 8vo and 4to sized paper, and the price will be respectively 20 and 25 rupees, or 2*l.* and 2*l.* 10*s.* We trust, as the work is limited, that it will meet with encouragement from the ornithologists of his own country.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

December 21, 1841.—E. Forster, Esq., V.P., in the Chair.

Read an extract of a letter from William Griffith, Esq., F.L.S., to R. H. Solly, Esq., F.L.S., dated Serampore, the 11th of October 1841, containing the following observations:—

"In *Santalum* the ovulum consists of a nucleus and an embryo-sac, prolonged both beyond the apex and base of the nucleus; the albumen and embryo are developed in the exserted part above the septum; the mass of the embryo is developed directly from the vesicle, which is the termination of a pollen tube; the seed (albumen) has no other proper covering than the incorporated upper separable part of the embryo-sac.

"In *Osyris* the ovulum is reduced to a nucleus and an embryonary sac, prolonged exactly in the same directions as in *Santalum*, but not to such a degree anteriorly; this anterior portion resembling exactly the unchanged part of the sac of *Santalum* below the septum. The albumen and embryo are formed outside the sac, and are absolutely naked, or whatever covering they may have did not enter into the composition of the ovulum."

Mr. Griffith adds, "I have lately looked at *Isoetes capsularis*, Roxb.; it is an instructive plant, for it shows that botanists are mistaken in their supposition as to the male. In Roxburgh's plant the contents of the sporangium are sometimes of two sorts, but both have the same origin, both are precisely similarly constituted, except perhaps as to contents; and the largest of these, the males of authors, become afterwards like the others, but larger. There can be no doubt that in all these plants the true sporules or seeds are those produced by division of an original simple cell or its contents. *Isoetes* and *Azolla* prove too a thing of some importance, that the dissimilar organs which have so puzzled botanists may have a similar origin. The true male of *Isoetes* will probably turn out to be the oblong, cordate, fleshy laminæ above the female. On the male my observations were stopped by indisposition. As a male it is certainly anomalous; it is probably, I conjecture, developed originally within the

* Catalogue of the Birds of the Peninsula of India, by T. C. Jerdon. Madras, 1839.

leaf, and the scale between it and the female is probably analogous to the indusium of ferns. The most instructive plant is *Anthoceros* (which is not a *Hepatica*), for this may explain Ferns by showing that a pre-existing organ, to be acted upon by the male influence, is not necessary. Endlicher says *Isoetes* has no stomata; De Candolle figures them in his 'Organographie;' in *I. capsularis* they are very evident: no matter whether emerged or submerged, all plants having a cutis have stomata."

Read also a paper "On a new genus of Plants from Chile." By John Miers, Esq., F.L.S.

This genus, which is named by Mr. Miers *Solenomelus*, on account of the confluence into a tubular form both of the stamina and stigmata, belongs to the natural order *Irideæ*, and is thus characterized:

SOLENOMELUS.

Cruckshanksia, *Miers, Travels in Chile*, ii. p. 529. *non Hook.*

Perianthium petaloideum; tubo brevi incurvo; limbo 6-partito, laciniis patentibus, 3 superioribus erectioribus, 3 inferioribus deflexis. *Tubus stamineus* cum tubo perianthii coalitus, demùm liber, ore antheras 3 sessiles gerens. *Stylus* filiformis. *Stigma* integrum, urceolato-tubulosum, margine ciliatum. *Capsula* triquetra, trilocularis, loculicido-trivalvis.—Herbæ *Chilenses perennes, habitu* Sisyrinchii. Spatha *bivalvis, dorso sub apice mucronata.* Flores *breviter pedicellati.*

1. *Solenomelus Chilensis*, foliis lineari-ensiformibus, corollâ aurantiacâ.

Cruckshanksia graminea, *Miers, Travels in Chile*, ii. p. 529.

Hab. apud Concon, locis umbrosis.

2. *Solenomelus punctatus*, foliis angustioribus, corollâ aurantiacâ; laciniis singulis supra basin puncto sanguineo notatis.

Hab. prope Concepcion.

Mr. Miers observes, that the curved corolla, the coherence of the filaments throughout their entire length, and the union of the stigmata into an urceolate tube, afford characters that sufficiently distinguish this genus from *Sisyrinchium*, to which it is in other respects most nearly related. In all the species of the latter genus that he has examined he has found a portion of the filaments free; and he thinks the genus should be limited to those species in which the stamina are only partially united. This would exclude *S. odoratissimum*, Cav. (which is apparently the same as *S. Narcissoides*, Lindl.) and *S. flexuosum*, Lindl., described as having entirely united stamina, and further differing from *Sisyrinchium* in having a long infundibuliform corolla, with more distinct markings, and a very odoriferous smell. On these species Mr. Miers proposes to found a genus under the name of *Symphyostemon*; agreeing with *Solenomelus* in the complete union of its stamina, but differing by its deeply cleft style and the shape of its corolla. He thinks also that several species added to *Sisyrinchium* by Sprengel, such as *S. collinum*, *S. filiforme* and *S. flexuosum*, should be discarded from it, and believes that the entire genus requires a revision, for which he regrets that he does not possess sufficient materials.

Read also a "Notice of a new species of *Araucaria* from the neighbourhood of Moreton Bay; and of the Germination of *Nuytsia flori-*

bunda," in a letter from J. C. Bidwill, Esq., to Richard Taylor, Esq., Under Sec. L.S. (See *Ann. Nat. Hist.* vol. viii. p. 438.)

February 1, 1842.—The Bishop of Norwich, President, in the Chair.

Read, "Contributions to Vegetable Embryology, from Observations on the Origin and Development of the Embryo in *Tropæolum majus*." By Herbert Giraud, M.D., communicated by the Secretary.

After referring to the researches of MM. Schleiden, Wydler, Mirbel and Spach, and A. St. Hilaire, on this important point, Dr. Giraud states that he was induced to select *Tropæolum* as the subject of his own observations on account of its solitary ovula, and their comparatively large size, which render the individuals of this family, as well as the allied *Geraniaceæ*, peculiarly fitted for the purpose. He arranges his observations under seven general heads corresponding with as many progressive periods in the growth of the female organs, and extending from the completion of the anatropous development of the ovule to the perfect formation of the embryo; or from the commencement of the expansion of the bud to the complete formation of the fruit. The results are collected from a great number of dissections.

In the *first* period, or just before the expansion of the bud, a longitudinal section of the carpellum from its dorsum towards the axis of the pistillum, dividing the ovule, shows the latter to have completed its anatropous development. A portion of rather firm and dense cellular tissue enclosing a bundle of vessels descends from the placenta and in apposition with it to form the raphe, and terminates in the base of the ovule. The nucleus has only one integument, at the apex of which is the exostome or micropyle, opening close by and to the outside of the point of attachment; and the conducting tissue of the style may be traced into the carpellary cavity as far as the exostome.

In the *second* period, during which the expansion of the bud and the dehiscence of the anthers commence, and therefore before impregnation, a small elliptical cavity makes its appearance near the apex of the nucleus, having a delicate lining membrane formed by the walls of the surrounding cells: this cavity is the embryo-sac, and a minute canal may be traced leading from it to the exostome. The apex of the embryo-sac encloses at this period a quantity of organizable mucilage containing many minute bodies having the appearance and character of cytoblasts.

In the *third* period, the apex of the nucleus and of its integument becomes slightly inclined towards the placenta. The embryo-sac is much enlarged and lengthened; its mucilage has disappeared and given place to an elongated diaphanous utricle (*utricule primordiale*, Mirbel; *vésicule embryonnaire*, Meyen; *extrémité antérieure du boyau pollinique*, Schleiden;) containing a quantity of globular matter or cytoblasts. This primary utricle is developed wholly within the embryo-sac, from which it is obviously distinct.

The *fourth* period occurs after impregnation. The pollen tubes do not extend into the carpellary cavity; but the fovilla with its granules is found abundantly in the passage leading from the style to the exostome. With the increased development of the embryo-sac, the primary utricle elongates and becomes distinctly cellular by the development of minute cells in its interior, while at the extremity next the base of the nucleus it is terminated by a spherical mass consisting of globular cells. The primary utricle at this period assumes the character of the suspensor (Mirbel), and its spherical extremity constitutes the first trace of the embryo.

In the *fifth* period the apex of the nucleus and of its integument becomes more inclined towards the placenta; the spherical extremity of the suspensor enlarges, and it becomes more evident that it constitutes the rudimental embryo. In the mean time the suspensor has become lengthened by an increase in the number of its cells; and its upper extremity is found to be protruded through the apex of the embryo-sac, the apex of the nucleus and the micropyle. From this extremity there is a considerable development of cells, many of which hang loosely in the passage leading to the conducting tissue of the style, while the rest unite in forming a process which passes down the outer side of the ovulum within the carpellary cavity. This process is composed of from nine to twelve rows of cells, and its extremity resembles in appearance and in the anatomical condition of its cells the spongiole of a root. By a slight traction of this cellular process the suspensor with the embryo may be withdrawn from the embryo-sac through the exostome, thus proving the continuity of the process with the suspensor, and through it with the embryo itself.

During the *sixth* period the suspensor becomes more attenuated; and the cellular process has reached the base of the ovulum, the cells of its extremity abounding with cytoblasts, which prove that it is still progressing in development. The embryo also increases in size, and two lateral processes are observed, which evidently form the first traces of the cotyledons.

In the *seventh* period all distinction between the nucleus and its integument ceases, and they form a single envelope enclosing the embryo-sac; the cellular process has become so much developed, that its extremity has passed round the base of the ovulum and is directed towards the placenta; and the lateral processes of the embryo have become distinct fleshy cotyledons, enclosing both the radicle and plumule in corresponding depressions of their opposed surfaces. The subsequent changes consist chiefly in the great development of the cotyledons, which ultimately occupy the entire cavity of the nucleus, filling the space usually taken up by albumen.

From these observations Dr. Giraud deduces the following inferences.

The formation of the embryo-sac and the development of cytoblasts within it having been shown to take place at a period prior to impregnation, and even the primary utricle itself making its appearance before the emission of the pollen from the anther and before the expansion of the stigma, the origin of the primary utricle cannot be referred to the influence of impregnation, nor can it have been derived from the pollen tube pressing before it a fold of the embryo-sac.

The primary utricle at its first formation being quite distinct from the embryo-sac, even at its apex (although brought into contact with it at a subsequent period, and ultimately penetrating it), cannot result from a depression or involution of the embryo-sac, as is maintained by M. Brongniart.

The pollen tubes (which after impregnation may be traced in the conducting tissue of the style) never reaching the micropyle, but pollen granules being found in abundance in the channel leading to it, and being doubtless brought into contact with the outer surface of the embryo-sac through the exostome; and the first trace of the embryo appearing at this time in the formation of the spherical body at the inferior extremity of the primary utricle—Dr. Giraud is led to conclude that the origin of this simple spherical body results from a peculiar process of nutrition, determined by the material or dynamic influence of the fovilla, conveyed through the medium of the primary utricle or suspensor.

The paper was accompanied by a series of drawings representing the ovulum of *Tropæolum* in the several stages of development described.

March 1.—T. Horsfield, M.D., V.P., in the Chair.

Read a paper " On some rare and beautiful Coleopterous Insects from Silhet, the major part belonging to the collection of Frederic Parry, Esq., of Cheltenham." By the Rev. F. W. Hope, F.R.S., F.L.S., &c.

The number of species described amounts to fourteen, one of which is regarded by Mr. Hope as forming the type of a new genus. The following are the generic and specific characters :—

Lucanidæ.

Hexarthrius Parryi, niger, mandibulis exsertis subdenticulatis bidentatis, capite thoraceque scabriusculis, elytris posticè castaneis. Long. lin. 36; lat. lin. 10.

Odontolabis Cuvera, ater, mandibulis valdè exsertis denticulatis, elytris pallidè castaneis litterâ V nigrâ signatis. Long. (mandibulis inclusis) lin. 34; lat. lin. 11.

Odontolabis Baladena, niger, mandibulis porrectis multidentatis, capite thoraceque unidentatis. Long. lin. 26; lat. 10.

Dorcas Westermanni, niger, mandibulis porrectis multidentatis capite thoraceque parùm brevioribus. Long. lin. 26½; lat. lin. 9.

Dorcas DeHaani, niger, mandibulis porrectis capite parùm longioribus: dente forti ferè trigono ante basin posito: reliquis minoribus. Long. lin. 22; lat. lin. 7¼.

Hab. in agro Assamensi. Mus. D. Hope.

Lucanus Brahminus, niger, mandibulis valdè exsertis denticulatis capiti thoracique æqualibus, thorace posticè utrinque dentato, elytris glabris marginatis. Long. lin. 24½; lat. lin. 6½.

Lucanus Buddha, niger nitidus, mandibulis valdè porrectis capite thoraceque longioribus denticulatis. Long. lin. 21; lat. lin. 6.

Rutelidæ.

Mimela Passerinii, viridis, thoracis lateribus luteolis, elytrorum margini-

bus elevatis pallidè virescentibus, corpore infrà roseo-cupreo, pectore capillis longis flavescentibus obsito. Long. lin. $9\frac{1}{2}$; lat. lin. $4\frac{1}{4}$.
Hab. in Montibus Himalayanis.

BUPRESTIDÆ.

Chrysochroa Edwardsii, viridi-aurata, thorace cupreo-purpureo, elytris fasciâ irregulari maculâ flavâ insignitis, corpore subtùs roseo-cupreo, pedibus concoloribus. Long. lin. 27; lat. lin. $8\frac{3}{4}$.

This superb *Buprestis* approaches most nearly to that named *Perottetii* by M. Guérin.

LONGICORNES.

Monochamus sulphurifer, corpore toto suprà et infrà flavo-sulphureo, antennis pedibusque nigro cinereoque variegatis. Long. lin. 13; lat. lin. $4\frac{3}{4}$.

Purpuricenus rubripennis, violaceus, elytris rubro-marginatis maculâ subquadratâ in medio disco insignitis, pedibus concoloribus. Long. lin. 15; lat. lin. 4.

ZONOPTERUS, *Hope*.

Caput mandibulis arcuatis, fronte declivi, cornu brevi utrinque ad basin antennarum. *Antennæ* 11-articulatæ, articulo basali apice crassiore, 2do minimo, 3tio longissimo, 4to ferè dimidio minore, 6 sequentibus ferè æqualibus, ultimo longiore acuto. *Thorax* depressus, capite duplò longior. *Elytra* thorace triplò longiora, parallela, apicibus rotundatis. *Pedes* femoribus 4 anterioribus incrassatis, posticis duplò majoribus subcompressis; tibiis posticis subincurvis.

Zonopterus flavitarsis, niger, antennis bicoloribus, thorace nigro-tomentoso, elytris flavo-bifasciatis, femoribus tibiisque atris, tarsis flavis. Long. lin. 15; lat. lin. 4.

Colobothea rubricollis, rubro-picea, antennis concoloribus, elytris nigricantibus maculis flavo-ochraceis aspersis. Long. lin. 15; lat. lin. 4.

SAGRIDÆ.

Sagra Carbunculus, cyanea, elytris igne auroque micantibus, pedibus posticis incrassatis; tibiis incurvis. Long. lin. $4\frac{1}{2}$.

BOTANICAL SOCIETY OF LONDON.

March 18, 1842.—John Edward Gray, Esq., F.R.S., &c., President, in the Chair.

The following donations were announced:—Parts 1, 2 and 3 of 'Algæ Damnonienses,' and Fasciculus 1 of Berkeley's 'British Fungi,' presented by Mrs. Margaret Stovin. The following specimens were exhibited: *Oxalis stricta*, collected at Penzance, and presented by the Royal Horticultural Society of Cornwall; *Elæodendron Argan* (Retz.), collected in the province of Haha, near Deabet, Barbary, by Dr. W. H. Willshire, and presented by him; *Hypnum polymorphum* (Hedw.), collected on the sands of Barrie, Forfarshire, by Mr. Wm. Gardiner, jun., and presented by him.

A paper was read from Edwin Lees, Esq., F.L.S., &c., being "Remarks on the Flora of the Malvern Hills in the counties of Worcester, Hereford, and Gloucester; Part 2, the Hills and their immediate Roots."

In geological language the Malvern Hills form an eruptive or igneous chain, stretching in a narrow ridge nearly due north and south for upwards of nine miles. Quartz, felspar, mica and hornblende are their mineralogical ingredients in numberless varied proportions; but it must be understood, that the greater part of the mass is in a disintegrated state, breaking up into angular fragments of every size, and thus forming debris on and materials for soil at the base of the slopes, while hard masses of granitic rock, weathering the atmospheric wear and tear of centuries, are of comparatively rare occurrence. This of course tends greatly to modify the capacity of these eminences as depositaries of plants, and although rising up boldly in an insular manner in the midst of a flat district, and with no superior heights near at hand, their moderate altitude precludes the growth of any alpine plants, while their complete exposure to the blaze of summer even unfits them for *subalpine* species that grow in shady localities further south. This may be instanced in the *Saxifraga hypnoides*, which, though it grows in the moist recesses of the Cheddar Cliffs, Somersetshire, is entirely absent from every part of this rocky range. On the other hand, *Sedum album*, which no drought can destroy, finds an appropriate home on the exposed cliffs of the principal hills here, flowering when most other plants are completely withered and burnt up by the intolerable heat.

The Phanerogamous vegetation of the Malvern Hills is by no means as varied or remarkable as might at first have been anticipated from its geographical position. But in fact the breadth of the chain nowhere amounts to a mile, and for the most part does not exceed half a mile. There are scarcely any longitudinal valleys, as in only one place does the chain break distinctly into two parallel heights, and throughout a distance of above nine miles there are but five transverse ones. The average height of the chain above the level of the sea is about 1000 feet, three of the highest hills attaining respectively the altitude of 1300, 1350, and 1444 feet. According to a very accurately taken barometrical observation by Mr. Addison of Great Malvern, the Worcestershire Beacon, which as just stated is 1444 feet in height by the Ordnance Survey, is only 923 feet above the Library at Great Malvern; the slope at the base of the hills being thus shown to be full 500 feet above the level of the Severn.

Such a moderate elevation can scarcely be expected to yield plants of an alpine kind, especially when the ravines, though not without rocks, possess none of a very precipitous character, and the streams that trickle down the hills have but very little relation to the torrents that dash in thunder down the cliffs of stern and rugged mountainous regions. The prevalence of a humid atmosphere from the excess of western and southerly winds is very favourable to the growth of the Cryptogamous tribes, more especially the Lichens, which are perhaps in greater abundance and variety here than within the same space in any other part of Britain. Indeed the late Mr. Purton, author of the 'Midland Flora,' remarked, that even in Wales he scarcely observed any Lichens that were not to be found upon the Malvern Hills. In like manner the Mosses are very luxuriant and abundant on the hills as well as in the woods around their bases, though the beautiful genus *Splachnum* seems to be altogether absent. *Jungermanniæ* constitute a great proportion of the investiture of the hills, though the variety of species is not very remarkable from the comparative scarcity of dripping rocks, yet in one shadowy ravine at least the beautiful *Jungermannia tomentella* is found. *Jungermannia resupinata* is rather abundant, and *Jungermannia ciliata* is excessively common. The Fungi are pretty numerous, and, as might be expected, the Agaric tribe in particular is profusely scattered on the grassy declivities of the hills in the autumnal season. The paper contained a very copious list of habitats, many of the specimens were exhibited, and Mr. Lees proposed to treat of the Cryptogamic vegetation of the hills in a future paper. The Society will thus possess specimens of all the plants mentioned in Mr. Lees's papers on the botany of this district.

BOTANICAL SOCIETY OF EDINBURGH.

This Society held its sixth meeting for the session on Thursday 14th April, Professor Christison in the Chair.

John Wilkinson, Esq., was elected a Resident Fellow; and Frederick M. Adamson, Esq., Glasgow, a Non-resident Fellow.

Donations to the Library and Herbarium were reported from Miss Harvey, Rev. A. Rutherford, and Messrs. Babington, Gutch, Tatham, Lindsay-Carnegie, Newbould, Peacock and Evans.

The following communications were read :—

1. Professor Balfour of Glasgow made some remarks on the natural order *Lecythidaceæ*, and exhibited various specimens of *Lecythis* and *Couratari* from Brazil.

Dr. Balfour also exhibited specimens of *Trigonocarpon olivæforme*, and other fossil Palm-fruits imbedded in sandstone, which had been collected at Stevenston, Ayrshire, by the Rev. David Landsborough.

Dr. Balfour also showed specimens of Snake-nut brought by Dr. W. H. Campbell from Guiana. (See *Ann. N. Hist.* vol. v. p. 202, and Plate V.)

2. Dr. Balfour read extracts from a letter which he had received from Mr. Edward Forbes, dated H.M.S. Beacon, Macri, Asia Minor, February 28, 1842.—Mr. Forbes states, " After returning in October from a round of the islands of the Archipelago, a cruise which was exceedingly fruitful in results as regarded marine zoology * and tertiary geology, but in consequence of the season almost fruitless in botany, I found the Beacon at Paros with half her crew laid up with fever, one of her officers dead, and all in bad spirits * * * *. From Paros I set sail in our little schooner to the shores of Asia Minor, and remained in her from October to the end of the year. I was then able to make my promised excursion to the Taurus, ascending the mountains to the height of 9000 feet, and journeying among them for fourteen days; but, though I loaded a mule with boards and paper, I grieve to say I could not fill them, for almost everything had gone out of flower.

" As this country, especially the alpine part (I speak of Lycia), has been visited by no botanist, I gathered every vegetable fragment

* The shells dredged up from 200 fathoms were most of them identical with those now found in a fossil state.

most religiously with the view of depositing them in the Herbarium of the Edinburgh Botanical Society.

"Next week the Beacon goes to Malta. If she had only remained a month longer, I should have had a great many plants, now only beginning to flower. I remain behind with a view of rejoining her in Candia in May. I go up the country, but as it will be impossible during that journey to collect many specimens of everything, I shall content myself with making pretty perfect sets of Lycian plants for the Botanical Society and a few botanists who will turn them to the benefit of science. I have not been fortunate hitherto in procuring materia medica information, but I hope to be so ere long."

Mr. Forbes also enclosed the following account of Lycian vegetation :—

Table of the Winter Vegetation of Lycia.

Date.	Plants in Flower.	Locality.	Habitat.	Ceased to flower.
Dec. 1841				
	Arisarum vulgare	General	In stony places on limestone.	End Feb. January.
	Clematis vitalba	Island in Gulf of Macri.	Stony places among trees, on limestone.	End Jan.
	Bellis sylvestris	General	Grassy and woody places, limestone and serpentine, &c.	January.
	Narcissus polyanthos	Islands.........	Grassy places on limestone.	January.
	Crithmum maritimum ...	Islands.........	On limestone rocks	——
	Polygonum equisetifolium	Islands.........	Sea-cliffs, limestone	January.
	Brassica lusitanica ?	Islands.........	Grassy places on limestone	——
	Passerina hirsuta	Psilis, Xanthus	Sandy flats	March ?
Carob tree forming fruit: wild olive ripe.				
Jan. 1842				
1st week.	Mercurialis annua	General	In stony places.	
	Anemone coronaria.........	General	Grassy places on all kinds of rock.	
	Mandragora officinalis ...	Macri	Grassy places on limestone	End Feb.
	Amygdalus communis......	Macri	On rocks (limestone).	
2nd week.	Euphorbia ?..................	Macri	Abundant on the gravelly plains.	
	Bellis perennis..............	General	Grassy places on serpentine, limestone and tertiary, supplanting *B. sylvestris.*	
3rd week.	Trichonema Bulbocodium.	General	On limestone and serpentine hills.	
	Cardamine hirsuta	General	Grassy places.	
	Euphorbia dendroides......	Cragus	Near the sea.	
4th week.	Veronica cymbalaria	Xanthus, Macri	Grassy places, and among shrubs on limestone, also on old walls.	
	Veronica agrestis	Xanthus	Fields.	
	Erodium cicutarium	Xanthus	Grassy places.	
	Euphorbia ?..................	General	In woods on limestone.	
Ferns and Mosses fruiting. Wheat three inches high. End of this month *red Anemone coronaria* are common, before they were mostly purple.				

Table continued.

Date.	Plants in Flower.	Locality.	Habitat.	Ceased to flower.
Feb. 1842				
1st week.	Gagea arvensis	General	On hills of limestone and serpentine.	
	Ficaria ranunculoides	Xanthus, Macri	Damp grassy places: not common.	
	Ophrys	Xanthus	Woods.	
	Senecio vulgaris	Patara	Sandy fields.	
	Calendula arvensis	Xanthus	Cultivated fields.	
	Euphorbia helioscopia ...	Macri, Xanthus	Grassy places.	
	——— peplus	General	Grassy places.	
	Erophila vulgaris	General	On limestone and serpentine hills.	
2nd week.	Thlaspi montanum	Xanthus, Macri	On limestone hills.	
	Lamium amplexicaule, &c.	Xanthus	Grassy and stony places.	
	Leontodon ?	Zumbli	On limestone.	
	Thlaspi bursa pastoris	General	On limestone.	
	Erophila ?	Zumbli	On serpentine only.	
	Senecio ?	Zumbli	Chiefly on serpentine.	
	Solanum nigrum	Oran	Woods, on sandstone.	
3rd week.	Colutea arborescens	General	On limestone and tertiary.	
	Hyoscyamus aureus	Tlos, Macri ...	On walls.	
	Arabis ?	Tlos	On limestone cliffs.	
	Cyclamen ?	Zumbli	On limestone in stony places.	
	Tulipa Sibthorpiana	Macri	Bushy places on limestone by the sea.	
4th week.	Scrophularia canina	Macri	On walls.	
	Biscutella eriocarpa	Macri	On walls.	
	Galium ?	Macri	On walls.	
	Saxifraga tridactylites	Macri	On limestone rocks.	
	——— hederacea	Macri	On wet limestone rocks.	
	Fumaria capreolata	Macri	Cultivated ground.	
	Crocus ?	Mountains.		
	Lavandula Stœchas in bud on the serpentine.			

3. Dr. Balfour read a report on the Progress and State of Botany in Britain from February 1840 to January 1841, being a continuation of a paper on the same subject submitted by Dr. Greville to the Society, and printed in its Transactions*.

Dr. Balfour noticed the various discoveries which had been made in structural, physiological and descriptive botany,—the floras, monographs and catalogues which had appeared,—the additions made to our knowledge of fossil botany,—the discoveries in the theory of agriculture and vegetable chemistry, and concluded with a catalogue raisonné of all the works and papers on botanical subjects which had been published in Britain during the period embraced by his report.

4. Dr. Balfour next read a communication which he had received from Mr. Ralfs of Penzance, relative to the following species of Algæ:—

* The report for the year 1841 will be given by Dr. Graham.

1. *Homœocladia anglica,* Ag. There prevails considerable confusion regarding the plant sent by Mr. Ralfs under this name. It is the *Microcoleus marinus* of Harvey. By some it has been looked upon as *Schizonema xylodes,* and by others as *Osciliatoria chthonoplastes.* From a comparison made with specimens in Mr. Berkeley's Herbarium, Mr. Ralfs is satisfied that his plant is the true *Homœocladia anglica,* and as such he sent specimens to the Society's Herbarium.

2. *Desmidium compressum,* n. sp. Filaments compressed; joints rather broader than long, deeply divided.

Pools Chyan-hâl Moor near Penzance, and Towednack Moor near St. Ives.

This very remarkable and distinct *Desmidium* is not scattered like the other species in loose bundles, but entangled among the leaves of aquatic plants. It is very gelatinous, more so, in fact, than any hitherto discovered; but its mucus is not condensed into a sheath as is that of *D. mucosum* and *D. cylindricum.*

The filaments are much compressed, and therefore appear nearly plane under a lens. The joints are so deeply divided, that at first sight a single one might be mistaken for two. This is more especially the case whilst the endochrome, denser in the centre, obscures the view of that portion which unites the segments of the frustule; but as soon as the joint becomes empty, its nature is distinctly seen. Though in other respects symmetrical, one segment of the frustule is sometimes much smaller than the other. At the centre, where the frustules join, there is a minute gland or process arising from each margin. The projection of these glands is easily seen, even before the frustules separate.

A transverse view shows the endochrome to be stellate, as in the other species, and also that the frustules are compressed, one diameter being about twice as great as the other.

Concerning this discovery Mr. Berkeley remarks in a letter to Mr. Ralfs :—

"I am quite delighted with your new *Desmidium*; your observations are very correct. I see very distinctly the gland between each pair of segments, but as there are no separate joints in my specimen, I cannot quite ascertain its form. It is certainly quite distinct from the other species, and is a most interesting discovery."

Specimens of *Desmidium compressum* and *D. Borreri* were presented to the Society by Mr. Ralfs.

Analysis.

1. Filaments with a mucous sheath.................................. 2.
   Filaments without a mucous sheath .... 3.
2. Joints compressed with two angles .... *cylindricum.*
   Joints cylindrical without angles .... *mucosum.*
3. Filaments triangular .... *Swartzii.*
   Filaments cylindrical or compressed .... 4.
4. Joints twice as long as broad, inflated; crenatures minute . *Borreri.*
   Joints not longer than broad, compressed, deeply divided ... *compressum.*

PHILOSOPHICAL SOCIETY OF GLASGOW.

The following details were given of experiments made on the lands of Knock, near Largs, in the spring and summer of 1841, by Mr. Wilson.

A piece of three-year-old pasture, of uniform quality, extending to 200 falls, old Scotch measure, was divided into ten lots of twenty falls each, and these were treated as follows, and produced respectively the quantity of well-made hay marked opposite each of the lots, as under:—

Lot.	Produce per lot. *lbs.*	Rate per acre. *lbs.*	Increase per acre. *lbs.*
1. Left untouched	420	3360	—
2. $2\frac{1}{2}$ barrels of Irish quick-lime added	602	4816	1456
3. 20 cwt. of lime from gas-works....	651	5208	1848
4. $4\frac{1}{2}$ cwt. wood charcoal powder	665	5320	1960
5. 2 bushels of bone dust	693	5544	2184
6. 18 lbs. of nitrate of potash........	742	5936	2576
7. 20 lbs. of nitrate of soda..........	784	6272	2912
8. $2\frac{1}{2}$ bolls of soot	819	6552	3192
9. 28 lbs. of sulphate of ammonia	874	6776	3416
10. 100 gallons of ammoniacal liquor from gas-works, at 5° of Tweddel's hydrometer	945	7560	4200

The value of each of the applications was precisely the same, viz. 5*s*. for each lot, or at the rate of 2*l*. per acre. All the articles were applied at the same time, on the 15th of April 1841, and the grass cut and made into hay in the following month of July.

ROYAL SOCIETY OF EDINBURGH.

March 21, 1842.

1. A paper was read by Richard Parnell, M.D., F.R.S.E., on a new species of British grass, which he named *Holcus biaristatus*. This grass was found in the neighbourhood of Edinburgh, and grows to the height of two feet or more. It is principally characterized by the outer palea of the lowermost floret being furnished with a long dorsal awn, arising immediately beneath the summit, which readily distinguishes it from *Holcus lanatus* and *Holcus mollis*, which have the lowermost floret without an awn. Several specimens were exhibited, and the more minute characters pointed out.

2. Mr. Goodsir presented a paper upon the Ultimate Secreting Structure, and on the Laws of its Function.

After referring to the labours of those anatomists who had verified Malpighi's doctrine of the follicular nature of gland-ducts, the author alluded to Purkinje's hypothesis of the secreting function of the nucleated corpuscles which line these ducts. In a rapid sketch of the results of inquiries since the appearance of Müller's work, 'De penitiore Structurâ Glandularum,' and more particularly of the observations of Henle and others on the closed vesicles which are situated at the extremities of certain ducts, Mr. Goodsir stated that no anatomist had hitherto "proved that secretion takes place within the primitive nucleated cell itself, or had pointed out the intimate nature of the changes which go on in a secreting organ during the performance of its function."

Numerous examples were now given of secretions detected in the cavities of nucleated cells of various glands and secreting surfaces. Among these were the ink of the *Cephalopoda*, and the purple of *Ianthina* and *Aplysia*; bile in an extensive series of animals; urine in the mollusk; milk, &c.

The wall is believed by the author to be the part of the cell engaged in the process of secretion. The cavity contains the secreted substance, and the nucleus is the reproductive organ of the cell. A primitive cell engaged in secretion is denominated by the author a primary secreting cell, and each cell of this kind is endowed with its own peculiar property, according to the organ in which it is situated. The discovery of the secreting agency of the primitive cell does not remove the principal mystery in which the function has always been involved; but the general fact, that the primitive cell is the ultimate secreting structure, is of great value in physiology, inasmuch as it connects secretion with growth as functions regulated by the same laws; and explains one of the greatest difficulties in the science, viz. why a secretion flows from the free surface only of a secreting membrane: *the secretion exists only on the free surface, enclosed in the ripe cells which constitute that surface.*

The author then proceeded to the consideration of the origin, the development, and the disappearance of the primary secreting cell; a subject which necessarily involved the description of the various minute arrangements of glands and other secreting organs. After describing the changes which occur in the testicle of *Squalus cornubicus,* when the organ is in a state of functional activity, and in the liver of *Carcinus Mænas,* it was stated that these were selected as examples of two orders of glands denominated by the author vesicular and follicular.

The changes which occur in the first order of glands consist in the formation and disappearance of closed vesicles or acini. Each acinus might be first a single cell, denominated by the author the primary or *germinal* cell; or secondly, of two or more cells enclosed in the primary cell, and produced from its nucleus. The enclosed cells he denominates the secondary cells of the acinus; and in the cavities of these, between their nuclei and cell walls, the peculiar secretion of the gland is contained. The primary cell, with its included group of cells, each full of secretion, is appended to the extremity or side of one of the terminal ducts, and consequently does not communicate with that duct, a diaphragm formed by a portion of the primary cell wall stretching across the pedicle. When the secretion in the group of included cells is fully elaborated, the diaphragm dissolves or gives way, the cells burst, and the secretion flows along the ducts; the acinus disappearing, and making room for a neighbouring acinus which has in the meantime been advancing in a similar manner. The whole parenchyma of glands of this order is thus, according to these observations, in a constant state of change of development, of maturity and atrophy; this series of changes being in rapidity directly proportional to the profuseness of the secretion.

In the second order of glands, the follicular, as exemplified in the liver of *Carcinus Mænas*, the germinal cell or spot is situated at the blind extremity of the follicle, and the cells produced from this spot, as they advance along the follicle, become distended with their peculiar secretion.

Among other general conclusions deducible from these observations, it appeared that ducts are intercellular passages, into which the secretions formed by cells are cast.

Finally, the author inferred, from the whole inquiry, that, 1st, secretion is a function of, and takes place within, the nucleated cell; and that, 2nd, growth and secretion are identical,—the same process under different circumstances.

MISCELLANEOUS.

NOTES ON MARINE ANIMALS.

June 24th, lat. N. 36° 9′, long. W. 164°, some brown-looking masses are floating about the ship; they are numerous, and appear like fragments of sea-weed. On catching some they proved to be a species of *Anatifa*. They are grouped together in bunches, and on examining them for the marks of attachment to a foreign substance, I thought I could distinguish these in two of the smaller masses, but on searching the larger carefully they were not visible.—25th. We have traversed 120 miles since yesterday, and the *Anatifa* still continues. The temperature of the sea has been from 61° to 65°, and of the air about 65°, throughout the twenty-four hours. We caught more today, and also finer specimens; they are undoubtedly without a place for attachment to a foreign body, for I have again examined them carefully. The water is likewise full of minute animals of the most lively motions.—27th. Lat. N. 43° 3′, long. W. 164° 9′. The *Anatifa* still continues, and since the 24th we have unceasingly been passing through them. Night and day they continue the same, and are surprisingly numerous. According to the log, we have now travelled 332 miles among them. After sunrise this morning the surface of the sea was observed to be covered with multitudes of *Velella*. For the last eight hours, moving at the rate of three miles and a half in the hour, they have been equally numerous. The curious and beautiful processes at their base have among them a great number of small gelatinous animals, but apparently without motion. One of them had a mass of small *Anatifa* within its gripe. Our course, since we have been among these animals, has been northerly with a little occasional zigzag deviation. I feel pretty certain that this is a large assemblage of *Anatifa*, which in all probability have lived here a considerable period, and continue to grow and increase their numbers whilst floating on the surface. Our course being in the direction to increase our latitude, it would seem probable that we are traversing their smallest diameter, as it is most likely that they would spread in the direction of the latitude, and it is then easy to comprehend what a vast extent of surface they must cover, and the countless multitude of the individuals. The temperature of the water today is 59°, the air remaining at 65°.—28th. The *Anatifa* ceased as above. The *Velella* still continues, and are generally very fine specimens. We have travelled eighty miles since midday yesterday and have not missed them. Some *Beröe* are among them. The *Anatifa* has partially reappeared, but is scarce. I have also discovered a group of them attached to the skeleton of a *Velella* : they have evidently been here a long time, as some had attained a good age.—29th. The *Velella* ceased last night, having continued around us for 101 miles. Yesterday we passed through a compact bed of them, which at a distance had a fine grass-green colour.

On July 27th, when going to the southward, in lat. N. 47° 54′, long. W. 127° 1′, we passed through the same *Velella* for several miles, though not so numerous as on the previous occasion.—Hinds, *MSS.*

ŒCONOMY OF THE WHALE.

To the Editor of the Annals of Natural History.

Sir,—The following questions have, I believe, been only imperfectly answered by physiologists. How does the Whale support the immense pressure he must bear at the depth in the sea to which he often dives? and what is the end to be answered by the blow-holes on the back of his head? It appears to me that both questions may be solved by one short answer, viz. he permits the water to enter his lungs as he dives to balance the pressure without, and spouts it out through the blow-holes by the aid of the air which expands in the lungs as he rises; the jet of water would impede his rising were it to pass from his mouth.—Yours, &c. J. D. C. Sowerby.

NOTES ON SOME LIBELLULÆ. BY J. C. DALE, ESQ., F.L.S.

In your last Number (LVI.), p. 163, reference is made to the figure of the wing of a fossil Dragon-fly found in Warwickshire, Mag. N. Hist. vol. iv. New Series, p. 302, as the *Æshna liassina*, Strickl., where the wings of *Æshna grandis* and *Libellula depressa* are also given to show the difference in size and structure. The stigma on the wing shows it to be nearer to *Cordulegaster* and still more to *Petalura* 'Zool. Misc.,' vol. ii. plate 94, where it is stated to be a native of New Holland; and I have a female of the same from Mr. Children's cabinet, which on comparison bears a close resemblance to the fossil fly.

I take this opportunity of making known as British the *Agrion pumilio*, Charp., having taken specimens in this neighbourhood many years ago; and although it may be mistaken for a variety of *A. elegans*, Vand. Lind. (*tuberculatum*, Charp.), at first sight, it is easily distinguished by the absence of the tubercle on the collar, immediately behind the head, so conspicuous in that species, and other good characters. Charpentier states it to be the smallest European *Agrion* he has seen (though it is not very much smaller than *A. elegans*). I have one from the East Indies scarcely exceeding one half in size. It seems strange that the female of *A. aurantiacum*, Longch., figured by Mr. Curtis, should be unknown.

There seems great uncertainty as to many species of *Libellulæ* described by Linnæus, in consequence of his too great brevity.

Lib. ænea is given "thorace æneo-viridi," which would have done very well if no other allied species had existed; but he gives as a syn. from Fn. Suec., "thorace viridi nitido *lineis flavis*," which evidently belongs to another species. He also refers as a syn. of *L. rubicunda* (figured by Mr. Curtis) to Ray 50. n. 8, which I take to be only *L. vulgata*.

The continental authors seem at a loss for the *L. rubicunda* and *Æ. juncea*, both of which are in the Linn. cab., and I have taken both in England.

Moses Harris has figured in his 'Exp. Engl. Ins.' a fly which I take to be the *Criorhina apicata*, Megerl., but which *has been* erroneously referred to *C. ranunculi*, *both* of which I possess now, the former having been taken near Bristol last year, and formerly at Stepney. It is remarkable in its similitude to the *Bombus hortorum*. I have also added *Eristalis alpina*, Pz., from Scotland lately.

Glanville's Wootton, April 8th, 1842.

WHAT CONSTITUTES A GENUS?

To the Editors of the Annals of Natural History.

GENTLEMEN,—I should like to ask ornithologists, through the medium of your valuable Magazine, what characters are sufficient to constitute a Genus? and if there be any rule for beginners to go by? or if every person who chooses to write a book on birds is at liberty to make and mend as he thinks proper? and thus add to the general confusion—(this seems to be too much the case). I have been attempting to arrange a small collection, but I am often brought to a stand-still, as I cannot see the characters which have caused the divisions; for what seems to be sufficient in one case is not in another. This has often caused me to wonder if there were a general rule to go by; perhaps G. R. Gray, Esq., or Mr. Strickland, will favour me with answers to my questions. Mr. Gould seems to deal largely in *genera*,—perhaps he may favour your ornithological readers with an answer, if there are no secrets.

I am, yours respectfully,

Liverpool, March 24th, 1842. H. G. I.

FURTHER REMARKS ON FIBRE. BY DR. MARTIN BARRY.

Dr. Barry examined the following objects, from two of the Mollusca, at the desire of Professor Owen, who dissected them out for the purpose: namely, from the *Oyster*, the branchial ganglion, and the branch connecting it with the labial ganglion; from the *Loligo*, the optic and brachial nerves. In all of these Professor Owen recognised filaments ("fibres") having the same remarkable appearance as those which Dr. Barry had previously shown to him in muscle.

On a subsequent occasion—several physiologists being present, one of whom was Professor Owen—there were seen muscular "fibrillæ," not only flat, grooved, and compound, but separated at the end into their single and simply *spiral* threads,—the really ultimate threads of muscle. In this instance chromic acid was substituted for the reagent above-mentioned (Annals, vol. viii. p. 546.) as usually employed by Dr. Barry in these researches: and for the examination of muscle he now finds the chromic acid to be even preferable thereto*.

To find the muscular "fibrillæ" of a size proper for examination, and so loosely held together that they may be separated with ease, the heart of a fish or reptile should be employed. Dr. Barry has used the heart of various fishes, as well as that of the turtle, newt, and frog—and chiefly the frog.

To find those states of voluntary muscle in which the transverse striæ are produced by the windings of comparatively large interlaced spiral filaments (see abstract of the postscript to Dr. Barry's paper "On Fibre," p. 506), he recommends muscle from the tail of the *very minute* tadpole—when this larva is only 4 or 5 lines in length (as at the present season)—or muscle from the leg of a boiled lobster, as being very easily obtained. In these states of muscle, the interlacing spirals are seen to dip inwards, towards the centre of the fasciculus, in a manner that may be represented by making the half-bent fingers of the two hands to alternate with one another, and then viewing them on the extensor side.

To find the filament in red blood-discs, Dr. Barry recommends the blood of a batrachian reptile, such as the frog or newt, on account of the large size of the discs in these animals. The blood should be examined just before its coagulation, as well as at various periods during the formation of the clot. Dr. Barry has usually added one of the above reagents, or nitrate of silver.

TEMPERATURE OF COLD-BLOODED ANIMALS.

M. Dumas, in requesting the Academy to add some new members to the commission charged with the examination of the memoir of M. Valenciennes and of that of M. Lamarre-Picquot, from some remarks of M. Dumeril which seemed to require an extension of the discussion, stated that the question was, in fact, to consider a point of physiology of the highest interest; for we may conclude, from the investigation of MM. Lamarre-Picquot and Valenciennes, that certain cold-blooded animals may, in given circumstances, become warm-blooded animals, in the same way that certain warm-blooded animals, the hibernating animals, become, in given circumstances, true cold-blooded animals. The question then is, to clear up this point of physiology, and to ascertain whether, in the same way that certain warm-blooded animals are able to support a lowering of

* We are indebted to Dr. Hannover for bringing into notice the use of the chromic acid for such purposes.

temperature without perishing, there are cold-blooded animals that can support and produce an elevation of temperature without danger to their life.

Some new members having been added to the commission, M. Flourens took occasion to mention, that, along with M. Becquerel, he had made some experiments on the temperature of cold-blooded animals. These experiments were made on several reptiles, on lizards, serpents, Batrachians, &c., on several insects, and on some fish. The temperature of all these animals was taken by comparative means, namely, the thermo-electric apparatus of M. Becquerel and a very delicate thermometer, so that the results obtained may be looked upon as very exact.

The most general result of these experiments is, that the animals said to be cold-blooded have a temperature of their own, higher, that is to say, than the external temperature; so that they are really warm-blooded animals. The temperature of lizards is more elevated than that of the Batrachians, &c. A difference of temperature is even found in the same animal, according to what region of the body is examined: for example, the temperature of an adder is perceptibly more elevated taken near the heart than it is in the region of the tail.

M. Flourens adds that M. Becquerel has long since committed the physical part of this investigation to writing, and that he himself will soon prepare the physiological part, and lay the entire memoir before the Academy.—(L'Institut, No. 424.)

PALÆONTOLOGY:—RUDISTA.

A memoir by M. Alcide d'Orbigny, entitled, "Quelques considérations zoologiques et géologiques sur les Rudistes," read at the Academy of Sciences Jan. 31, is published in the 'Ann. des Sc. Naturelles' for March. It is summed up (L'Institut, No. 424) in the five following propositions:—

1st. The *Rudista* hitherto unknown in the inferior districts of the chalk formation, instead of being disseminated in the middle of the terrestrial strata, form successive depots, banks whose horizon is intersected; they may therefore be considered as the best marks which can be taken as limits of strata.

2nd. These distinct zones of *Rudista*, deposited in the middle of the same basin and in a succession of strata but little dislocated, as we see to the west of the Pyrenæan cretaceous basin, might prove that there was no need of great local disturbances to bring into the same place different fauna; but that, without doubt, other causes influenced this successive substitution of one fauna for another.

3rd. The *Rudista* have appeared five times at the surface of the globe in the cretaceous system, each time under entirely different forms, without there being any zoological passage in the species, or transfer of individuals from one geological zone into another. Thus the respective fauna of the five zones of *Rudista*, whether in distinct stages, or in beds of the same stage, have been successively annihilated and substituted by others wholly different, which would not evince in this series of beings any transition either of forms, or in the beds which contain them.

4th. The *Rudista*, divided by distinctly marked zones in the middle of the cretaceous districts, form therein more or less extended horizons, and always in the same respective position in relation to the other fossils.

Hence the distribution of beings in the terrestrial strata would not be due to chance; but, as M. d'Orbigny has already found with regard to the Cephalopoda, it would be the result of the succession, in an invariable order, of fauna more or less numerous, the perfect knowledge of which is hereafter destined to furnish the chronological history of the ancient zoology of the globe.

RISSOA HARVEYI.

To the Editors of the Annals of Natural History.

Dear Sirs,—The Supplementary Number of your interesting periodical has reached me, in which you have been pleased to insert a paper of mine, communicated to the Geological Society by James Smith, Esq. of Jordan-hill. Allow me to correct a mistake in which you had no share. It is stated (vol. viii. p. 515), that of the seventy species of marine shells found by me in the post-tertiary deposit at Largs, all were well-known inhabitants of the British seas, except two species of *Rissoa*; one of which had been previously found in the Crag, and the other had been referred, with doubts, to the *Rissoa Harveyi* of *Mr. Forbes*. I should have said, the *R. Harveyi* of *Mr. Thompson* of Belfast, by whom it had been figured and described in a former vol. of the Annals (v. p. 96), and named in honour of Mr. Harvey, the distinguished naturalist who discovered the shell.

I am happy to add that my doubts have been completely removed. I sent a specimen of the subfossil shell to Mr. Thompson, your very intelligent correspondent; and by return of post he says, "the subfossil is the veritable *R. Harveyi*, which I of course was much gratified to see, two examples only of the recent shell having hitherto been found." It is a remarkably beautiful little shell, and I am glad that the subfossil specimens already outnumber the recent examples, as two or three have been found by myself, and as many by the Misses Mure of Warriston, whose sweet residence is adjoining to the post-tertiary deposit. Though the other shells were known, there were several of them of considerable rarity; such as *Cardium serratum*, of which only one valve was found; *Bulla truncata, Phasianella tabulata, Rissoa cimex, Rissoa costata, Rissoa calathisca, Rissoa striatula, Cemoria Flemingii*, &c.

Stevenston Manse, Ayrshire,
18th April, 1842.

Yours sincerely,
D. Landsborough.

NIGER EXPEDITION.—MR. FRASER.

The letter from Mr. Fraser, the naturalist to the Niger expedition, dated from the mouth of the river Nùn, W. Africa, August 14, 1841, read at the meeting of the Zoological Society, Dec. 14, which we noticed in our number for January, contains some interesting facts relating to the habits and habitats of certain animals. Among the skins of Mammalia, Mr. Fraser observes, he had forwarded a *Galago* which was shot at Cape Coast, close to the town, in a tamarind tree, where he also found its nest, built, or rather laid, in a fork formed by the branches. The nest was composed of loose leaves. The animal resembled the *Loris gracilis*, but its limbs were stouter. The following monkeys, Mr. Fraser states, appear to be found in the neighbourhood of Sierra Leone: *Troglodytes niger*, *Colobus ursinus*, *Cercopithecus fuliginosus*, common, *Cerc. Sabæus*, and *Cynocephalus Papio*. The banks of the beach are everywhere perforated with large round holes, which the natives informed Mr. Fraser were inhabited by an animal which they call the Ground-pig, which is the *Aulacodus Swinderianus* of Temminck. At Bassa, the author of the letter saw some skins of *Cercopithecus Diana*, said to be common in that district; he also saw a skin of an antelope, apparently the *Antilope Ogilbyi*, Waterh. At Cape Coast the *Cercopithecus petaurista* is to be found, and likewise the *Colobus leucomeros*. Skins of the last-mentioned animal as well as of the *Cercopithecus Diana* were extremely plentiful at Accra.

Part X. of the SCIENTIFIC MEMOIRS is just published; and contains amongst others, the following translations from the German, connected with Natural History:—On the Distribution of Temperature on the Surface of the Earth; by Prof. Dove of Berlin.—On the Azotized Nutritive Principles of Plants; by Prof. Liebig:—and on numerous Animals of the Chalk Formation still found in a living state; and of the organization of the Polythalamia; by Prof. Ehrenberg.

OBITUARY:—Dr. Theodor Vogel.

Science has to deplore, in the death of Dr. Vogel, the loss of a zealous and accomplished botanist, and an amiable man. We learn this melancholy news from a letter received from Mr. C. G. Roscher, dated on board the Albert, January 27. Hopes had been entertained that during his stay at Fernando Po he would have recovered from the effects of African fever, which had proved fatal to so large a number of those engaged with him in the disastrous expedition up the Niger; but as a consequence of his previous attack, and of his anxiety in any degree in his power to fulfill the purposes of his journey, he was seized with a dysentery, which, notwithstanding the careful attentions of Mr. Thomson, surgeon of the Soudan, and of Dr. M'William and Mr. Troschel, closed his earthly career on the 17th of December. His surviving fellow-travellers, by whom he was highly esteemed for his kind and generous qualities, and truly Christian virtues, committed his remains to the grave by the side of those of Captain Allen.

We learn that Dr. Vogel had diligently availed himself of the few opportunities which had been afforded him of extending botanical knowledge. He made an excursion of two days, in company with Dr. Stanger, from Accra to the Aquapin hills, where he collected many plants of great interest, several of which he considered as new;

and among the rest, a new species of mangrove. The arrival of his papers and collections will, it is hoped, soon put us in possession of his last labours.

It is impossible to advert to so melancholy an occurrence without an expression of disgust and reprobation, that so many lives, and some of them so valuable, should have been sacrificed by placing the Niger Expedition at the entire disposal of the most blind and presumptuous fanaticism, and under the control of persons who chose needlessly, and in spite of every remonstrance, to loiter for hours and days in situations where the atmosphere was most pestilential.

METEOROLOGICAL OBSERVATIONS FOR MARCH 1842.

Chiswick.—March 1. Showery: clear. 2. Overcast: stormy and wet. 3. Cloudy. 4. Overcast. 5. Clear and very fine. 6. Slight haze: very fine. 7. Cloudy: slight rain. 8. Very fine: heavy rain. 9. Stormy with heavy rain. 10. Boisterous: clear at night. 11. Densely overcast. 12, 13. Cloudy and fine. 14. Drizzly. 15. Hazy: very fine. 16. Hazy: overcast. 17. Fine: stormy and wet. 18. Cloudy and fine. 19. Clear and cold: stormy with hail. 20. Cloudy: showery: squall in afternoon. 21. Stormy: showers. 22. Cloudy: rain. 23. Very clear: hail-shower. 24. Hazy. 25. Cloudy: stormy with rain. 26. Clear: cloudy. 27—29. Very fine. 30. Rain. 31. Rain: cloudy: boisterous with rain at night.—The mean temperature of the month was nearly 3° above the average.

Boston.—March 1. Rain: rain early A.M.: rain P.M. 2. Cloudy. 3. Rain: rain early A.M. 4. Cloudy: rain early A.M. 5—7. Fine. 8. Cloudy. 9. Fine: rain P.M. 10. Stormy: rain early A.M. 11, 12. Cloudy. 13. Fine: rain early A.M. 14. Cloudy. 15. Fine. 16. Cloudy: rain at night. 17. Fine: rain at night. 18. Windy. 19. Windy: rain at night. 20. Cloudy: rain A.M. and P.M. 21. Windy. 22. Fine: rain P.M. 23. Fine: snow A.M.: rain P.M. 24. Cloudy: rain A.M. 25. Fine. 26. Windy. 27. Fine: rain P.M. 28. Fine. 29. Fine: rain early A.M. 30. Cloudy. 31. Rain: rain early A.M.

Sandwick Manse, Orkney.—March 1. Cloudy: aurora. 2. Clear. 3. Cloudy: rain. 4. Clear. 5. Cloudy: showers. 6. Bright: cloudy. 7. Cloudy. 8. Shower: clear. 9. Clear. 10. Sleet-showers: clear. 11. Showers: rain. 12. Bright: clear. 13. Hail-showers: clear. 14. Cloudy: clear. 15. Cloudy: aurora. 16. Cloudy: rain. 17. Clear: rain. 18. Cloudy: showers. 19. Cloudy: large hail. 20. Showers. 21. Cloudy. 22. Snow-showers: cloudy. 23. Cloudy: drizzle. 24. Drizzle. 25. Showers: sleet. 26. Snow-showers. 27. Snow-showers: cloudy. 28. Rain: showers. 29. Sleet-showers: showers. 30. Cloudy: showers. 31. Damp.

Applegarth Manse, Dumfries-shire.—March 1. Cold, with slight showers. 2. Shower of snow: rain. 3. Heavy rain. 4. Showers. 5, 6. Fair and mild. 7. Slight showers: rain P.M. 8, 9. Hail-showers. 10. Hail-showers, with snow. 11. Heavy rain. 12. Fair but threatening. 13. Fair. 14. Rain all day. 15. Mild and moist. 16. Drizzling: rain P.M. 17. Fair A.M.: heavy rain P.M. 18. Showers. 19. Slight showers. 20. Fair: snow on the hills. 21. Fair and clear. 22. Slight snow: frost. 23. Frost: fair. 24. Fair and fine: slight frost. 25. Wet P.M.: violent wind. 26. One slight shower. 27. Frost A.M.: rain P.M. 28. Rain P.M. 29. Fair. 30. Showery. 31. Wet A.M.: cleared up.

Sun shone out 23 days. Rain fell 18 days. Snow 4 days. Frost 4 days. Hail 3 days.

Wind north 2 days. South-south-east $3\frac{1}{2}$ days. South 1 day. South-south-west 1 day. South-west 11 days. West-south-west 1 day. West $7\frac{1}{2}$ days. West-north-west 2 days. North-west 2 days.

Calm 4 days. Moderate 6 days. Brisk 2 days. Strong breeze 10 days. Boisterous 6 days. Stormy 3 days.

Mean temperature of the month	41°·52
Mean temperature of March 1841	44 ·07
Mean temperature of spring-water	42 ·20

Meteorological Observations made at the Apartments of the Royal Society, LONDON, *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; *by the* Rev. W. Dunbar, *at Applegarth Manse*, DUMFRIES-SHIRE; *and by the* Rev. C. Clouston, *at Sandwick Manse*, ORKNEY.

Days of Month.	Barometer.								Thermometer.									
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		Orkney, Sandwick.		London: R.S.			Chiswick.		Boston 8½ a.m.	Dumf.-shire.		Orkney, Sandwick.	
1842. Mar.		Max.	Min.		9 a.m.	9 p.m.	9½ a.m.	8½ p.m.	Fahr. 9 a.m.	Self-reg. Mx.	Self-reg. Mm.	Max.	Min.		Max.	Min.	9½ a.m.	8½ p.m.
1.	29·236	29·588	29·226	28·83	28·97	29·11	28·79	28·96	49·8	50·5	42·0	51	31	47	45	31½	41	41
2.	29·770	29·766	29·701	29·33	29·25	29·35	29·21	29·43	43·7	51·0	37·8	52	49	38	40	33½	40	40
3.	29·916	29·856	29·839	29·35	29·50	29·38	29·66	29·35	52·3	52·6	43·7	57	41	51	46	37	39½	36
☾ 4.	30·008	29·957	29·918	29·43	29·62	29·65	29·38	29·55	45·3	55·8	43·8	48	29	47	45½	35	41	41
5.	30·042	30·036	30·008	29·52	29·75	29·80	29·73	29·81	41·3	50·6	39·0	51	27	42	49	35½	41	40½
6.	30·010	29·992	29·813	29·59	29·79	29·60	29·78	29·55	42·0	52·2	39·2	51	26	40·5	51	39	43	42
7.	29·750	29·720	29·477	29·26	29·37	29·10	29·35	29·07	44·3	51·0	39·0	54	46	40	45	35	42	43
8.	29·528	29·500	29·416	28·97	29·17	29·20	28·93	29·15	51·5	51·8	44·3	57	35	48	47	38	41	38
9.	29·660	29·606	29·152	29·13	29·20	29·10	29·16	29·10	43·3	54·6	39·0	48	37	41	42½	32	39	36
10.	29·574	30·018	29·463	29·04	29·33	29·72	29·22	29·55	41·5	49·1	38·6	47	31	37	44	33	38	39
11.	30·040	30·040	29·825	29·55	29·55	29·40	29·39	28·51	45·3	48·6	40·0	50	27	41	45½	35½	39	43½
● 12.	30·091	20·045	29·938	29·59	29·78	29·58	29·66	29·50	44·3	53·6	41·3	58	40	41	48	36	44	41½
13.	29·940	30·132	29·888	29·39	29·65	29·89	29·53	29·84	46·3	56·0	43·7	57	37	46	49	37	43½	41
14.	30·276	30·281	30·223	29·82	29·95	29·98	29·82	29·86	45·4	51·7	44·2	49	45	41·5	49	38	44	46
15.	30·398	30·332	30·324	29·84	30·08	30·10	29·94	30·03	49·5	50·8	45·3	51	46	52	49	41	51	46
16.	30·360	30·316	30·138	29·82	30·05	29·83	30·09	29·96	51·3	51·6	49·8	56	44	51	48	43	46	42
17.	30·188	30·131	29·761	29·63	29·89	29·32	29·81	29·33	50·3	52·7	47·1	56	43	46	46½	36½	42	42½
18.	29·792	29·739	29·609	29·19	29·30	29·24	29·10	29·01	48·7	55·3	45·7	52	35	45	48	37½	41	42½
☽ 19.	29·558	29·562	29·280	29·06	29·12	28·98	29·07	29·23	43·6	52·3	39·0	46	40	41	41	33	43½	40
20.	29·298	29·638	29·400	28·95	29·30	29·63	29·51	29·90	41·7	46·7	41·4	48	38	41·5	45	33	40	37
21.	29·890	30·157	29·890	29·52	30·01	30·16	30·23	30·20	41·7	48·0	39·4	49	34	43	46	31	39	38
22.	30·158	30·151	29·951	29·78	30·00	30·06	30·16	30·32	39·5	46·4	36·9	48	30	37·5	47½	31	40	36
23.	30·124	30·183	30·102	29·75	30·18	30·15	30·26	30·15	39·5	45·2	34·3	46	28	39	45½	30½	40½	45
24.	30·240	30·221	30·167	29·85	30·10	30·10	30·16	29·98	37·8	43·3	33·6	46	34	37	57	33	46	41
25.	30·128	30·130	29·607	29·69	29·82	28·98	29·52	29·02	44·7	45·2	37·9	54	36	45	51	39½	44½	33
○ 26.	29·636	29·629	29·581	29·12	29·26	29·42	29·14	29·34	44·8	53·4	39·8	50	29	42·5	45½	34	34	35
27.	29·774	29·763	29·746	29·31	29·52	29·46	29·46	29·49	43·3	49·0	36·0	52	44	41·5	46	30½	37	36
28.	29·720	29·740	29·704	29·25	29·37	29·27	29·16	29·21	50·3	50·8	43·0	60	47	48	54	40	47	41½
29.	29·912	29·921	29·860	29·38	29·61	29·70	29·32	29·56	50·2	58·5	49·2	59	48	48	49	38½	44	43
30.	29·896	29·914	29·836	29·32	29·46	29·57	29·43	29·31	50·7	57·4	49·2	59	42	51	53	40½	45	43
31.	29·780	29·795	29·426	29·26	29·22	29·20	29·18	29·22	48·8	57·4	45·6	56	43	45	55	40	41½	40
Mean.	29·893	29·931	29·718	29·40	29·584	29·549	29·520	29·501	45·6	51·5	41·6	52·18	37·48	43·7	47·6	36·0	41·87	40·41

Days of Month.	Wind.					Rain.					Dew-point.
1842. Mar.	London: R.S. 9 a.m.	Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	London: R.S. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Lond. R. S. 9 a.m.
1.	s.	w.	calm	sw.	w.	·047	·02	·09	......	·01	46
2.	s.	sw.	w.	sw.	nw.	......	·41	·04	......	·05	40
3.	ssw.	sw.	calm	sse.	e.	·402	·01	·28	......	......	47
☾ 4.	sw.	w.	calm	sw.	w.	......	......	·10	......	·91	45
5.	s.	w.	calm	wsw.	sw.	......	......	......	......	·06	42
6.	ssw.	se.	calm	sse.	s.	......	......	......	......	·12	41
7.	s.	s.	calm	sse.	se.	......	·02	......	0·93	......	40
8.	s.	sw.	w.	sw.	sw.	......	·17	......	......	·03	46
9.	s.	w.	calm	sw.	s.	·150	·47	......	......	......	42
10.	w.	nw.	nw.	w.	sw.	·455	·01	·72	......	·06	40
11.	s.	s.	calm	sw.	s.	......	......	......	......	·11	40
● 12.	w.	sw.	calm	sse.	w.	......	·06	......	......	·23	42
13.	w.	w.	w.	w.	sw.	·094	......	·03	......	·18	44
14.	s.	s.	calm	sw.	se.	·022	·02	......	......	......	43
15.	s.	sw.	calm	sw.	sw.	......	......	......	0·50	......	46
16.	s.	sw.	calm	sw.		......	......	......	......	......	49
17.	w.	sw.	calm	ssw.	sw.	......	·05	·12	......	·14	48
18.	w.	w.	w.	w.	sw.	·011	......	·04	......	·15	48
☽ 19.	w.	sw.	w.	w.	w.	......	......	......	......	·07	40
20.	nw.	nw.	n.	nw.	n.	·080	·10	·13	......	·05	42
21.	nw.	n.	n.	n.	n.	·105	·08	·16	......	·02	39
22.	nw.	n.	calm	n.	n.	·091	·08	......	......	·08	36
23.	n.	n.	calm	nw.	w.	·091	·03	·09	0·55	......	35
24.	n.	w.	n.	wnw.	w.	·025	......	·05	......	·04	35
25.	sw.	w.	calm	w.	w.	......	·07	·03	......	·05	39
○ 26.	w.	nw.	w.	wnw.	nw.	·086	·01	......	......	·74	40
27.	w.	w.	calm	w.	nw.	......	·02	......	......	·02	40
28.	w.	w.	calm	sw.	sw.	......	......	·06	......	·44	43
29.	w.	w.	calm	sw.	w.	......	......	·03	......	·26	46
30.	s.	sw.	calm	s & w.	s.	·010	·05	......	0·76	......	48
31.	sse.	sw.	w.	w.	n.	·069	·13	·11	......	·10	47
Mean.						Sum. 1·777	1·81	2·08	2·74	3·98	Mean. 42

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 58. JUNE 1842.

XXXI.—*General Features of Chusan, with remarks on the Flora and Fauna of that Island.* By Theodore Cantor, M.D., Bengal Medical Service, &c.

The island of Chusan, or Great Chusan, is situated on the east coast of China, between lat. 30° and 31° N. and long. 122° and 123° E.* It is the greatest and most important of the group of islands which bear that name, and is separated from the nearest main-land, Keeto Point, by an arm of the sea, about ten miles across, thickly studded with smaller islands, varying in extent from little slightly elevated rocks to islands several miles in circumference. This uninterrupted chain of islands renders it necessary to look upon Chusan, and the whole group indeed, more as a part of the continent than as islands. The extremes of temperature are more like those of a continent than of an island. The aspect of Chusan is hilly, being traversed by steep rocks in all directions, occasionally surmounted by peaks with intervening valleys. The rocks belong to the older volcanic series, chiefly consisting of claystone, porphyry, and a number of varieties, of which Lieut. Ouchterlony in his statistical notes has given the following description:—

"In portions of the cliffs on the south and north coasts the rocks are observed to assume a columnar structure †, and dykes and masses of greenstone burst through the beds of claystone on various points, indurating and altering them to a considerable extent. On the west coast the claystone por-

* An observatory erected in 1840 near the engineer camp was situated in 30° 0′ 10″ N. and 122° 14′ E. The variation of compass was found to be 2·33 E., magnetic dip 42·16. The circumference of the island is $51\frac{1}{2}$ miles; its greatest length about 20, its greatest breadth $10\frac{1}{2}$ miles. The direction of the island is from N.W. to S.E.

† Columnar structure is also visible on Buffalo Island, a short distance to the southward of Chusan.

phyry assumes a slaty or laminated structure, and appears to be quarried extensively, both for use on the island and for exportation to the main-land, affording excellent slabs for paving and for floors, and good blocks for common building purposes. A coarse conglomerate is also to be seen intervening between beds of the claystone, imbedding angular fragments of many descriptions of igneous rocks and workable porphyry, which is also quarried and made use of for pillars, blocks for corn-mills, basement slabs, &c."—Calcutta Journal of Nat. Hist., vol. ii. p. 136.

As characteristic features in the island, may be mentioned the absence of rivers, lakes and forests. The valleys are fertilized by numerous streamlets communicating with narrow canals, which traverse the island, and serve both for agricultural purposes as well as means of communication for want of carriage-roads. All the canals, at least in several miles distance round Ting-haé, the principal city of the island, discharge their surplus into a common canal, which passing through the city communicates with the sea.

The entire absence of forests appears to be of a comparative recent date, to judge from certain passages in a letter written by Mr. Cunningham in the year 1701, in which *deer* are mentioned as being in abundance, which circumstance would presuppose a woody appearance of some part of Chusan at least. The writer says, "The island in general abounds with all sorts of provisions, such as cows, buffaloes, goats, deer, hogs, wild and tame geese, ducks and hens, rice, wheat, calavances, coleworts, turnips, potatoes, carrots, beetach and spinach. Here also the tea grows in great plenty on the tops of the hills, but it is not in such esteem as that which grows on more mountainous islands. Although this island is pretty well stored with people, it is far from what it was in P. Martini's time, as he describes Chusan. The rest of the circumjacent islands are either desert or meanly inhabited by a few people, but all of them stored with abundance of deer, for it is not long since Chusan began to be peopled. It is true in Martini's days, about fifty years ago, it was very populous for the space of three or four years, at which time the fury of the Tartar conquest was so great that they left it desolate, not sparing so much as the mulberry-trees (for then they made a great deal of raw silk here); and in this condition it continued till about eighteen years ago."—Extracted from Harris's complete collection of Voyages in Chinese Repository, vol. ix. p. 133.

Chusan, as well as most of the smaller islands, presented on our first approach in July 1840, a striking and novel appearance; a crowded population manifested itself in the cultivation of every spot which by art of man could be forced to administer to the first necessities of life. To meet the demand of an over-population, every inch of ground is laid under contribution for the greatest possible amount of produce; in fact, industry has increased the original arable land in the rich alluvial valleys by transforming the naked sides of the hills, covered in many places by a barely one-foot-deep crust of disintegrated rock, into cultivated terraces. The highest hill at Chusan is not above 1800 feet above the level of the sea; the rest are of a much less elevation, and admit in most places of terrace-cultivation to their summit.

Position and climate warrant us, as before observed, to draw the inference, that Chusan in its fauna and flora cannot originally have differed materially from the opposite main-land, though the absence of rivers, lakes, and lastly forests, cannot but greatly influence either; in other words, the same animal and vegetable productions may be presumed to exist in the neighbouring regions of the continent, but with greater variety in forms and in numbers, inasmuch as both are affected by the presence or absence of rivers, lakes, and forests. To which should be added another consideration, the changes which the original physical aspect of a country must undergo by cultivation. Thus it may be assumed, that Chusan may afford a criterion of the fauna and flora of the neighbouring regions of China, but only to a limited extent.

In the cultivation at Chusan rice holds the first rank, and of that there seem to be two varieties; one cultivated in the valleys by the aid of irrigation, another on the heights, where the protracted periodical falls of rain afford a substitute for the art displayed by the Chinese agriculturist. During our first occupation of Chusan the rice-harvest commenced in the end of August, but soon after a new crop was observed to spring up between the drills or ridges of the old, which, irrigated partly by the celebrated water-wheels, and partly by the subsequent heavy showers of rain, seemed to promise another harvest before the setting-in of the winter season. The amount of the produce is such as to enable the inhabitants to dispose of a vast surplus, and this is the chief staple commodity, which is exported either as paddy or converted into "sám-shoo," a spirituous liquor distilled from rice. To judge by the number of distilleries and the quantity of samshoo in store at Ting-haé, it would seem that the city exports the greater quantity of rice converted into that commodity. All other kinds of grain occupy a secondary rank, such as *Holcus Sorghum* (Barbadoes millet), *Polygonum*, of which several species are cultivated, one of them for the sake of the blue dye it yields, Job's-tears (*Coix Lachryma*), and maize. Of vegetables, *Convolvulus Batatas* (sweet potatoe) seems to be the greatest favourite with the Chinese; also *Solanum Melongena* (brinjol), *Chenopodium* (spinach), *Nelumbium*, *Cucurbita maxima* (pumpkin), water-melons, ginger, and turnips. Of fruit-trees, apples, pears, quinces, peaches, walnuts, grapes and citrons. Although both fruit and vegetables thrive remarkably well, they are of a very inferior description; rice, the staff of life, has engrossed all the care of the Chinese agriculturist, who looks upon all other objects of cultivation as secondary. There seems however to be every reason to believe that most European sorts of grain, vegetables and fruit would succeed at Chusan.

To the former vegetable productions are to be added, *Thea sinensis*, *Stillingia sebifera*, *Elæococcus Vernicia*, and *Nicotiana*. Tea is grown exclusively for the consumption of the inhabitants, and most of the houses and farms have either small plots allotted to the shrub, or it is planted in hedges or on the fine stone walls with which the houses are commonly surrounded. The shrub was in flower in July, had ripe fruit at the end of September, and flowered again at the commencement of November. The tea at Chusan when seen in leaves was even by judges considered to be of the black kind, but when made into infusion its colour and flavour were those of the green kind. On my inquiries from the farmers whether they made black and green tea indiscriminately from the same shrub, I was invariably told they gathered the leaves and prepared them, such as they were, without paying any further attention. The fact is, they are evidently not initiated in the secrets of the manufacturing districts, and their tea is of such inferior quality that it cannot form an article of commerce. A gentleman of one of the commercial firms in Macao, who visited Chusan during our first occupation, informed me that with great trouble he had contrived to collect some ninety pounds of tea on the island, for which he paid a price far beyond its value, solely with a view to encourage the inhabitants to establish commercial intercourse.

The fresh leaf is coarse and nearly $2\frac{1}{2}$ inches in length. The capsules either contain a single seed, and their outline is then circular; or two seeds, which make the outline resemble the Arabic character of number 8; or seldom three, in which case the outline acquires a blunt triangular shape.

Stillingia sebifera is cultivated to a considerable extent for the sake of the tallow-like matter which covers the ripe fruit.

It flowers in the month of July and August, and the fruit arrives at maturity in November, when the capsule containing three seeds bursts open. The process by which the vegetable tallow is secured is very simple. The seeds, after having been taken out of the capsules, are thrown into large vessels of boiling water, which, after being allowed to cool, leaves the pure white hardened substance, insoluble in alcohol, on the surface. The latter is again melted and formed into candles over wicks of thin bamboo or straw, which have been lengthways surrounded by a closely fitting spiral of thinner straw. These candles, which are said to form a no small article of exportation, are originally of a beautiful white colour, but sometimes dyed red; they burn remarkably well, without any unpleasant smell, and notwithstanding the rudely made wick, give a very good light. I have kept several of these candles exposed to the influence of the hot season in Calcutta, notwithstanding which they did not lose their original hardness. *Stillingia sebifera* has many years ago been introduced in Bengal, where it seems to thrive remarkably well; but Dr. Roxburgh observes, that the temperature of the winter season is not sufficiently low to allow the substance to congeal. This seems also to be the case in Canton province, where the substance is mixed with animal tallow, and thus fabricated. I have been informed that the tree is found in our northern territories, where there would seem to be no obstacle to prevent the substance from being applied to œconomical purposes and as a useful vehicle for ointments, but I am not aware of such experiments having been tried.

The cotton plant (with white flowers) succeeds very well, and is grown in many places, but to a very limited extent, and solely for the use of the cultivators; and such is also the case with tobacco. Small plantations of *Elæococcus Vernicia*, Juss., are seen here and there. The varnish it yields, although of inferior quality, is in great demand for furniture, and indeed for all the frame-work of the houses.

On the sides of the hills, where the scantiness of soil or the steepness is such as not to admit the plough, oaks and pines are raised for fuel: either attain to but a small size. The oak, I am informed by Mr. Griffith, is very like one which he discovered in the Khasyah Hills. The leaves resemble those of *Quercus infectoria*, while the sessile flowers approximate it to *Q. sessiflora*. A few very fine large junipers are seen in gardens. Firewood, vegetable and mineral coals, as well as timber, form articles of importation.

The agricultural implements at Chusan are of a description superior to those used in the southern provinces, particularly the plough, the winnow, and the chain-pumps. Although the Chinese may be said to be pre-eminently an agricultural nation, and it has been the policy of their government to encourage and acknowledge agriculture as one of the most honourable pursuits, the eminence it has attained has been somewhat overrated. In the mere mechanical parts, such as the distribution of human labour in the cultivation of rice, and in a few instances of adopting the simplest means, the Chinese may be said to have arrived at perfection; but in the higher branches the Chinese are far behind the best European rural œconomists. It has been observed, that the small allotments of land in China must necessarily preclude any attempt at extensive operations, and while the individual is confined to raise a crop barely sufficient to maintain his own family, accommodation of the crop to the soil is almost entirely out of the question. As for the rest, nothing can be said of the agriculture at Chusan that has not already been noticed elsewhere, with one exception, and that is the unheard of and equally repulsive means to which the inhabitants resort to obtain manure for the fields. Suffice it to say, that in Ting-haé the inhabitants make a point of collecting the offal, which in a city it is the first duty to the health of the public to carry away, as it is to decency to hide. Here every house-owner not only makes this a source of traffic, for it is sold to the tillers of the soil, but the consequence of this custom has manifested itself in the social state of the people and obliterated all feeling of decorum*.

The period of our first occupation of Chusan, from the commencement of July 1840 till March 1841, was too short to afford data sufficient to obtain the annual mean tempera-

* In a short and interesting topographical account of Chusan, published in the 'Chinese Repository,' vol. x. p. 328, the following description of Ting-haé is given:—"The city possesses no large gardens or squares, but a considerable extent of open ground on the eastern side is devoted to the cultivation of rice. The canal, which nearly surrounds the city, sends a large branch through a water-gate near the southern gate, which, dividing into many branches, traverses the greater part in all directions. These branches form several large pools of foul stagnant water, into which every description of filth was thrown, and the street-sewers also opening into the canals rendered the latter extremely offensive, and during the warm weather caused a most unpleasant smell throughout the city. Added to this source of malaria, great numbers of large jars were placed at the corners of most of the streets and in all vacant places, which were filled with a fermenting mass of animal and vegetable offal, gathered from the houses and preserved for manuring the fields in the neighbourhood; as may be supposed, in some of those places the stench was dreadful."

ture and that of the four seasons. As the day however is not far distant when China will be no longer a field of speculation but one of research, it is preferable to await the sure results of continued meteorological observations, although the following few extremes may suffice to show the range of the thermometer. The observations were made in the open air in the shade.

	Highest.	Lowest.
July	86°	79°
August	93	76
September	100	71
October	84	58

On our first arrival in July the weather was very pleasant; the heat became oppressive towards the end of August, particularly at night, and remained so till the end of September, when heavy and protracted showers of rain made their appearance and did not cease till the end of November. The winter season commences in November, and I am informed that snow fell in the end of December, and that the thermometer sunk in January to 22°.

These great vicissitudes in climate manifest themselves in the absence of the brilliancy of the Indian flora and the frequent occurrence of true Europæan forms. The Indian forms are of stunted growth, and many of them, such as the palms and the plantain, which are cultivated, do not arrive at maturity. Among the beauties of the wild flowers are a cærulean *Commelina* and *Plumbago, Ipomœa cærulea,* a delicate lilac *Aster, Nelumbium, Oxalis stricta,* a white *Clerodendron* and a lilac *Lycium.* In August ripe brambles and raspberries were found on the sides of the hills. The strawberry, which is very plentiful, was ripe in the commencement of August; the fruit is insipid, and by the Chinese fancied to be poisonous*. The plant was again in flower (of a rich gamboge colour) in the middle of September.

The hop plant, which may almost be said to cover Chusan and such of the surrounding islands as I had an opportunity to visit, flowered in August, and was in fruit in September and the commencement of October. When first I observed the *Humulus,* I became anxious to ascertain if it might not originally have been introduced by the English during the time of the Factory; but the inquiries which Mr. Gutzlaff was kind enough to make among the inhabitants, who, although it is

* A *Fragaria,* probably the same, has been observed at Nagree, in Sikkim, by J. W. Grant, Esq.

not used, have several names for the plant, have established it beyond doubt to be indigenous. A group highly characteristic of the flora of Chusan attracted my attention in a tea-plantation; it consisted of a tea-shrub entwined by a hop-plant and surrounded by a strawberry, a bramble, *Artemisia vulgaris*, *Hypericum perforatum*, *Viola canina*, a pine, an oak, a plantain, and a fan-palm.

The following list of plants, collected at random, some of which I identified, with their genera, on the spot, while for the rest I am indebted to the kindness of Mr. Griffith, will serve to give some features of the flora.

Plants flowering at Chusan in July, August and September.

A. Exogenæ.

Ranunculaceæ.
Ranunculus sceleratus.
Nelumbiaceæ.
Nelumbium.
Cruciferæ.
Thlaspi.
Brassica.
Sinapis.
Resedaceæ.
Reseda luteola?
Tamaricaceæ.
Tamarix.
Violaceæ.
Viola canina?
Sterculiaceæ.
Sterculia.
Malvaceæ.
Gossypium.
Hibiscus.
Aurantiaceæ.
Citrus.
Ternstrœmiaceæ.
Thea chinensis.
Camellia.
Hypericaceæ.
Hypericum perforatum.
——— montanum?
Aceraceæ.
Acer.
Vitaceæ.
Vitis vinifera.
Balsaminaceæ.
Balsamina.
Xanthoxylaceæ.
Xanthoxylum.
Oxalidaceæ.
Oxalis stricta.
Celastraceæ.
Ilex.
Euonymus.
Rhamnaceæ.
Zizyphus.
Anacardiaceæ.
Rhus.
Fabaceæ.
Phaseolus.
Melilotus.
Rosaceæ.
Rosa sinica.
Potentilleæ.
Potentilla.
Rubus idæus.
——— Chamæmorus.
Fragaria.
Geum rivale?
Amygdaleæ.
Amygdala persica.
Prunus.
Pomeæ.
Malus.
Pyrus.
Cydonia.
Eriobotrys japonica.
Lythraceæ.
Lagerstrœmia indica.

Myrtaceæ.
Myrtus.
Punica Granatum.
Cucurbitaceæ.
Cucumis Melo.
(Red and white water melons.)
Cucurbita maxima.
——— lagenaria.
Actinostemma (nov. gen.), Griffith.
Portulacaceæ.
Portulaca.
Illecebraceæ.
Herniaria (prope glabram).
Crassulaceæ.
Sedum.
Sempervivum.
Hamamelaceæ.
Hamamelis.
Araliaceæ.
Hedera Helix.
Panax aculeatus.
Apiaceæ.
Daucus Carota.
Carum.
Caprifoliaceæ.
Sambucus japonica.
Cinchonaceæ.
Pæderia fœtida.
Gardenia.
Compositæ.
Aster.
Bidens.
Lactuca.
Gnaphalium.
Inula.
Senecio?
Chrysanthemum.
Artemisia sinensis.
Oleaceæ.
Olea fragrans.
Jasminaceæ.
Jasminum.
Convolvulaceæ.
Convolvulus Batatas.
Ipomæa cærulea.
Solanaceæ.
Solanum nigrum.
——— Dulcamara.
Solanum Melongena.
——— Lycopersicum.
Datura fastuosa.
Nicotiana.
Capsicum.
Lycium.
Primulaceæ.
Anagallis.
Lamiaceæ.
Rosmarinus officinalis.
Mentha.
Origanum.
Marrubium.
Verbenaceæ.
Verbena.
Clerodendron.
Sesameæ.
Sesamum.
Plumbagineæ.
Plumbago.
Plantagineæ.
Plantago.
Chenopodiaceæ.
Chenopodium Bonus Henricus.
Celosia cristata.
Begoniaceæ.
Begonia.
Polygonaceæ.
Polygonum Fagopyrum.
Rumex Acetosa.
Rheum.
Eleagneaceæ.
Eleagnus.
Euphorbiaceæ.
Stillingia sebifera.
Elæococcus Vernicia.
Phyllanthus.
Chloranthaceæ.
Chloranthus inconspicuus.
Salicaceæ.
Salix babylonica.
——— ——— ?
Urticaceæ.
Urtica.
Cannabis sativa.
Morus.
Ficus.
Humulus Lupulus.

Cupuliferæ.
Quercus.
Juglandaceæ.
Juglans regia.
Taxaceæ.
Salisburia adiantifolia.
Coniferæ.
Pinus.
Juniperus.
Cupressus.

B. Endogenæ.

Hydrocharaceæ.
Hydrocharis Morsus ranæ.
Scitamineæ.
Zingiber officinale.
Orchidaceæ.
Herminium?
Musaceæ.
Musa.
Iridaceæ.
Iris.
Pardanthus.
Liliaceæ.
Lilium.
Allium.
Commelinaceæ.
Commelina.
Palmaceæ.
Raphis flabelliformis.
Areca Catechu.
Alismaceæ.
Alisma Plantago.
Sagittaria.
Pistiaceæ.
Lemna.
Graminaceæ.
Triticum.
Zea Mays.
Saccharum officinarum.
Bambusa.
Oryza.
Poa.
Coix Lachryma.
Holcus Sorghum.
Setaria.
Panicum.
Andropogon.
Lycopodiaceæ.
Lycopodium.
Filices.
Filix.
Pteris.
Aspidium.
Lygodium.
Nephrodium.
Asplenium.
Pleopeltis.
Musci.
Muscus hypnoides.
Lichenes.
Bæomyces?
Algæ.
Conferva.
Sargassum.
Fungi.
Agaricus.

The causes which affect the fauna of Chusan have been noticed in the preceding pages, and we may, from these, infer its poverty in variety of forms. It has been asserted that scarcely any large wild beasts are found in the Chinese empire; a dense population, which may be said to be *par excellence* agricultural, would *à priori* corroborate this opinion. At Chusan, which is comparatively a young colony, deer*, which

* It may as well be mentioned that two fine deer, *Cervus Axis*, of which the Chinese are very fond, were brought in 1840 in a junk from Formosa to Chusan. One of them, which I kept, died in the commencement of November, apparently from the vicissitudes of the weather.

were plentiful in Mr. Cunningham's time, are at present entirely unknown. Over-population cannot admit of the co-existence of the larger domesticated animals: thus, the few bullocks which were found on our first occupation were solely used for agricultural purposes; but there were neither buffaloes nor sheep, which latter (a broad-tailed kind) are said to be plentiful all over China. The food of the people is chiefly vegetable, and fish may be said to form the principal animal food. Among the Mammalia there is at least one Indian species, for several skins of the scaly ant-eater which I examined at Chusan, and were said to have been procured on the island, belonged to *Manis pentadactyla*, Linn. "This," Mr. Ogilby observes in his interesting memoir on the Mammalogy of the Himalayas, "the only species of the family known to inhabit the continent of Asia, is found in the lower and less elevated parts of the central regions; but all the *Edentata* are essentially inhabitants of the warmer parts of the earth, more especially of tropical America, and we cannot therefore expect to find their forms reproduced in the Himalayas."

Scantity of forms is a striking feature in the ornithology of Chusan, and it can scarcely be doubted that the absence of forests is one of the principal causes. During my stay on the island, I never saw nor heard of others having observed a bird of prey. As before mentioned, the Chinese exist upon vegetable food; and when, which is very seldom the case, carrion is exposed, it is soon discovered by the numerous half-reclaimed dogs. The great care which the Chinese bestow upon the burial of the remains of their dead may also be here noticed. Nearly all of the birds which will be enumerated below are very numerous, and among them there are some common Europæan forms, such as the magpie, tree-sparrow (both also occur in Japan), blackbird, and some which are equally common in Bengal, such as the little kingfisher, the drongo or king crow, both of which were observed by Col. Sykes in the Dukhun; where also the common swallow of Chusan, which leaves in August, *Hirundo erythropygia*, Sykes, "appeared in millions in two successive years in the month of March in the parade ground at Poona; they rested a day or two only, and were never seen in the same numbers."—Catalogue of Birds in the Dukhun, Proceed. Zool. Soc. 1832, Pt. II. p. 83.

Of Chelonian Reptiles but two forms were found, one of which, *Trionyx tuberculatus*, approaches closely to *T. javanicus*. None of the large Saurians occur, nor Monitors; but both the little *Hemidactylus*, which is very numerous, and the *Tiliqua* are nearly allied to species inhabiting Bengal and other parts of India. It has generally been believed, that

China is infested with very few serpents. At Chusan, although few in species, they are remarkably numerous. *Naja*, which appears to be the only terrestrial venomous serpent, as well as the species of *Lycodon, Coluber* and *Tropidonotus*, are, as pointed out in the descriptions, closely allied to Indian species. *Python Schneideri* has hitherto been found only in Java, Banca, Amboyna, and once at Malacca. All these, however, are forms which characterize tropical Asia. I am told that several species of Pelagic serpents occur in the Chusan Archipelago. Although none have come under my observation, there seems to be no doubt about their existence in the latter locality, as they have been found at Japan; and it may be observed, that certain species of fish which form their favourite prey are as plentiful as in the Bay of Bengal. The serpents of Chusan are different from those of Japan, where their specific strength is in the same proportion to their numerical as in the former island. M. Schlegel observes, that the terrestrial serpents of Japan seem chiefly to represent Europæan forms, while a species of the genus *Trigonocephalus* is the only form establishing analogy between the fauna (?) of Japan and that of India or the tropical regions in general. (Fauna Japonica, Ophidii, p. 82.) This is partly correct in as far as the genus is concerned. But M. Schlegel has described another Japanese serpent, *Tropidonotus Vibakari*, which, to judge from the description and figure, is very closely allied to *T. surgens* and to *T. mœstus*, both found in Bengal (Proceed. Zool. Soc. 1839), and perhaps, by the peculiarity of its integuments, also to *T. rufodorsatus* of Chusan. In the Batrachian Reptiles there exists a striking resemblance between the fauna of Chusan and Japan: in both the frogs are European forms, the toads not; *Bufo gargarizans* approaches to the Indian toad, figured as *B. dubia* in General Hardwicke's 'Illustrations.'

With the Pelagic fishes but little opportunity was afforded to become acquainted, as unfortunately the fishermen had followed the example of most of the other inhabitants, who had fled on our first occupation of Chusan in 1840. No other nation derives so much nourishment from the sea and the rivers as the Chinese. On the passage in June 1840 through the Formosa Channel, along the provinces of Fokeen and Chekeang, we daily fell in with hundreds of boats, a certain number of which accompanied each fishing-junk of 200 to 300 tons burden. These craft anchor and send out their small but fine-sailing little boats, each manned with four to six men, who act in concert so as to form one long line of nets, distinguished at intervals by little flags attached to floating pieces of bamboo. The time which must elapse before the nets can become filled with fish is employed in angling with hook and line. A few hawls were sufficient to fill the boats, which then repair to their junk, the common receiver of their harvest. To judge by the list of fishes of Macao given in Mr. Bridgman's 'Chrestomathy,' the Chinese sea must be rich in forms. The following few came under my observation at Chusan :—

Labrax japonicus, *Cuv.*
Nebris.
Umbrina.
Hæmulon.
Stromateus albus, "*Pomfret.*"
——— niger, "*Pomfret.*"
——— securifer, *Cuv.*
Trichiuris savala, *Cuv.*
Clupea affinis, Gray Illust. Ind. Zool.
Engraulis Hamiltonii, Gray Illust. Ind. Zool.
Solea Zebra ?
Carcharias.
Trygon.

To this may be added another small collection from the entrance of the river Peiho, for which I am indebted to Dr. George Playfair :—

Labrax japonicus.
Mugil parsia, *Ham.*
Gobioides rubicunda, *Ham.*
Calliomorus Chaca, *Ham.*
Engraulis Hamiltonii.
Tetrodon.

Nearly all these forms inhabit also the Bay of Bengal and other parts of the Indian Ocean.

Among the fishes inhabiting fresh water and estuaries, the greater number are Indian forms: two species inhabit Bengal, viz. *Anabas scandens*, Cuv., and *Cyprinus daniconius*, Ham.; one is Javanese and three are Europæan; among the latter is an eel, which seems to be identical with *Anguilla latirostris*, Yarrell.

The terrestrial and fluviatile Mollusks are remarkably rich in forms, not only in point of variety but also in interest, which will be seen by the excellent descriptions from the pen of W. H. Benson, Esq. A few approach to Europæan forms; three are identical with Indian, viz. *Helix* tapeina*, Benson, *Planorbis compressus*, Hutton, and *Helix naninoides*, which last is also found at Singapore.

Among the Annelides occurs a remarkable form, with the anterior part drawn out to the sides like the head of *Zygæna* or *Cerambyx Fichtelii*; another, but of a different species, was first discovered by Mr. Griffith in 1836, found under stones in the Naga Hills; a third species has been observed in Bengal.

Of the Crustacea, one approaches to an Europæan form, the rest are tropical.

* *Helix cestus*, Benson, which inhabits the N.E. frontier of Bengal, is very common about Macao and the islands in Canton river.

The Arachnida are remarkable for their numerical strength, their habits, and the size to which some of them attain. *Epeïra fasciata*, Walckenaer, appears to be the only Europæan species inhabiting Chusan.

With regard to the Entomology of Chusan (a collection of insects having been despatched to the Museum of the Hon. the Court of Directors, and a duplicate series by order of Government to the Entomological Society of London), it must suffice to state, that Indian forms prevail and Europæan forms are not numerous. Many identical species occurred in the extensive collections formed in the Khasyah Hills and Assam* in 1835–36, by Messrs. M'Clelland and Griffith. Among the forms characteristic of Chusan were a species of *Tingis*, a *Centrotus*, and a brilliant golden green *Agrion* with black wings.

[To be continued.]

XXXII.—*Notice of the Genus* Murchisonia. By M. D'Archiac†.

On taking a survey of the numerous genera of the Gasteropodous Mollusca, we find in many cases, especially in the fossil genera, shells possessing the peculiar character of a more or less deep sinus or notch on the right lip. Thus, amongst the *Naticæ* we find *Natica cincta* (Phill. Geol. of Yorksh., pt. 1. pl. 4. fig. 9), and perhaps *Buccinum vittatum* (Phill. Geol. of Yorksh., pt. 2. pl. 16. fig. 14), as well as several other shells of pl. 15 of the latter work. Between *Solarium* and *Euomphalus* we find the genus *Schizostoma* of Bronn, and certain shells not yet classed from the lower oolite of Calvados and the carboniferous limestone of Belgium. The latter certainly do not present a proper notch on the last whorl, but a certain number of holes, which close as the shell advances in age, nearly in the same manner as in *Haliotis*. Between *Trochus* and *Turbo* we find *Pleurotomaria* and *Seissurella*; between *Cerithium* and *Fusus* the great genus *Pleurotoma*. Lastly, *Nerinæa*, the situation of which does not

* The richness and interest of the fauna and flora of the province of Assam, which from its position is of our Indian dominions the one most calculated to throw light upon the south-western part of China Proper (Yunnán), may be inferred from the reports and collections of the two above-named naturalists: Mr. Griffith has added further to our knowledge by the botanical and zoological collections which he has continued forming by native collectors, trained and privately maintained by himself, in the Khasyah Hills.

† From the Bulletin of the French Geological Society, vol. xii. 1841.—We are indebted for the translation to Thomas Johnson, Esq., of Hexham.

appear to be yet determined, also presents as an important character the notch on the right lip.

We have thus many shells which, though similarly provided with a sinus, differ much in other respects; for instance, between the genera *Schizostoma* and *Pleurotoma* there is a distance similar to that which separates *Fusus* from *Euomphalus* or *Solarium*, and there is as much reason for uniting the former as the latter. We are aware, that to arrive at correct classification a combination of all the characters is necessary, and that the attention must not be confined to one alone; it does not however appear that Count Munster has observed this rule, for in his last work he gives the generic name *Schizostoma* to many species not only widely differing from those on which the genus was founded, but also varying considerably from each other*.

The shells which M. Verneuil and myself propose to unite under the name of *Murchisonia* are widely distributed in the formations beneath the coal series; but we are not as yet acquainted with any above these formations†. Goldfuss at first regarded many of them as *Melaniæ*, and afterwards as *Turritellæ*; Phillips and Hisinger have adopted the latter name for other species; Count Munster placed some of them in the genus *Schizostoma*; Murchison included two in *Pleurotoma* and one in *Pleurotomaria*; Von Buch, when describing *Turritella cingulata* (Hisinger), classes it as a *Pleurotomaria*; lastly, Beck is inclined to refer the *Turritellæ* of Goldfuss to the *Cerithinæ*. We shall now endeavour to show whether this difference of opinion does not sufficiently prove that these shells, which we place between *Cerithium* and *Turritella*, do not constitute a distinct group with sufficiently marked characters to form a genus, or at least a subgenus, in a systematic classification.

* The genus *Pleurotomaria* appears, on the whole, to be ill defined, for we find placed in it indifferently turbinated shells provided with a columella and a small umbilicus with a quadrangular aperture, like *Trochus*, or rounded, as in *Turbo*, and others which are discoidal, without a columella, having the umbilicus sufficiently open to allow the whorls of the spire to be seen, and an opening, which, joined to their other characters, gives them the appearance of *Solarium*. We think with Bronn, that all species presenting the latter characters ought to be placed in the genus *Schizostoma*, as they differ as much from the others as *Solarium* does from *Trochus* or *Turbo*.

† If we had not personally procured well-preserved specimens of *Turritella concava*, Sow. tab. 565, in the quarry at Chilmark (Wiltshire), the figure given by this author would lead us to believe that this shell might belong to the genus *Murchisonia*; but we are satisfied that the lines of growth do not undergo any inflection or interruption, and that they proceed from behind to the anterior part of the suture at the base of each whorl.

In fact, the *Murchisoniæ* cannot be confounded with the *Schizostomæ*, as the latter are depressed, planorbular, with a very wide umbilicus, and without a columella; they are, in fact, true *Euomphali* with a NOTCHED APERTURE. The characters of the aperture of *Melania* equally oppose the introduction of *Murchisonia* into that genus; and it differs from *Pleurotomaria* by its turrited and more elongated form, as well as in the aperture, which authors do not appear to have sufficiently noticed hitherto. The absence of a true canal, and the slight elongation of the columella, which is curved, equally oppose its introduction amongst the *Pleurotomæ*. The *facies* of *Murchisonia* distinguishes it at the first glance from *Turritella*. The disproportion of the successive whorls in some varieties, and the irregularities observable in the growth of others, are doubtless empirical characters, but exceedingly common in *Murchisonia* and *Cerithium*, whilst they are rare in *Turritella*, which is perfectly regular throughout the whole length of the spire. The external ornaments of *Murchisonia* are also more like those in *Cerithium* than *Turritella*. Lastly, the examination of the mouth, the most important character of all, removes *Murchisonia* still further from the latter genus. Instead of being rounded, as in *Turritella*, it is oblong and twice as long as wide, terminating at the lower angle in a very small canal, and sometimes presenting a groove at the upper angle. The columella, which is slightly curved, is reflected in the form of an S, and the right lip has a deep narrow notch with parallel edges.

During the life of the animal the continuous closing of this notch has produced an elevated keel or carina, which is simple or double, or rather a flattened fillet bordered by two more or less elevated regular bands, approximating so nearly in some species that they appear to unite, were it not for a fine stria which enables one to distinguish them*. The

* The notch in *Murchisonia* and *Pleurotomaria* is not closed in the same manner as the sinus in *Pleurotoma* and some of the *Cerithinæ*. In the former, the process of closing is in some measure independent of the growth of the rest of the aperture. The striæ are interrupted at the fillet or keel, and those we observe on this part do not correspond with the inflected striæ above and beneath them. On the contrary, in *Pleurotoma* the sinus and the aperture are closed by a continuous calcareous plate or lamina, and the striæ, though more or less inflected, are always uninterrupted; in *Pleurotomaria* and *Murchisonia*, the trace of the notch corresponding to that part of the mantle of the animal, which, instead of a simple rounded hollow, would present a deep narrow notch with parallel edges, is always distinctly defined by two bands or striæ, nothing similar to which appears in *Pleurotoma* or *Cerithium*.

In variety *e.* of *Murchisonia bilineata*, nob., in *Pleurotomaria limbata*, Phill., and *P. Defrancii*, nob., as well as in *Schizostoma radiata*, nob., it striæ of growth on leaving the suture of the whorls are arched anteriorly, and then take a backward direction as far as the keel or fillet. On these they form a curve convex posteriorly, and beyond the striæ take a forward direction, again curving as they approach the base of the aperture. It is chiefly the constancy, and especially the perfect regularity of the fillet or keel, throughout the whole length of the spire, which has determined us to separate these shells from *Cerithium*; for in the latter genus we find species such as *Cerithium lineola, echinoïdes, involutum, Cordieri, acutum, variabile, turris*, &c., having a sinus on the right lip, which is always indicated on the whorls by the inflections of the striæ of growth. The slight curvature of the columella and the shortness of the canal, in most species from the secondary formations, appear to point out the affinity of *Murchisonia* rather to the *Potamides* than the true *Cerithinæ*. The *Potamides* do not appear to us to be more exclusively fluviatile than the *Cerithinæ* themselves to be exclusively tertiary or recent. We may lastly remark, that the *Murchisoniæ* represent the *Cerithinæ* and *Turritellæ* in the ancient formations, as the fossil *Pleurotomariæ* represent the existing *Trochi*.

The following is our definition of the genus *Murchisonia*:

Shell turrited; aperture oblong, oblique, terminated at the base by a very short or truncated canal. Columella curved, slightly recurved outwardly. A notch, more or less deep, on the right lip, narrow, the edges parallel, the successive closing of which produces on the middle of the whorls a simple or double keel, or rather a continuous fillet or band, well defined throughout the whole length of the spire.

seems probable that the mantle of the animal was also deeply notched; but from the two lips or edges of the notch being in contact, instead of a greater or less fillet or keel, there are two calcareous plates superimposed, and the striæ of growth, which on each of them diverge in opposite directions, indicate that they are formed by two separate portions of the mantle. In confirmation of our view of the manner in which the closing of the notch takes place in these three genera, we generally find that the wider the fillet the less salient it is. In fact, it is obvious that the two lips of the notch in the mantle being wide asunder, they cannot form either a fillet or keel; the notch would then only be closed at its posterior extremity, independently of the two portions of the mantle, which would secrete above and beneath the right lip of the aperture. On the contrary, when they approach and secrete calcareous matter at the point of contact, the two lips of the notch would form a keel, elevated and marked in proportion as their contact was more intimate. In certain shells, as in *Schizostoma radiata*, the plates thus produced are completely united. The importance, as a specific character, of the greater or less width or elevation of the fillet or keel does not appear to us to be considerable; and we shall show elsewhere that the proportions of the notch are very variable in the same species.

The species composing the genus *Murchisonia*, such as we have here restricted it, are, as far as we know at present, the following:—

1. *Murchisonia spinosa*, nob. (*Turritella spinosa*, Gold., Museum of Bonn; *Buccinum spinosum*, Sow., pl. 566, fig. 4; *Cerith. antiquum*, Stein., Mém. de la Soc. Géol. de France, t. i. p. 367.)
2. ——— *intermedia*, nob.
   ——— id. var. *a*.
3. ——— *bilineata* (*Turritella bilineata*, *melania*, id. Gold.).
4. ——— *excavata*.
   ——— id. var. *a*.

All these shells are widely distributed in the limestone of Pfaffrath, Hagen, Iserlohn, Vilmar, Sötenich, &c. *M. spinosa* is found in Devonshire, in deposits of the same age. *M. excavata* is likewise found in the carboniferous limestone of Visé (Belgium), and the rest in the limestone of Néhou and Izé, near Vitré, in the departments of Manche and Ile-et-Vilaine.

5. *Murchisonia bigranulosa*, nob., Paffrath.
   ——— id. var. (*Turritella abbreviata*, Sow., pl. 565, fig. 2), Paffrath, Devonshire.
6. ——— *binodosa*, nob., Lustheide*.
7. ——— *cingulata*, nob. (*Turritella cingulata*, Hisin. pl. 12, fig. 6), Sweden.
8. ——— *articulata*, nob. (*Pleurotoma*, id., Murch. Sil. Syst. pl. 5, fig. 25), Ludlow Rock.
9. ——— *Corallii*, nob. (*Pleurotoma*, id., Murch. ib. pl. 5, fig. 26), ib.
10. ——— *Lloydii*, nob. (*Pleurotomaria*, id., Murch. ib. pl. 8, fig. 14), ib.
11. ——— *tæniata*, nob. (*Turritella*, id., Phill. Geol. of Yorksh., pt. 2, pl. 16, fig. 7), Bolland (mountain limestone), Gronau.
12. ——— *tricincta*, nob. (*Schizostoma*, id., Munst., pl. 15, fig. 14), Elbersreuth.
    ——— id. var. *a*, nob., Vilmar.
    ——— id. var. *b*, Bas-Boulonnois.
13. ——— *fusiformis*, nob. (*Pleurotomaria*, id., Phill., pl. 15, fig. 16.)

* These different species will be described and figured in a 'Memoir on the Fossils of the ancient formations of the neighbourhood of the Rhine,' on which M. Verneuil and myself are engaged at present, and which will appear in the next volume of the Transactions of the Geological Society of London.

XXXIII.—*Organographic and Physiologic Sketch of the Class Fungi*, by C. Montagne, D.M. *Extracted from* 'Histoire physique, politique et naturelle de l'île de Cuba,' par M. Ramon de la Sagra, *and translated and illustrated with short notes by the* Rev. M. J. Berkeley, M.A., F.L.S.

[Continued from p. 236.]

Hymenomycetes, Fr.

These Fungi, which compose the highest family of the class, are characterized by an hymenium composed of utricles or exosporous asci*, in contradistinction to that of *Discomycetes*, in which the asci are endosporous. But the differences are not confined to this single character; the receptacle itself, on which the hymenium is spread, is not only more varied in its form, but more complicated in its organization.

I will follow step by step this organization, from the formation of the mycelium or vegetative system to the production of the spores, and in this rapid review will endeavour to omit none of the numerous modifications which the different organs undergo in the successively decreasing series of genera and species.

The mycelium does not always appear under the same form; it presents flakes of white filaments loosely interwoven, fibres or roots; or it spreads out in smooth or radiating membranes of the most delicate tissue (*e. g. Himantia*); or finally, it creeps under the bark of trees or amongst the very fibres of the wood forming those black lines or spots which we so frequently observe. Fries remarks that in most cases the mycelium is perennial; that it is on this account we find it barren, and that it produces fruit only after a given time in each species, and under certain meteorological momenta. These conditions are, as everyone knows, heat and moisture. If light is not as necessary for the perfect evolution of the mycelium, since, on the contrary, it is in caves and mines that it acquires a greater degree of development, it is indispensable to that of the fructification which it is destined to produce†. As in plants of a higher order, it is to its overgrowth that the sterility of the fungus is due. These vegetables are not then nocturnal plants, as has been falsely asserted. I have already explained the nature of the filaments which compose the mycelium: as it varies little in outward appearance, still less in its structure at the time of its first appearance, I shall not return to the subject.

At a certain epoch not easily appreciable, and variable in each

* The word *ascus* is scarcely appropriate here. The utricles are in fact the same organs as the stem of *Botrytis*, as will be seen by comparing *Botrytis curta*, Berk., or any species of the *B. parasitica* group.—M. J. B.

† *Cantharellus Dutrochettii*, Mont. (*C. crucibulum*, Fr. Ep.), nevertheless passes through all the phases of its morphosis on bottle-racks made of deal, in the darkness of cellars. [It may however perhaps be doubted whether this and *A. pannoides*, which is perfected in the same situation, are autonomous species. The remark however will hold good of *Merulius lacrymans*, &c.—M. J. B.]

species, there appear upon the mycelium one or more little ovoid or spherical tubercles, whose successive increase shows what species we have before us; for at first all are concealed under a more or less dense spidery web, which the greater part cast off before completing their evolution, but in which some always remain enveloped. In this respect we cannot overlook the striking analogy which exists between the whole class of Fungi and that of insects, an analogy already recognised and pointed out by the illustrious Fries. The veil with which I said the tubercles were covered is sometimes woven into a membrane of greater or less thickness, and more or less tough, which, after having enveloped the fungus, as the elements of an egg in its shell, at last bursts at the summit or on the side, and gives it free access to air and light. This membrane, which is called volva (*velum universale*), frequently remains at the base of the peduncle, and then affords excellent characters for specific distinctions. Sometimes it bursts circularly around the pileus, and its upper hemisphere glued to its surface, forms spots or discoloured warts, as in *Agaricus muscarius*. In other cases it is entirely resolved into persistent scales. Sometimes it is formed of a byssoid web so delicate that not the least trace is to be found. Besides the volva, which is wanting in many genera, many *Hymenomycetes* are supplied with a second envelope, which, after its rupture, remains frequently upon the peduncle under the form of a collar or ruffle; this is called a ring (*velum partiale*). It is complete when it encloses the whole pileus; incomplete when, being fixed on its border, it covers only the gills.

The ring, which is generally white, is membranous or arachnoid, persistent or fugacious, adhering to the peduncle, or free and moveable. Its upper or inner surface has frequently striæ which correspond to the gills with which it has been in contact. It is fixed at different heights upon the stem; most frequently at about a third from the top. But the partial veil is not always membranous; in one tribe of the genus *Agaricus*, an arachnoid web unites at first the border of the pileus to the stem. This extremely delicate web, which is named curtain (*cortina*), is composed of white or coloured threads, and leaves traces of its existence either on the stem or on the margin of the pileus.

The peduncle or stem (*stipes*) is that part of the fungus which, when it exists, springs immediately from the mycelium and supports the pileus. Its presence is not essentially necessary, since it is wanting in many species, which are therefore named apodi or resupinate. In those which are provided with it, it either occupies the centre of the pileus, in which case it is called central (*mesopus*), or else it is eccentric (*excentricus*), or it is seated at the very edge of the pileus (*pleuropus*). The stem may be cylindrical or fusiform, or swollen and bulbous at the base, solid and stuffed, or fistulose, either from the first or consecutively, smooth and uniform or flaky, tomentose, villous, &c., annulate or ringless, same- or party-coloured, soft, elastic, fibrous and tough, or even woody in certain species.

When it is altogether wanting, or the pileus is attached immediately to the matrix by a greater or less portion of the border, it is called stemless (*apus*); or if applied by its whole upper surface, which is thence become inferior, it is called resupinate.

The stem is dilated above into an organ of various forms, but usually orbicular or flabelliform, which is called pileus, or, which is better, hymenophorum, since this term is applicable to tribes whose hymenium clothes a claviform or branched receptacle, not having consequently the least resemblance to a hat.

The hymenophore, which is membranaceous, fleshy, coriaceous or corky, assumes the most different forms. Sometimes it is a sort of convex, hemispherical, campanulate, ovoid, conical hat; sometimes depressed in the centre, and infundibuliform, or altogether plane, or even with its border turned up (*e. g. Agaricus, Boletus, Polyporus*, &c.); sometimes it forms simple or branched clubs (*Clavaria*); sometimes cup-shaped membranes (*Exidia*), or sinuous folds and plaits (*Tremella*). In stipitate *Hymenomycetes* the pileus is always, even when it becomes separable from it, an expansion of the flesh of the stem, and composed of the same elementary cells, sometimes however slightly modified.

In *Agaricini* the pileus is horizontal, and bears beneath plates or gills (*lamellæ*), whose central substance is formed by membraniform processes (*trama, dissepimentum*, Fr., subhymenial tissue), which are given off at right angles to this surface, and radiate from the centre to the circumference: these plates are simple or equal when they are of the same length, or compound when they are unequal in length; that is to say, when between two long gills there are other shorter ones which measure only a third, a fourth, &c., of the radius of the pileus. In this case Krombholz calls them didymous, tridymous, tetradymous, or polydymous, as half, third, or quarter gills, &c., are interposed. They are more or less close and numerous, thin or thick, broad or narrow, straight or ventricose in their free edge: in relation to the stem they are variously circumstanced, being sometimes fixed to it either by their whole breadth or by running down the stem (*decurrentes*); or they are attached by a less portion than the whole breadth, in consequence of their being rounded off at the point of attachment; or, before they attain this point, there is a portion cut out as it were, in which case they are said to be sinuate. The free or lower border of the gills is entire or toothed, straight or ventricose, equal or undulated, acute or obtuse, sometimes channelled or cleft longitudinally, as in *Trogia* and *Schizophyllum*. As regards consistence, they are fleshy, membranous, coriaceous, watery, milky, flexible, or brittle, &c. Their colour is very variable, and presents every shade of white, black, rose-colour, violet, brown, &c. Lastly, they are persistent or deliquescent, as in *Coprinus*. In the genus *Montagnites* (*Agaricus radiosus*, Pall.) not only are they persistent, although they become black, but, which is very remarkable, they remain still fixed by a short filament round the top of the stem after the destruction of the hymenophore. In *Cantharelli* the gills are so narrow that they are reduced to simple dichotomous or branched folds. In *Merulius* these folds anastomose and form a network, which indicates a passage from *Agaricini* to *Polyporei*.

The hymenophore of *Polyporei* produces tubes instead of gills. In *Boletus* these tubes, which may be regarded as gills rolled round (a view which is confirmed by the structure of *Fistulina*), adhere loosely; and, as the trame of the pileus does not pass into them, they are easily separated without injury. It is not so with *Polyporus*, the trame of the pileus supplying the skeleton, as it were, of the tubes or pores which the hymenium lines; they cannot therefore be separated from the hymenophore, or from each other, as in *Boletus*. The pores vary in form and size. Sometimes, as in *Dædalea*, they are deep labyrinthiform sinuses formed by frequent anastomosing of agaricinoid gills; sometimes they are in the form of five- or six-sided alveoli, as capacious and as regular as the cells of bees; sometimes these pores are so minute as scarcely to be visible by a good lens. All intermediate conditions are found. They are round or angular, regular or irregular, short or long, equal or unequal, simple or disposed in layers (stratose), &c. The substance which separates them is called dissepiment. Their colour, though variable, is perhaps less so than in *Agaricus*. Their aperture (*os*) affords good characters; it is sharp or obtuse, entire or toothed, torn, velvety, &c. Their cavity is often clothed with a glaucous or silvery substance. In *Glæoporus*, the pores, which are almost imperceptible in a dry state, have not their dissepiments formed by the trame of the hymenophore, but are hollowed out in a gelatinous hymenium, heterogeneous and of a different colour, analogous to that of *Auriculariæ*, to which this new genus forms a transition.

The hymenophore of *Hydna* is bristly below, with teeth or prickles (*dentes*, *aculei*), sometimes with simple tubercles, as *Radulum*, or seriate interrupted gills, as *Sistotrema*; these prickles are of greater or less length, more or less voluminous, and approximate. The distinct aculeiform tubes of the genus *Fistulina* are not separable from the pileus, from whence we may infer that they are formed from the trama, and that this genus forms the transition from *Polypori* to *Hydna*. In all the other genera of the tribes the prickles are solid, and very variously formed and coloured. As in the preceding and following tribe, the hymenophore offers the same variations as we have already made known in *Agaricini*, that is to say, that it is sessile or stipitate, with the stem central or lateral, entire or dimidiate, frequently reversed, and in this case reduced sometimes to a thin layer of arachnoid tissue, pulverulent as it were, from whence the prickles arise. Lastly, that of *Auricularineæ* is raised sometimes into radiating veins (*Cymatoderma** = *Cladoderris*, P.), into mammillæ, as in *Grandinia*, or into papillæ, as in *Thelephora*, or perfectly smooth, as in *Stereum*. The hymenophore of *Clavariæ* is vertical, simple or branched, rarely foliaceous, the upper portion being linguiform,

* Judging by the figure and description, I suspect that this genus, lately established by Junghuhn (Tijdschr. voor Natur. Geschied. en Physiol. 2–3 stuck, 1840) on a fungus of Java, scarcely differs from *Thelephora dendritica*, Pers., gathered in the island of Rawak by M. Gaudichaud, on the expedition of the Uranie, commanded by M. Freycinet.—See Mont. Ann. Sc. Nat., Nov. 1841, and Berk. Hook. Lond. Journ. Bot. No. 3.

clavate, or ending in a sharp or obtuse point. In *Tremellæ* it is foliaceous, decumbent, sinuous, plaited, or smooth and gelatinous.

Having gone through the forms of the hymenophore, let us now examine its structure. In general two different tissues enter into its composition : one consists of cells which are at first spherical, but which become polyhedral by mutual pressure; the other of septate filaments, generally of a very small diameter. The union, intermixture and felting of these elementary tissues not only determine the gelatinous, spongy, fleshy, or corky or woody nature of this organ, but produce, moreover, the many forms which they present. We must not forget that the central layer (*trama*) of the gills of Agarics, of the prickles of *Hydna*, of the dissepiments of *Polypori*, &c., being formed by prolongations of the tissue of the hymenophore, is consequently, in the majority of cases, composed of the second order of cells, that is to say, the elongated; sometimes, nevertheless, covered by another thin layer of globular cells, which separate it from the sporigerous membrane; and that in *Russula* and *Lactaria*, whose trama is altogether composed of these cells, it is from these very cells that those proceed, which, under the name of basidia, anthers, paraphyses, &c., concur in the formation of the hymenium. There is still a very important fact, should it be confirmed, and which, in any case, I ought not to pass by in silence, viz. the presence of laticiferous vessels in some species of this family. Their discovery is due to M. Corda, who assures us that he has seen them in *Russula fœtens*. According to this mycologist, who has also figured (Ic. Fung. iii. p. 42, t. 7. f. 106, *g*, *i*, *k*, *l*) this vascular system, whose existence has never been suspected, the laticiferous vessels are continuous, pellucid, equal, generally flexuous, much branched, and frequently anastomosing by means of collateral branches. They contain (I am still speaking of *Russula fœtens*) a milky, semitransparent, opaline juice, filled with molecules, and which appears to move slowly in different directions. These vessels are more numerous in the gills of *Russula fœtens*, and on the surface of the stem, than in the parenchym of the pileus or peduncle. They contribute, moreover, according to Corda, to the formation of the hymenium in this Agaric, descending between the basidia under the form of cæciform tubes, attenuated at first at the extremity, and then terminated by a globular swelling (*l. c.* fig. 106, *g*, *i*)*.

The parenchym of many *Hymenomycetes* presents the very curious phænomenon of becoming blue when, after being torn or broken, it is put in contact with the atmosphere (*e. g. Boletus cyanescens*).

We have seen that in *Discomycetes* the hymenium consists of cylindrical or claviform tubular cells, placed parallel to each other, and each containing eight sporidia arranged in a single row; in other words, that it is composed of endosporous asci: that of *Hymenomycetes* presents a structure almost similar as regards the cells and their disposition, but instead of being included, the sporidia, most fre-

* See moreover the ideas on this subject put forth by M. Morren, Acad. Roy. des Sc. Brux., 5 Janv. 1839.

quently quaternate, are seated on their apices; in other words, these organs are exosporous.

As is the case with the male organs of *Targionia*, this organization, correctly seen and tolerably figured by Micheli * a century since, and in more recent times by Bulliard, had been cast into oblivion by the most celebrated botanists of our times, who had lost the trace of it. It is but a short time since it has been called to mind and established, that the immortal Florentine, with very imperfect instruments, had nevertheless very correctly observed nature, and was the only one who had done so†.

The paraphyses (*Basilarzellen*, Corda) are elongated, tubular, cæciform cells, placed parallel the one to the other, like the pile of velvet. In most cases they are the termination of the filaments of the parenchym of the hymenophore, or of the trame of the gills of Agarics, the prickles of *Hydnum*, &c. Some, as is the case also with basidia, are furnished even by the outermost of the two layers of cells which accompany the trame.

The basidia (Lév., Cord., sporophores, Berk.) placed between these paraphyses, and, like them, tubular, are distinguished not only by their being rather longer, which makes them project perceptibly beyond the surface of the hymenium, but, besides this, because they contain, before the maturity of the sporidia, a coloured opake juice, clouded by an innumerable quantity of granules and some drops of oil,

* Micheli indeed observed that the sporidia were exogenous, and he has figured their quaternate arrangement in *Coprinus*, but it is not correct that he was acquainted with the basidia; the bodies figured by Micheli, which have been supposed to be what has been lately observed by so many mycologists, being merely the little hairs with which the gills are often fringed. This will at once be found to be the case if the letter-press be compared with the figures. On pointing this out to Dr. Montagne, whose love of science is equalled by his love of truth, he most kindly and candidly replied, "J'ai revu les planches de Micheli que vous citez et relu le texte. Il parait par celui-ci que ce savant n'a pas vu le fond des choses, et à cette époque, certes il est étonnant qu'il ait même si bien vu. Je conviens avec vous qu'il n'est pas le moins question du monde des basidies dans le texte, mais Micheli y parle très clairement de la disposition quaternaire des spores, qu'il indique pl. 73, fig. *h*."

Müller's figure of *Ag. comatus* shows correctly the sporidia seated on the spicules of the basidia. The eyes of modern mycologists were for years blinded by Link's celebrated paper, or the real structure would long since have been recognised. The modern re-discovery is due to Ascherson; at least he is the first who made it known.—M. J. B.

† An excellent history of this subject may be found in the memoirs of Berkeley and Léveillé on the hymenium, and in the third volume of the 'Icones Fungorum' of Corda, who claims the honour of having first conducted naturalists into the path of truth. None of these authors mention the opinion which Palisot de Beauvais proclaimed in 'Encyclopédie Méthodique,' in the article *Champignons*. This savant holds, that the bodies which Micheli took for spores are not the true seeds, but an heterogeneous powder which the wind carries upon the gills or the eggs of insects. The grains, he says, are enclosed in the gills between their coats. [This is of a piece with his eccentric notion, that the reproductive bodies of mosses are contained in the columella.—M. J. B.]

which, in proportion as the evolution of the sporidia is perfected, gradually clears and at length becomes transparent. This juice, during life, is subject to an evident motion analogous to that which we have observed in *Botrytis Bassiana*, *Ascophora Mucedo*, &c. From the summit of the basidia spring threads (*sterigmata*, Corda [spicules, Berk.]), generally four in number (*basidia tetraspora*), destined to support the reproductive bodies. The number of these threads is normally four, and then they are, as it were, verticillate at the free extremity of the basidium, and disposed thus : : at the four angles of a square; but sometimes there are but two, the others being abortive. They may even be reduced to unity; but occasionally there are two additional threads, raising the number to six (*basidia polyspora*), placed at the extremities of the major axis of an ellipse thus ·::· ; or finally, by the suppression of one, the number is reduced to five ::·. These threads or peduncles are frequently swollen at their point of attachment and apex. In some genera with monosporous basidia (*e. g. Tremella*) the support is wanting, the sporidium resulting then from a sort of strangulation of the tip of the basidium. The threads are hollow, and communicate with the cavity of the basidia, that the juices which contribute to the nourishment and increase of the sporidia may reach them without any impediment.

The sporidia, the object and end of vegetation, are bodies destined to reproduce the fungus. In the whole family with which we are occupied, these bodies are outward or acrogenous, and not enclosed in special cells or endogenous, a character which approximates them to *Mucedines*, in which are some genera (as *Isaria*, *Ceratium*, &c.) which Messrs. Berkeley and Corda associate with *Hymenomycetes*, the genus *Clavaria* forming a natural transition. The sporidia, which are spherical, oval or oblong, straight or curved, smooth or rugged, naked or echinulate, one- or more celled (*e. g. Gomphus rutilus*), are composed, as in the majority of species of this vast class, of an episporium and a nucleus, sometimes accompanied by some drops of an oleaginous substance, held in suspension in an opaline fluid, at length grumous, which circulates in the basidia even after their complete evolution. The episporium, formed of a single indehiscent cell, bears at the point of attachment (at least in the species where this is evident) either a little cavity, named by Corda hilum (Ic. Fung. iii. t. 8. fig. 115, *h*), or a little conical obtuse or pointed nipple (*l. c.*, t. 7. fig. 99, *h*), indicating the place of the ancient aperture by which the granular fluid (*massa sporacea*) of the basidia penetrated into the cavity of the episporium, before the formation of the nucleus. This hollow or nipple is moreover the point by which the sporidium was attached to the thread. As regards their direction, if they have, as in *Mucedines*, the same axis with the sterigma, Corda calls them *trepanotropous**; if, as when they are attached laterally, their axes are different, they are called *pleurotropous*. These epithets are applied to the sporidia alone, when the direction of their axis is compared with that of the axis of the threads. The

* I should prefer orthotropous or homotropous.

nucleus is usually consistent, rarely fluid, and at length assumes, within certain limits, various colours. They are white, rose-coloured, ochraceous, ferruginous, purple-brown, or black; and Fries, in the 'Systema Mycologicum*,' has availed himself of the fact, that the same colour prevails in allied species, to form the principal sections in the methodic distribution of the genus *Agaricus*.

The anthers (*antheræ*, Klotzsch, *cystidia*, Lév., *antheridia, pollinaria*, Corda) are a third kind of vesicular or tubular cells which occur in the hymenium of some Agarics and many *Boleti*. According to Corda, these cells do not arise from the trama descending from the pileus, but their base is lost amongst the cells of the nearest of the two layers usually interposed between the trama and hymenium. This is at least the result of the examination of the greater part of the figures in which he has figured these organs. Sometimes, in certain *Coprini* for example, the anthers are even placed in a little hollow in the surface of the hymenium, which they considerably exceed. These organs, which Micheli considered as buttresses destined to keep the gills separate from one another, and to prevent their mutual agglutination, because doubtless he had not observed them in the tubes of *Polypori*, where the notion is inapplicable; these organs, to which Bulliard already attributed a fecundating property, though he confounded them with others which have not the least analogy with them; these organs, finally, whether regarded or not as grains of pollen sprinkled over the surface of the hymenium†, are formed of a single indehiscent, extremely thin and transparent, cylindrical, conical or acuminate cell, filled with a mucilaginous, limpid, colourless juice, or rarely coloured by a light tint of yellow or bistre‡, in which float extremely fine molecules. This mucilage, at a later period, exudes from the cell, and appears at its tip in the guise of rounded drops. Corda assures us that the anthers appear before the evolution of the basidia, and that they disappear when the sporidia are mature. It is to the viscid nature of the juice which they pour out that we must attribute the agglutination of the spores round the cystidia of Léveillé, when these reproductive bodies have abandoned their supports. The organs considered as endowed with the property of fecundating the sporidia have been observed in a certain number of species only, which however should not invalidate the opinion of the authors who assign them this distinction, since even in Mosses, where the presence of these organs is averred, there are a great number of species in which they could not be found.

* In a later and newly published work, 'Epicrisis Systematis Mycologici,' he has attempted a new arrangement of the genus, founded principally upon the structure of the trama of the gills or subhymenial tissue; but we do not find that he has rendered the determination of the species of this difficult genus more easy, and we still prefer the former arrangement, with a few exceptions. [In this opinion of Dr. Montagne I most entirely concur. I do not know in the whole field of Botany a more masterly effort of genius than the arrangement of this genus in the 'Syst. Myc.'—M. J. B.]

† Corda (Ic. Fung. iii. p. 44) establishes this comparison, and supports it by observations and reasoning which appear conclusive.

‡ In *Ag. balaninus*, Berk., they are of a deep purple.—M. J. B.

The hymenium whose structure I have just described covers the two faces of the gills of *Agaricini*, and the whole surface of the prickles in *Hydna*, by being reflected upon the hymenophore in the interval which separates them; penetrates into the interior of the tubes or pores of *Polypori*, clothes the whole surface of *Auricularini*, and the upper surface only of *Clavariæ*, and extends finally into the sinuosities of *Tremellini*, with the gelatinous substance of which it is frequently confluent.

The *Hymenomycetes* are fungi which flourish and increase most abundantly in temperate climates. Nevertheless, even under the tropics, where the negligent manner in which they have been looked for has induced a supposition that they are more rare than they really are, there are certain localities in which their number and variety are not less than with ourselves. Besides, in Europe, their development is subordinate to the seasons, and the greater number appear only in autumn, the most favourable time for their growth, because of the joint heat and moisture. In equatorial countries, on the contrary, according to Junghuhn (Communic. sur Java, Ann. Sc. Nat. Bot., 2 sér., tom. vii. p. 170), besides that the species of this family are at least as abundant* as in our climate, their reproduction goes on during the whole of the year. M. Leprieur has observed the same fact in Guiana. With us the summer and autumn are the seasons which favour and expedite the evolution of the greatest number of *Agaricini*, *Polypori*, &c. Spring is less propitious, and winter produces a few rare species only of these tribes. Amongst *Hymenomycetes*, some are common to a great many countries, others are found only within certain limits (*e. g. Ag. olearius*, *Pol. Tuberaster*); some, amongst which it is remarkable that we must reckon *Ag. campestris*, the only species eaten at Paris, are cosmopolites. *Schizophyllum commune* is also of this number.

Fungi of this family flourish especially on wood, at the foot of trees or on the trunk, on dead or rotten wood, on dry branches fallen on the ground, on living mosses, and in general on all organized, diseased, or dead bodies. We find them likewise in fields and meadows. They grow solitary or grouped together (*gregarii*), or united into a mass (*cæspitosi*). Sometimes they form by being disposed in concentric circles, what were named fairy rings, because people were absolutely ignorant of the cause of their production. Perhaps we are as ignorant at the present time as to the ultimate cause; but if I mistake not, we may give a plausible explanation of the proximate cause, that is to say, of the concentric disposition of the circles. This appears to result from the circular dispersion of the spores of the preceding year, perhaps also from the eccentric vegetation of the mycelium; that is to say, outside the last circle

* They are probably much more so in proportion to the whole number of species. In Junghuhn's 'List of Fungi of Java,' given by Dr. Montagne in Ann. Sc. Nat. Nov. 1841, out of 113, 66 are Hymenomycetous; and the proportion is still greater in a collection made by Cuming in the Philippine Isles.—M. J. B.

only*. An analogous instance, though in miniature, is found in *Oidium fructigenum.*

The colour of Agarics, *Boleti*, &c., has attracted the attention of some observers. We will consider it both in the hymenium and hymenophore. The colour of the hymenophore of Agarics and *Boleti* is not constant in the same species; it may be white, red, blue, brown, olive and yellow (*e. g. Russula emetica, Boletus scaber*), without any variation in the other characters. The colour of the hymenium is less liable to vary in the same species, and when such a variation does take place, it is usually due to advance in age. Thus, in *Pratellæ*, the gills are at first rose-coloured or violet, and at last become black. In *Coprini*, from white or gray they pass to black at the time of their deliquescence. As regards the proximate cause of the colour of Fungi, it appears, after the observations of Morren†, that it is attributable to the presence of spherical corpuscles of $\frac{1}{300}$ of a miliemetre circulating in the tubular filaments whose interlacing forms the hymenophore, or free and dispersed in their interstices, but not possessed of any motion in either case. Their colour is more intense in proportion as they are nearer the outer surface of the fungus; that is to say, as they are more immediately influenced by light.

As to duration, it is ephemeral in a great number of Agarics; in the fleshy species it is in general from seven to fifteen days; some, however, last longer. In the perennial *Polypori* it extends to many years; but these species increase by the successive production of new layers, which every year are deposited on those of preceding years.

It is in this family that we find the most delicious Fungi, as, for instance, *Agaricus cæsareus* (*Cibus Deorum*, Clus.), or the true *Oronge*, *A. campestris, A. prunulus, Boletus edulis*, &c. But amongst them we find also the most violent vegetable poisons, and this even in certain species which unhappily, without long study, are too easily confounded with the most wholesome fungi. I cannot here enter into any detail relative to the culinary preparation of good species, or the means of remedying accidents caused by partaking of bad fungi. On these points, the general works which treat on these productions, or those which relate to toxicology or medicine, may be consulted, and in particular 'Traité des Champ. Comest.' by Persoon, or the treatises of Messrs. Roques and Cordier. The article *Agaric*, in 'Dictionnaire universelle d'Histoire naturelle,' by my friend and fellow-labourer Léveillé, will also give valuable information on this head. There are still some uses to which these

* This last explanation is admitted by Dutrochet, Observ. sur les Champ., Ac. des Sc. Paris, 3 Mars, 1834. [It appears, from measurements which have been accurately taken, that fairy rings increase annually in diameter, which accords with this notion, and the dark colour of the grass is doubtless owing to the stimulating power of the mycelium.—M. J. B.]

† See note on *Agaricus epixylon*, Bull. (*A. applicatus*, Batsch), Acad. Roy. Sc. de Bruxel., 5 Janv. 1839.

plants are put, as well in domestic economy as in medicine, but we have touched on these before in the general introduction. In the economy of nature, besides that they hasten the decomposition of organic substances which supply the office of matrix to them, and with which they unite in forming humus or vegetable soil, they moreover serve to nourish a multitude of insects, worms, mollusks, &c. It is believed that they help to purify the atmosphere by absorbing certain deleterious gases.

I have not yet spoken of *Phylleriaceæ**, which Fries has placed in an appendix at the end of the class. They have lately been considered as a luxuriant growth of the superficial cells of the parenchyma of leaves, the only organs indeed on which they occur. I am inclined to think that such is their origin. M. Fée attributes their presence to the larvæ of insects, which stimulate the leaves and elicit the anomalous development of elongated, coloured, frequently transparent, simple or septate cells, forming a more or less dense mass on living leaves, which are in consequence often deformed. Nothing like spores has been discovered. The genera which compose this tribe, of which I have one or two species to describe from Cuba, are *Taphrina, Erineum, Septotrichum, Phyllerium.*

In this short and rapid sketch I have considered successively the Fungi of the whole class, in their varied and gradually more complicated forms; and, as far as my powers and my limited space have allowed, I have endeavoured to collect everything new and interesting which has been published respecting them during a period of nearly fifteen years; to unroll before the eyes of the reader, under the form of a simple, though necessarily imperfect sketch, the vast tablet representing the actual state of mycology under the twofold relation of organography and physiology. To close this difficult attempt, which I should not have ventured upon if it had not been imposed by the plan adopted in this work, and of whose success I am not very confident, I must still add something on the chemical composition of these plants, and of their reproduction, considered in a general manner.

The analyses of Vauquelin and Braconnot had caused chemists to recognise and admit in these plants principles which the recent and well-known labours of my learned colleague M. Payen on vegetable substances have definitively erased from the catalogue of simple substances of organic chemistry. Thus, for instance, *Fungine*, considered as a simple body, according to this excellent chemist, is but a mixture of *cellulose* and fatty matter. M. Payen having had the extreme kindness to communicate to me the result of his analyses, I am able to give the following list of elementary substances which enter generally into the composition of Fungi:—1. water; 2. cellulose, constituting all the solid part of the membranes of the tissue; 3. three azotous substances; one insoluble in water; a second soluble, co-

* Fries, Syst. Myc. iii. p. 519. Fée, Mém. sur le groupe des Phyllériées, 8vo. Paris, 1834. Grev. Mon. Erin. in Ed. Phil. Jour., p. 67. Schlecht. Mon. Erin. in Soc. Roy. Ratisb. 1822. Kunze, Mon. der Gatt. Erin. in Myk. Heft ii. p. 117, Leipz. 1823. Corda, Ic. Fung. iv. p. 1.

agulable by heat; a third soluble in alcohol; 4. fatty matter analogous to wax; 5. fatty substances; one fluid at an ordinary temperature, the other solid, crystallizable at the same temperature; 6. sugar; 7. matter capable of being coloured brown by the action of free air; 8. an aromatic substance; 9. traces of sulphur; 10. traces of salts of potash and silex *.

The reproduction of Fungi has been a subject of long and lively controversy; but I think modern observations, by clearing up the question, have induced a more uniform opinion, and one more nearly approaching truth.

It was long believed that their production was due to an equivocal generation, or simply to the decomposition of organized bodies. It is to Micheli that we owe the experiments which have passed sentence on this erroneous opinion, which, however, was held recently by some distinguished botanists. The proverb *nihil de nihilo* is here applicable, and I can scarce bring myself to believe that spontaneous or equivocal generation has any supporters amongst botanists. But amongst those who do not deny that a sporule can germinate, there are some who nevertheless cling to equivocal generation, admitting those transformations from whence it would result that a species, instead of producing a being identical with itself, would give birth to another species of a different genus or even family. This error is due to the fact, that in order to the production of the fructification, or in other words, what we term the fungus itself†, the vegetative system requires a greater or less length of time, sometimes even many years. Suppose that the sporidia of a *Clavaria* have given birth to an *Himantia*; who does not now know that this production, which has erroneously been constituted a genus, is nothing but the *mycelium* or organ of vegetation, from whence at some more distant epoch a *Clavaria* would have arisen identical with that from whence the *mycelium* sprang? And, as Fries expresses himself very judiciously on this subject‡, "*At num e seminibus Pyri Mali satis mox pomum habebis? Primum sine dubio enascetur arbuscula; sic inter Fungos* mycelium." There is no fungus of the six families which we have reviewed which does not normally bear sporidia. Are these then mere *lusus naturæ*? This notion is repugnant to reason and common sense. We must then admit that, as in all organized bodies, these sporidia are not, cannot be anything but organs destined for the reproduction of the species. Besides, that which reason counts for probable, observation and direct experiment have put completely beyond doubt.

The most curious fact in the physiology of Fungi is perhaps that of the kind of copulation which we observe amongst the branches of *Syzygites megalocarpus*, Ehrenb. This phænomenon is analogous to

* It is curious that the greatest proper heat met with by Dutrochet in the vegetable kingdom, with the exception of that of the spadix of *Arum*, was in *Boletus æreus*.—See Ann. Sc. Nat., Feb. 1840.—M. J. B.

† *Totus fungus pro merâ fructificatione habendus est.* Fries, Lichen. Europ. Proleg., p. xx.

‡ Ecl. Fung. in Linnæa, v. p. 503.

that which takes place in *Conjugatæ* of the class Algæ, and especially in the genus *Closterium*. The tips of two branches approach, join, and form by their junction a verrucose sporangium, in which the spores appear to result from the mixture of the contents of the two. But this mixture, as we may easily imagine, cannot take place without the resorption of the septum at the point of juncture, which in fact takes place. Nevertheless, it would appear that the copulation is not indispensable to the accomplishment of the function, since, when the two branches do not touch, a single sporangium is formed at the extremity of one of the two, or else, though more rarely, one appears on each extremity*.

In their germination, which is not now matter of controversy, there is a simple elongation of a single pole, or of two opposite poles, of the epispore of the sporidia (*mono-dinema*) ; or else, according to Corda (*l. c.* ii. p. 26, t. xiii. fig. 97, No. 21), this bursts like the testa in the true seeds of Phænogamous plants, to make way for a filament susceptible of reproducing the plant from whence it emanates, or at least of concurring in its reproduction. It appears, indeed, to be averred, that in many fungi, especially amongst those which are highest in the series, one, or even several sporidia are not sufficient for the production of a new individual. Nature, in infinitely multiplying the number of seeds in these plants, seems to have wished to initiate us into the secret of their propagation. The mycelium, which arises from the germination of the sporidia, should seem to be unable to work the almost instantaneous growth of an Agaric; for example, if it were composed of too small a number of filaments, themselves limited in their vegetative powers. It is then, in this case, only by the simultaneous concourse of an immense number of sporules that we can hope to obtain the desired result. But even this is not always sufficient; many other conditions are necessary; such as the choice of situation or matrix, atmospheric or meteorological momenta, and, above all, the season. If I can form any sure conclusion from some experiments which I have made during the microscopic investigation of *Botrytis Bassiana* (Muscardine), nature is not so peremptory in the lower fungi; for after having succeeded in separating upon the stage of the microscope a single sporidium, I have not only caused it to germinate and run through all the phases of its new existence, even to the production of the fruit; but what is more surprising, I have obtained, unexpectedly, the same result on a simple plate of glass placed under suitable conditions of light, heat, and moisture. The same experiment was equally successful in *Ascophora Mucedo*.

We have at last arrived at the production of the mycelium, which completes the circle, the first half of which is formed by the vegetation and the second by the fructification. To sum up: a fungus reduced to its simplest form is composed of a septate or continuous thread, terminated by a cell or nucleiferous swelling, which is the spore. If we would follow in thought all the modifications of these two organs, we may, by ascending constantly, as we have done, to-

* Corda, Pracht. Flora, p. 50.

wards beings more and more complicated, arrive at the very summit of the series, viz. *Amanita cæsarea*.

The various developments which the unfolding of this new subject for contemplation would allow of, would carry me beyond my object. Far from having exhausted, I have, alas! scarcely glanced over it. I leave this to those who are more capable. I could attempt only a feeble sketch; may it at least be sufficient to guide the reader in the midst of the numerous difficulties which await him in the study of this great and important class of the vegetable kingdom.

Paris, Feb. 1, 1841.

XXXIV.—*Observations on the Progress recently made in the Natural History of the* Echinodermata. By Prof. Agassiz.

[Continued from p. 197.]

In my 'Prodromus' I expressed doubts as to the membranous ambulacral tubes in the Sea-urchins having any relation to their powers of locomotion, grounding my opinion upon some observations which I had made on the sandy shores of Normandy, and upon the very positive assertion of Aristotle, who tells us that they move by the aid of their spines; and that even by the state of these organs their degree of progressive power may be known (liv. iv. chap. v.). Mr. Forbes, however, has shown this view of the matter to be erroneous, and has demonstrated that they also progress by means of their ambulacral tubes, especially when upon solid surfaces. In company with this gentleman I have seen them ascend, by the aid of these tubes, the perpendicular sides of a smooth glass vessel. No further evidence could be wanted to set at rest the point in question. It yet remains to be shown whether, among the *Cidarites*, the long club-shaped spines are not the principal organs of motion, and that it is among the Sea-urchins with very short bristles that the ambulacral tubes are essential to this function. M. de Siebold mentions the existence of microscopic cilia in the interior of these tentacula and of their vesicles (Mül. Archiv, 1836, p. 295). M. Ehrenberg, on the other hand, describes the vibratory movements in the membrane of the spines of *Echinus saxatilis* (movements which are denied by Mr. Forbes), and indicates the existence of an internal circulation of corpuscles, similar to the globules of blood, in the retractile tentacula upon the dorsal face of the *Asterias violacea*; he adds, moreover, that the surface of these tentacula is entirely covered with vibratile cilia (Mül. Archiv, 1834, p. 577). M. Volkmann has also given some new details upon the circulation in the *Asteriæ*, but I am only acquainted with his researches from extracts (Wiegm. Archiv, 1838, vol. ii. p. 333).

The history of the development of the *Echinodermata* is enriched with many important facts. M. Sars has made known the changes which the *Asterias sanguinolenta* of Müller undergoes during the early stages of its existence.

Mr. Thompson of Cork, twelve years after having described his *Pentacrinus europæus*, published a second memoir on this animal, in which he regards it as the young state of the *Comatula rosacea.* This opinion has been fully confirmed by Messrs. Forbes, Thompson of Belfast, and Ball, who have seen the living *Pentacrinus europæus* detach itself from its stalk, and swim freely in the form of a small *Comatula.* The information given by Mr. Forbes regarding the development of this *Comatula* is highly curious.

M. de Siebold has indicated the existence of the vesicle and the germinal spot in all the *Asteriæ* which he examined (Müll. Archiv, 1836, p. 297). M. J. Müller has also described the vesicle and germinal spot of the *Comatulæ* and *Ophiuræ.* M. Peters (Müll. Archiv, 1840, p. 143) announces that the Sea-urchins have the sexes distinct. They do not differ externally it is true; the sexual organs in both males and females have the same appearance; but in the females of *Echinus purpureus* and *E. Melo* the sexual glands are red, and contain ova where the *vitellus* and germinal vesicle are to be distinguished, whilst in the males these are white, and only filled with spermatozoa. MM. Valentin and R. Wagner have likewise noticed a distinction of sexes amongst the *Holothuriæ*, and M. Rathke among the *Asteriæ.* M. J. Müller, moreover, observes that it is probably the same in the *Crinoideæ*, or at least in the *Comatulæ* (Müll. Archiv, 1840, p. 144). MM. Valentin and Miescher have observed spermatozoa in the *Spatangus purpureus* (Repert. de Valentin, 1840, p. 301). M. Milne Edwards has confirmed these facts by additional observations.

In a special memoir inserted in Wiegm. Archiv. for 1837 (vol. i. p. 241), M. Philippi has described two monstrosities in the genera *Echinus* and *Spatangus.* MM. H. de Meyer and Agassiz have also made known various monstrosities depending both upon deficiency and excess.

Many lengthy memoirs have appeared upon the fossil *Echinodermata*, and a large number of species will be found described in a variety of general works upon geology and palæontology. But these works are wanting still in agreement, most of the authors differing in opinion as to the limits which should be assigned to genera. The genera which have been established subsequently to those of Miller among the *Crinoideæ*, and which are very numerous, would appear especially to call for revision. M. Alcide d'Orbigny has just undertaken this difficult task, in publishing his 'Histoire naturelle des Crinoïdes vivans et fossiles,' a work which is based upon the critical examination of a very extensive collection of specimens. It appears to me that the great merit of this monograph consists in the systematic arrangement of the genera, which are here distributed into natural families, whilst before we had them disposed without any method, but just as some might happen to follow upon others (*pêle-mêle à la suite les uns des autres*). Three parts of this interesting work have already appeared, which contain descriptions of the genera *Guettardicrinus*, *Apiocrinus*, and *Millericrinus*, of the family *Apiocrinoideæ*. It is only to be regretted that M. d'Orbigny was not aware of the labours of M. Ch. König, who, in his 'Icones sectiles,' had long since established many genera, of which his *Ceriocrinus*, *Pomotocrinus*, and *Symphytocrinus* appear to me synonymous with those proposed by M. d'Orbigny. M. L. de Buch has also published, in the Bulletins of the Berlin Academy, a critical investigation of the *Sphæronites*, a group of *Crinoideæ* but little known, and whose structure had escaped the observation of his predecessors. This memoir is accompanied with beautiful figures. Pander has also given, in his 'Beyträge zur Geognosie des Russischen Reichs,' some information upon these fossils, accompanied with figures. Count Munster, in a special memoir upon the fossil *Crinoideæ*, inserted in the 'Acta nova Academ. Cæsar. Leop. Carol. Naturæ Curiosorum,' t. xix. &c., has made known a new genus under the name *Gasterocoma*, and has given excellent figures and admirable descriptions of a large number of species which had not been published in his great work on the fossils of Germany. In his 'Beyträge zur Petrefactenkunde,' Count Munster has also described many new *Crinoideæ* of the transition period, among which are three new genera very remarkable for the disposition of the parts of the cup (*calice*), which, deviating from the quinary type so general in this group of animals, present numbers not found in the class *Echinodermata*. He calls these genera *Diocrinus*, *Triacrinus*, and *Asterocrinus*. Count Munster has moreover, in the same work, established his genus *Comaturella*, and described many new species belonging to known genera. M. Herm. de Meyer has also established two new genera of *Crinoideæ* in the 'Museum Senkenbergianum' for 1837, under the names *Isocrinus* and *Chelocrinus*. M. Bronn has described the genus *Ctenocrinus* in the 'Jahrbuch für Mineral. u. Petref.'

for 1840; M. Steininger that of *Halocrinites,* in the eighth and ninth volumes of the Bulletin of the Geological Society of France, and in the first volume of the Transactions of this Society. MM. Quenstedt (Wiegm. Archiv, 1835) and Bronn (Jahrb. für Min. 1837) have described some new species of *Encrinus* from the muschelkalk; so that three species of this remarkable genus are now known.

Mr. Phillips, in the second part of his 'Geology of Yorkshire,' besides describing many new species belonging to known genera, has established two new genera of *Crinoideæ* from the coal-measures, to which he gives the names *Euryocrinus* and *Gilbertsocrinus.* The same writer has moreover described a great number of new *Crinoideæ* belonging to the most ancient fossiliferous deposits, in the work of Mr. Murchison upon the Silurian system, among which we likewise find many new genera, which he calls *Marsupiocrinites, Hypanthocrinites,* and *Dimerocrinites.* The genus *Ischadites* of M. König (Murch. Sil. Sys., pl. 26, fig. 11) also belongs to the *Crinoideæ*; M. de Buch considers it to be identical with *Sphæronites aurantium.* Under the name *Scyphocrinites,* M. Zenker has described a peculiar form in this class, in his 'Naturgeschichte der Urwelt.' Lastly, M. de Hagenow has made known a new genus allied to *Solanocrinus,* which he names *Hertha,* and many new species of *Crinoideæ* and *Echinidæ.*

I shall allude again to the genera *Glenotremites* of Goldfuss and *Ganymeda* of Gray, because I have ascertained with certainty that they have been established upon crinoidal axes belonging to the family of the *Comatulæ,* and consequently they ought to be suppressed. As regards the genera *Caryocrinites,* Say, and *Trianisites,* Rafinesque, these are only known to me by name. The genus *Marsupites* of Mr. Mantell (*Marsupium,* König) is too well known to be mentioned as a recent acquisition to the science of palæontology.

M. Römer, in his work upon the Jurassic fossils of the north of Germany, and in his second work upon the cretaceous fossils of the same country, describes a considerable number of new species amongst the *Echinites* and *Crinoideæ.* MM. Koch and Dunker have described many new *Echinites* in the Supplement to the first work, and M. Hinsinger those of the formations in Sweden in his 'Lethæa Suecica,' accompanied with excellent figures.

The family of the *Crinoideæ* ought especially to engage the attention of naturalists, inasmuch as, from the great variety of forms which it contains, it will furnish the clue to the development of the entire class *Echinodermata.* These forms are as it were the precursors of the *Comatulæ,* the *Asteriæ,* and the *Echinites,* the forms of which they have in some instances already appropriated. In this particular the most remarkable of all the genera is that which I shall describe under the name *Echinocrinus,* and which presents the perfectly spheroidal shape of the Sea-urchins, with the narrow *ambulacra* and long prickly spines of certain *Cidarites.* The analogy with these last is so striking, that detached fragments of this genus (which is only found in the coal-measures and transition formations) have already actually been described as fragments of *Cidarites.* Such for instance, among others, are the *Cidaris Urii* of Fleming, the *Cidarites Nerei, Protei* and *priscus* of Count Munster, and some other unpublished species.

But little is known at present of the fossil *Asteriæ* and *Ophiuræ*; a very small number only have been described, amongst which, as new species, I shall mention those which Mr. Williamson has published in Loudon's 'Magazine of Natural History' for 1836, and those from the collections of the Earl of Enniskillen and Sir Philip Egerton, described by Mr. Broderip in the fifth volume of the 'Transactions of the Geological Society of London,' without enumerating those which have been published by Count Munster, M. Goldfuss, M. Des Moulins and M. Agassiz. Their number however is very considerable, and I am glad to announce a work by Mr. Dixon which is to embrace all the British species.

M. Frédéric Dubois of Montpereux, in the Atlas of his travels in the Crimea, &c., has commenced the publication of the magnificent collection of fossils brought by him from those countries by the issue of a large plate of highly interesting *Echinites.* In the fourth volume of the second series of the 'Memoirs of the Academy of Sciences of Turin,' De Sismonda has published a complete monograph of the fossil *Echinites* of Piedmont, in which he describes a new genus under the name *Anaster,* and a large number of new species accompanied with good figures. M. Grateloup has likewise published a special memoir upon the fossil Sea-urchins which occur in the calcareous formations in the environs of Dax (Actes de la Soc. Lin. de Bordeaux, tom. viii.). M. Leymerie has described many interesting species of the genus *Diadema* in the third vol. of the 'Geol. Trans. of France.' In the same work, vol. ii., M. Dujardin has also described a new Sea-urchin, from the chalk. M. de France has given, in the 'Dictionary of Natural Sciences' of Levrault, numerous articles on the various genera of fossil *Echinodermata,* which make us acquainted with the condition of the science upon this subject at the period of the publication of this encyclopædia. Notwithstanding that it embraces these fossils in their totality, the great work of Goldfuss on the Petrifactions of Germany will for a long time to come be a standard work for the study of fossil *Echinodermata.*

In the 'Nouveaux Mémoires de la Soc. Helvétique des Scien. Naturelles' (tom. ii. et iv.), I have made known the fossil *Echinites* of Switzerland; my descriptions are accompanied with figures which represent all the species under various aspects. In this memoir I have established the following genera:—*Hyboclypus, Pygorhynchus, Conoclypus, Pygurus, Hemicidaris, Acrocidaris, Acrosalenia, Tetragramma, Pedina,* and *Glypticus.* In the first volume of the 'Mém. de la Soc. des Sc. Nat. de Neuchâtel,' I had previously published, in part, a notice on the species of the Neocomian formations; since then, in my systematic catalogue of the casts of the fossil Sea-urchins in the museum at Neuchâtel*, I published the essential characters of the new or little known genera which I have established up to the present time amongst the *Echinites.* The following genera are there characterized for the first time:—*Toxaster, Brissopsis, Nucleopygus, Globator, Caratomus, Amblypygus, Ibeliophora*†, *Amphiope, Encope, Echinopsis, Cyphosoma, Acropeltis, Cœlopleurus, Codiopsis, Podophora,* and *Acrocladia.* The distribution of many series of these casts has given a publicity to my researches upon the *Echinites,* which I hope will aid in advancing our knowledge of these fossils, and facilitate the identification of specimens which as yet may not be figured or even described. I have also put into circulation representations, as faithful as it was possible to obtain them, of a great number of unique specimens in a very perfect state of preservation.

Since the publication, in 1838, of my first monograph upon the *Echinodermata,* the materials at my disposal have been greatly augmented. A number of new species in all the orders of the class *Echinodermata* have been entrusted to me by the numerous friends of science, who have considered that a most efficacious way of serving it would be that of bringing together, in the same publication, the greatest possible amount of data. I therefore esteem it both a duty and pleasure to record here the names of all those who have acquired new claims to my gratitude, whether it be in the communication

* Catalogus System. Ectyporum Echinodermatum Fossilium Musei Neocomensis, 4to, 1840.

† This genus has since regained the name *Rotula,* given to it more than a century ago by Klein, but of which no one had taken notice.

of original specimens, or in furnishing me with information upon the distribution or location of species. * * *

[The length to which the list extends of British and Foreign Naturalists to whom Prof. Agassiz expresses his obligations, precludes our giving it insertion.—EDIT.]

Neuchâtel, July 1841.

XXXV.—*Descriptions of new species of Coleopterous Insects belonging to the Genus* Apocyrtus, *collected by* Hugh Cuming, Esq., *in the Philippine Islands.* By G. R. WATERHOUSE, Esq., Assistant Secretary and Curator to the Zoological Society.

Order COLEOPTERA.

Sect. CURCULIONIDES.

Div. PACHYRHYNCHIDES, Schö.

Genus APOCYRTUS, Erichson.

Apocyrtus Schœnherri.

Ap. niger; capite notâ inter oculos et utrinque infra oculos; thorace notâ transversâ anticâ, maculisque duabus lateralibus et superioribus, necnon elytris maculis viginti-duabus, splendidè cupreis, vel aureo-cupreis; rostro rugoso-punctato ad basin transversìm impresso, capite et rostro canaliculo longitudinali impressis; thorace crebrè punctato; elytris globoso-ovatis ferè duplò thorace latioribus, distinctè punctatis, punctis in striis irregularibus dispositis. Long. corp. $8\frac{1}{2}$ lin.; lat. $3\frac{3}{5}$ lin.

This is the largest species of the genus I am acquainted with; its elytra are less globose, and the thorax is larger in proportion to the elytra than in *Ap. inflatus*: the beautiful metallic spots with which it is adorned vary somewhat in hue, being in some specimens of a reddish golden tint, and in others of a copper colour. The rostrum is thickly punctured, and the punctures are more or less confluent; a transverse indented line separates the rostrum from the head, and a longitudinal impression runs from this line towards the fore-part of the rostrum, becoming gradually broader in front and terminating in a line with the insertion of the antennæ. The head is rather sparingly punctured; between the eyes is a small metallic spot (in some specimens wanting), and beneath the eye is an oblique mark formed of brilliant scales. The thorax is very nearly equal in length and breadth, subglobose, and truncated before and behind; on the anterior margin is a transverse mark, about midway between the anterior and posterior margins; and towards the side of the thorax is a round spot, and just above the insertion of the femur is a broad oblong mark formed of brilliant scales; the surface of the thorax is rather coarsely punctured, and the punctures are many of them confluent. The elytra are more than one-third broader than the thorax —sometimes nearly twice as broad—about one-third broader than long, ovate and very convex; they are punctured, and the punctures are small, and for the most part arranged in striæ: the spots, formed of scales, are either nine or ten in number on each elytron; viz. two at the base, three arranged in a transverse line near the middle, a sixth larger oblong spot on the outer margin rather behind the middle of the elytra, and three on the apical half, one of which is very near the apex; the second, above this and near the suture, is large, and has a tendency to divide into two spots, and in some cases joins the apical spot; the third is in a line with the last, and near the outer margin; the tenth spot, when present, is small, and placed between the two last-mentioned spots. On the meso- and meta-sternum are four spots, one near the insertion of each of the femora.

Apocyrtus Hopei.

Ap. niger; capite anteriore et rostro rugosis, lineâ squamosâ longitudinali; thorace subgloboso, distinctè punctato, punctis plerùmque confluentibus, marginibus anticis et lateralibus, sic et maculis duabus suprà squamis obsitis; elytris ovatis, thorace conspicuè latioribus, irregularitèr punctato-striatis, striis ordine gemino dispositis; ad basin et ad apicem lineis duabus longitudinalibus, fasciâ in medio, margine laterali, maculisque duabus subapicalibus è squamis effectis; maculis notisque omnibus pallidè cupreis. Long. corp. $6\frac{1}{4}$ lin.; lat. $2\frac{1}{2}$ lin.

This species is about equal in size to the *Pachyrhynchus moniliferus*, and approaches that insect in form; but the rostrum is rather narrower and longer, and the elytra are also more elongated. The markings are of a very pale copper colour, with a slight metallic hue; they consist of a longitudinal mark between the eyes which extends on to the rostrum, terminating in a line with the point of insertion of the antennæ; a line borders the anterior margin of the thorax, and there is a patch of scales on the sides of the thorax just above the base of the femora; besides these two marks, are two spots on the upper surface: a moderately broad line runs parallel with and close to the outer margin of each elytron, but is interrupted towards and at the apical portion; at the base is a longitudinal mark situated at a short distance from the suture; this mark is joined to the lateral band by a transverse line at the base of the elytra; it terminates considerably short of a central transverse fascia: on the apical portion of the elytra are two other longitudinal marks, the foremost portion of which is thickened, and lastly there are two largish transverse subapical spots. Besides the scales which form these spots and markings, are numerous minute scattered hairs on the hinder part of the elytra, as well as on the body beneath and on the legs.

Apocyrtus cæruleonotatus.

Ap. niger; capite maculâ inter oculos et utrinque infra oculos, thorace maculis duabus et margine antico lateribusque, necnon elytris maculis sexdecim vel octodecim, cæruleis; rostro rugoso punctato ad basin transversìm depresso, capite et rostro canaliculo longitudinali impressis; thorace globoso crebrè at levitèr punctato; elytris oblongo-ovatis thorace parùm latioribus distinctè punctatis, punctis in striis irregularibus dispositis. Long. corp. $6\frac{3}{4}$ lin.; lat. $2\frac{3}{4}$ lin.

This species is larger than the *Pachyrhynchus moniliferus*; the thorax is broader in proportion to the elytra, and the elytra are less globose. The spots on the thorax and elytra are of moderate size, and most of them round.

Apocyrtus ruficollis.

Ap. piceus; thorace pedibusque rufescentibus; corpore subtùs, genibus, tarsisque nigrescentibus; thorace cum elytris quoad latitudinem ferè coæquali. Thorax punctatus, disco impunctato, ad latera subtuberculata. Elytra subseriatìm punctulata. Long. corp. $6\frac{1}{2}$ lin.; lat. $2\frac{1}{3}$ lin.

This species nearly resembles the *Ap. profanus* (Eschsch.) in form, but is proportionately rather shorter and broader; it is much less coarsely sculptured than that species, and more than twice the size.

Apocyrtus quadrulifer.

Ap. niger; thorace punctato; elytris parcè punctatis; capitis notâ suboculari, et rostri notâ basali, necnon thoracis margine lineisque duabus longitudinalibus, pallidè cæruleo-viridibus; sic et elytrorum lineas, areas quatuordecim, plerasque quadratas, circumdantibus; areis duabus suturalibus. Long. corp. 6 lin.; lat. 3 lin.

This species nearly resembles in size and form the *Pachyrhynchus moniliferus*, but the thorax is proportionately larger, and the elytra rather narrower. The rostrum is thickly but finely punctured, and has a transverse groove behind, and a large oblong shallow impression in front. The thorax is distinctly punctured, is margined by a greenish blue line, and has two longitudinal lines above, towards the sides. The elytra are divided by longitudinal and transverse lines into numerous areas which are mostly of a quadrate form, or nearly so: at the base of the elytra five of these areas (which are rather longer than broad) form a transverse series—the largest of these is the central one: in the middle of the elytra there is another transverse series of four areas; here, therefore, there is a line on the suture; behind these again are five more areas; the central one is long, and extends to the apex of the elytra, and those adjoining on either side are nearly of a triangular form. The elytra are distinctly punctured, but the punctures are scattered, and, excepting near the suture, do not form longitudinal striæ. The thorax is rather sparingly punctured; the head is smooth behind; but between the eyes are some indistinct confluent punctures; in front of the eyes is a transverse impression, and on the basal half of the rostrum is a longitudinal depression, which is dilated in front. The upper surface is rather finely punctured.

Apocyrtus subquadrulifer.

Ap. niger, thorace suprà punctulato; elytris distinctè punctatis; capitis notâ suboculari et rostri notâ basali, necnon thoracis margine lineisque duabus metallicè viridibus, sic et elytrorum lineis areas undecim plerasque oblongas circumdantibus; areis tribus suturalibus. Long. corp. 6 lin.; lat. $2\frac{1}{2}$ lin.

This species is about equal in size to the *Pachyrhynchus moniliferus*; the elytra are rather more elongated, and the thorax a trifle less swollen in the middle: it is rather less than the *Apocyrtus quadrulifer*; the rostrum is narrower and more contracted at the base; the thorax and elytra are also proportionately narrower. Like the insect last mentioned, the present species has the elytra divided into rectangular areas by lines formed of green or blue-green scales; but here the number and disposition of these areas are different, there being three central or sutural areas, whilst in *P. quadrulifer* there are but two: the total number of areas is eleven; in *P. quadrulifer* there are fourteen. Between the eyes is a longitudinal groove, and immediately in front of them is a transverse furrow, through which the longitudinal groove is continued, and terminates about the middle of the rostrum. The thorax is margined with green in front and at the sides, besides which there are two longitudinal green lines, one on each of the disc. The space between the two last-mentioned lines presents a few scattered small punctures, but towards and at the sides the thorax is smooth; the length and width of the thorax are very nearly equal; in front and behind it is truncated, and in the middle it is slightly swollen. The elytra are rather less than twice as broad as the thorax, convex, ovate, attenuated behind; they are punctured, and the punctures are small, rather scattered, and have a tendency to arrange themselves into striæ.

Apocyrtus metallicus.

Ap. æneus, nitidus, thorace maculis duabus supernè, duabus anticè et utrinque unâ; elytris distinctè punctato-striatis maculis sexdecim; his maculis è squamis viridi-aureis. Long. corp. $4\frac{1}{2}$ lin.; lat. $1\frac{3}{4}$ lin.

The *Ap. metallicus* and *Ap. lævicollis* are the only two species of the present genus I am acquainted with in which the ground-colour of the body and legs is metallic: the colour is the same in both species, being sometimes of a bronze hue, and sometimes having a slight copper-like tint. *Ap. metallicus* is readily distinguished from *Ap. lævicollis* by the elytra being adorned with smallish round spots, which are of a golden or golden green colour, the last-named species having narrow bands instead of spots. The rostrum is rather finely punctured in front, has a longitudinal groove, and is separated from the head (which is almost destitute of punctures) by a very deep transverse channel. The thorax is small compared with many of the genus, subglobose, truncated before and behind, glossy, and very distinctly punctured; on the anterior margin is a small spot on each side immediately behind the eye; on the lateral margin is another and larger spot, and there are two small spots on the upper surface about midway between the anterior and posterior margins, and rather widely separated from each other. The elytra are of an ovate form, and distinctly punctato-striated: on each elytron are eight round or nearly round spots, viz. two at the base, two in a transverse line in the middle, three, also in a transverse line, behind the middle, and one near the apex: on the abdomen beneath are four spots. All these spots are formed by golden green scales.

Apocyrtus lævicollis.

Ap. æneus, nitidus; rostro punctato, sulcâ longitudinali, et ad basin profundè transversìm impresso; thorace subgloboso, indistinctissimè punctulato; marginibus squamis cæruleo-viridibus ornato; elytris rotundato-ovatis, punctato-striatis, fasciis duabus et versùs apicem punctis duabus lineisque arcuatis duabus apicalibus cæruleo-viridibus. Long. corp. $3\frac{1}{2}$—$4\frac{1}{2}$ lin.; lat. $1\frac{1}{3}$—$1\frac{3}{4}$ lin.

This pretty little species varies considerably in size, as will be seen by the above dimensions. The rostrum is separated from the head by a very deep transverse impression, and has a distinct longitudinally impressed line; in front it is convex, and rather thickly though finely punctured. The head is very sparingly punctured; the thorax is subglobose and rather small; its surface is glossy and is very delicately punctured; the margins are adorned with blue-green scales. The elytra are convex, of an ovate form, and nearly twice as broad as the thorax, distinctly punctato-striated: at the base of each elytron is a transverse narrow blue-green band, on the middle is a second band, and behind is a longitudinal mark running parallel with and at a short distance from the suture; joining this mark with the central transverse fascia is a curved line which runs nearly parallel with the outer margin of the elytron; in the area enclosed by the markings last described is a small round spot. The glossiness and smoothness of the thorax will serve to distinguish the present species from all others of the genus here described, excepting the *Ap. metallicus*, which greatly resembles the *A. lævicollis*, not only in this character, but in size, form, and also in the sculpturing of the elytra: this however appears to be less strongly marked in the present than in the preceding species.

Apocyrtus elegans.

Ap. niger; rostro suprà concavo; capite punctato, anticè lineâ transversâ impresso, et inter oculos striâ longitudinali; thorace subgloboso, tuberculis crebris parùm elevatis obsito, suprà maculis duabus, anticè et ad latera, squamis aureo-viridibus ornato; elytris subseriatìm punctatis, maculis ornatis, his maculis, lateribusque elytrorum, aureo-viridibus. Long. corp. $5\frac{1}{2}$ lin.; lat. $2\frac{1}{3}$ lin.

Rather less than the *Pachyrhynchus moniliferus*; the thorax smaller, and the elytra proportionately more elongated. In size and disposition of the markings the present species resembles the *Ap. gibbirostris*; but in that species the thorax and elytra are very nearly equal in width, whilst in the *A. elegans* the thorax is considerably narrower than the elytra: here the upper surface is covered with glossy tubercles, and there is a somewhat indistinct dorsal channel; in *Ap. gibbirostris* the thorax is coarsely punctured above.

The rostrum is concave above, rather finely punctured, and separated from the head by a transverse groove: the head presents largish scattered punctures between the eyes, and has a longitudinally impressed line in the same part; beneath the eye is a small brilliant spot. The thorax is subcylindrical, but dilated in the middle; the anterior part is narrowly margined with brilliant scales, and there is a broad patch of these scales on each side, besides two smallish round spots on the upper surface: these are widely separated and situated not far from the hinder margin. The elytra present a nearly ovate outline, but are somewhat pointed behind; they are distinctly punctured, and the punctures have a tendency to form themselves into lines. At the base of each elytron are two roundish spots of moderate size, one of which is near the suture, and the other joins the broad marginal band; in the middle are three spots arranged in a transverse line, but the two outermost of these are confluent and also join the marginal band; behind the middle are three other spots, the outermost of which also joins the band just mentioned as well as an apical spot. All these spots are of moderate size, nearly round, and formed of brilliant golden green scales, and the broadish marginal band is formed of similar scales.

Apocyrtus bifasciatus.

Ap. niger; pedibus piceo-rubris, genibus tarsisque nigrescentibus; capite inter oculos depresso et canaliculo longitudinali super rostrum ducto; rostro parcè punctato; thorace globoso, rugoso-punctato; elytris oblongo-ovatis, thorace paulò latioribus, distinctè punctatis: capite maculâ viridi inter oculos et utrinque infra oculos ornato; thorace margine antico lateribusque viridibus; elytris distinctè punctatis, fasciis duabus latis transversalibus ornatis; his maculis fasciisque è squamis splendidè aureo-viridibus effectis. Long. corp. 6 lin.; lat. $2\frac{1}{4}$ lin.

The two broad transverse fasciæ on the elytra of this species (one of which is at the base and the other behind the middle) are almost joined by a series of brilliant scales on the sides of the wing-cases: there is a brilliant spot on each side of the abdomen between the middle and posterior pairs of legs.

Apocyrtus geniculatus.

Ap. niger; femoribus, tibiisque rufis, genibus nigris; capite punctato, sulco longitudinali impresso; thorace subgloboso, anticè posticèque truncato, suprà punctis distinctis confluentibus impresso; elytris thorace distinctè latioribus, ovatis, posticè paulò acuminatis, punctatis, punctis confluentibus atque subseriatis, posticè aliquantò repentè contractis, ad suturam elevatis et tuberculo instructis, ad latera propè basin depressis. Thorax ad latera squamis cæruleis adspersus. Elytra fasciâ non valdè distinctâ subapicali, lateralibusque cæruleis. Long. corp. $6\frac{3}{4}$—5 lin.; lat. $2\frac{3}{4}$—2 lin.

This species much resembles the *Ap. bifasciatus*, but the thorax is narrower and more thickly and distinctly punctured, and the elytra are also more thickly punctured. As in *Ap. bifasciatus*, there is sometimes a basal and subapical fascia on the elytra, but these in most specimens can scarcely be traced, and are never distinct; they are formed by scattered pale blue scales. In one sex there is a tubercle on the hinder part of the elytra situated on the suture, and behind this tubercle is a brush of minute hairs. At the base of the elytra is a depression on each side, and a small hump near the humeral angle. The punctures of the elytra in some specimens are confluent and give a rough appearance to the surface; in others they are arranged into moderately regular striæ. The legs are almost of an orange colour; the coxæ, knees, tip of the tibiæ, and the tarsi are black.

Of the *Ap. geniculatus* very many specimens were brought home by Mr. Cuming: the *A. bifasciatus* appears to be scarce or very local, the collection containing but one specimen.

Apocyrtus picipennis.

Ap. ater; femoribus tibiisque rufis, genibus nigris; capite parcè punctato, longitudinalitèr impresso; rostro ad basin transversim impresso, rugoso, et squamis viridibus ornato; thorace subrotundato, anticè posticèque truncato, rugoso, margine antico, lateribus, fasciâque transversâ interruptâ, squamis viridibus ornatis; elytris subrotundatis, rufo-piceis, irregularitèr punctato-striatis, fasciis tribus, è squamis cæruleo-viridibus effectis, et ad apicem squamis quasi pulverulentis. Long. corp. 6—5 lin.; lat. $2\frac{3}{4}$—$2\frac{1}{4}$ lin.

This may be distinguished from many of the genus by the more globose form of the elytra which are much broader than the thorax, and thus makes an approach to the *Ap. inflatus*; in that species however the disproportion between the width of the thorax and elytra is considerably greater. The head is distinctly punctured, the rostrum is thickly punctured and somewhat rugose; an impressed line is observable between the eyes, and this extends on to the rostrum, which is separated from the head by a broadish transverse groove. Between the eyes is a patch of blue or green scales, and these often extend on to the base of the rostrum. The thorax is subglobose and rugose above; on the anterior margin is a narrow line of scales, and on each side is a broader band, besides which there is a transverse fascia rather behind the middle, which is often interrupted in the centre. The elytra are one-third broader than the thorax or rather more; they are distinctly punctured, and the punctures are arranged in somewhat irregular striæ; at the base is a transverse fascia, a second is situated in the middle, and a third between this and the apex; these fasciæ are rather narrow, and are sometimes of an ultramarine blue colour, and sometimes greenish; the apex of the elytra is powdered as it were with scales of a similar colour. The head, thorax, body beneath, knees and tarsi, and antennæ are black; the elytra and coxæ are pitchy red, sometimes pitchy; the legs are red.

Apocyrtus gibbirostris.

Ap. niger, nitidus; rostro (in fœm.?) suprà gibbere instructo; thorace ferè rotundato, punctato, punctis confluentibus, margine antico, lateribus, fasciâque interruptâ, squamis viridibus ornatis; elytris latitudine cum thorace ferè coæqualibus, subseriatìm punctatis, fasciis tribus plùs minùsve interruptis, lateralibus, maculisque apicalibus è squamis aureo-viridibus effectis. Long. corp. $5\frac{3}{4}$ lin.; lat. $2\frac{1}{3}$ lin.

Rostrum with two large deep foveæ at the base, the remaining portion elevated and forming a large hump, the surface of which is nearly flat, thickly punctured, and of a triangular form, the base of the triangle being in front. Head rather sparingly punctured between the eyes and with a longitudinally impressed line. Thorax broad and nearly globose, coarsely punctured, the punctures confluent; a narrow margin of scales in front, a broader mark at the sides, and a transverse band rather behind the middle: this band is interrupted in the centre, and does not extend to the lateral margins. Elytra subovate, broadest rather behind the middle, and suddenly acuminated at the apex; the width but little exceeding that of the thorax: the brilliant golden green scales with which the elytra are adorned are so arranged as to form a broadish and somewhat irregular band at the base, and this joins a narrower band on the lateral margins; in the middle is a transverse fascia which is sometimes broken up into spots, and behind the middle is a second similar fascia; towards the sides of the elytra is a longitudinal mark which is sometimes interrupted, and in other cases joins the two fasciæ just mentioned: besides these markings there is another line on each elytron which runs parallel with and near the suture; this is joined at the apex of the elytra by the marginal band. The punctures of the wing-cases, which are not strongly marked, are arranged in striæ, but these are not always very regular. I have before me a specimen agreeing with the above description, but which differs in being smaller and narrower, and in wanting the hump on the rostrum. I presume the specimen described is a female and the humpless one is the male. Other specimens agree with the last, excepting in having two spots on the upper part of the thorax instead of the fascia: they have a broad subapical fascia on the elytra and a spot at the apex, but no longitudinal mark near the suture.

Apocyrtus subfasciatus.

Ap. ater, nitidus; capite notâ inter oculos; thorace globoso anticè posticèque truncato, suprà crebrè tuberculato, tuberculis nitidis et parùm elevatis, marginibus anticis et lateralibus sic et maculis tribus, viridibus; elytris latitudine cum thorace ferè coæqualibus, subseriatìm punctatis, fasciis tribus plerùmque interruptis, lateralibus, maculisque apicalibus aureo-viridibus. Long. corp. $5\frac{1}{4}$ lin.—4 lin.; lat. $2\frac{1}{6}$—$1\frac{2}{3}$ lin.

In size and form, as well as in the markings, this species so closely resembles the *Ap. gibbirostris*, that I feel considerable hesitation in giving it a name, though it differs considerably in the sculpture of the thorax. In the *gibbirostris* the thorax is punctured, whilst the *subfasciatus* has the upper surface of the thorax covered with glossy and but little elevated tubercles.

The head is punctured between the eyes, where there is moreover a longitudinally impressed line which is continued on to the rostrum and terminates nearly in a line with the base of the antennæ; the upper surface of the rostrum is thickly punctured; a patch of golden green scales is situated partly on the head and partly on the rostrum. The thorax is nearly equal in width to the elytra, has the anterior and lateral margins adorned with green scales, besides which there are three spots on the upper surface, an oblong spot in the middle extending to the hinder margin, and one on each side about midway between the anterior and posterior margins. The elytra are rather short, nearly as broad at the base as in the middle; they are distinctly punctured, and the punctures have a tendency to form longitudinal lines: at the base of each elytron is a transverse band, which is often interrupted and broken into spots; in the middle of the elytra is a transverse series of spots, arranged one on each side near the suture, and a second near the lateral margin which is larger; near the apex of each elytron is a transverse mark which joins a longitudinal line situated near the suture and a band on the outer margin of the elytra, and thus encloses a triangular area; these marks however are sometimes broken up into spots, and the band on the outer margin of the elytra is often interrupted in parts.

This appears to be a very common species in the Philippine Islands.

Apocyrtus cuneiformis.

Ap. niger vel piceo-niger; pedibus rubris, genibus tarsisque nigris; corpore cuneiformi, posticè latissimo; rostro crebrè punctato, punctis confluentibus, sulco lato longitudinali et ad basin lineâ transversâ, impresso; capite lineâ longitudinali impresso; thorace mediocritèr convexo in medio vix dilatato, suprà rugoso vel subtuberculato; elytris suprà crebrè punctatis, punctis confluentibus, subdepressis, ad basin quoad latitudinem vix cum thorace coæqualibus; squamis minutis cæruleis corpore superiore adsperso. Long. corp. $5\frac{3}{4}$—$4\frac{1}{2}$ lin.; lat. $2\frac{3}{4}$—$1\frac{3}{4}$ lin.

The very small blue scales on the head, thorax and elytra of this insect are very indistinct, requiring a lens to perceive them; they are moreover so scattered as scarcely to affect the general ground-colouring.

Apocyrtus subcuneiformis.

Ap. rufo-piceus; pedibus rufis, antennis, genibus, tarsisque nigris; corpore subdepresso, subcuneiformi; thorace rugoso; elytris suprà depressis crebrè subseriatìm punctatis, tuberculo suturali versùs apicem instructis, pilis vestito. Long. corp. 6 lin.—5 lin.; lat. 3—$2\frac{1}{3}$ lin.

This species very closely resembles the *A. cuneiformis*, but differs in having the thorax proportionately narrower, the elytra broader, more decidedly depressed above, and the broadest part is more removed from the apex or nearer the middle than in that insect; the colour is always pitchy red, whereas in *A. cuneiformis* it is usually black and rarely pitchy; the sculpturing is rather less strong. Both species were abundant in specimens in Mr. Cuming's collection, but they do not appear to have been collected in the same locality, some of Mr. Cuming's bottles containing one species and some the other. In form the present and preceding species differ considerably from others of the genus: the thorax is less globose, being but little dilated in the middle; the elytra are of the same width as the thorax at the base; thence they gradually become wider—in *cuneiformis* the upper surface is subdepressed, and the widest portion is near the apex; in *subcuneiformis* the upper surface of the elytra is nearly flat, but at the sides and apical fourth they suddenly drop as it were, and thus, viewing the insect from above, the rounded angle formed by the sudden descending of the parts mentioned constitutes the outline of the visible portion; at the suture and towards the apex of the elytra is a blunt tubercle, which is furnished with a brush of small hairs.

Apocyrtus rufescens.

Ap. corpore rufescente; pedibus rufis; antennis, genibus, tarsisque nigris thorace subcylindrico, in medio vix dilatato, tuberculis minutis crebrè obsito; elytris convexis, in medio dilatatis, ad apicem acutis, crebrè tuberculatis, ad latera tuberculis majoribus in seriebus tribus vel quatuor obsitis. Long. corp. $5\frac{3}{4}$—$4\frac{3}{4}$ lin.; lat. $2\frac{1}{2}$—$2\frac{1}{5}$ lin.

Closely allied to *A. cuneiformis* and *A. subcuneiformis*, but distinguished by the elytra being narrower, not depressed above; the apical portion is more produced, and does not form a right angle with the dorsal surface, but descends gradually: the thorax is thickly studded with minute tubercles, and so are the elytra; on the sides of the elytra there are three or four longitudinal rows of tubercles of a larger size: on the suture and at the commencement of the apical third of the elytra is a tubercle which is provided with a tuft of small hairs: the body beneath is pitchy red; the upper parts are of a dull red colour. In some specimens small scattered green scales are observable on the thorax and elytra, especially on the sides of the former, and at the base and on the sides of the latter.

[To be continued.]

XXXVI.—*The Physical Agents of Temperature, Humidity, Light, and Soil, considered as developing Climate, and in connexion with Geographic Botany.* By Richard Brinsley Hinds, Esq., Surgeon R.N.

[Continued from p. 189.]

Hitherto our attention has been chiefly directed to the temperature of the air, under the influence of various circumstances which regulate the amount. The direct heating power of the sun's rays, or radiation, has not been noticed, though their action on the vegetable kingdom is often very important. As vegetation under usual circumstances is fully exposed to the effects of the seasons, the conditions to which it is liable, from the presence or absence of the sun, become a subject of important inquiry. Two different results follow radiation: the first is an increase in the sensible heat during the period of the sun's rays above the horizon; the second is a decrease of the same, due to a transfer of heat during the night from the earth, by what is called terrestrial radiation. By this the temperature around vegetation is capable of being very considerably reduced.

I. Daily observation shows us the very great difference between the impression made on our feelings by the temperature of the shade and the sun's rays. The fact ascertained, it was next necessary to discover whether it obeyed any regularity in its relation to the temperature conferred on the air by the sun, and whether the progression of the seasons, time of the day, or the latitude, influenced this relation. The laws of its influence over the surface of the globe are now generally determined, and they become another confirmation of that omnipotent foresight by which the conditions of our nature were so distributed, that where at first view the absence of an agent would convey a momentary impression of error or confusion, a little inspection will display a new agent compensating for the absence of the other.

Its relations in different latitudes are not perhaps what would have been anticipated, since the power of the sun's rays over the temperature advances inversely to the mean heat. In low latitudes, and with a high annual mean, the difference is less than in high latitudes where the annual mean is low. In Mr. Daniel's Essays some observations on this subject are given which clearly prove this; and further, it appears, by some synchronous observations, that in the month of June, when the sun's rays were 47° above the air at Bahia, they were 65° in England. Connecting these with the polar regions, it was found that in the month of March, when in England the power of radiation was 49°, at Melville Island it was 55°. As none of the details given show any regular progression through different parallels, I obtained the materials for the following table; the observations were chiefly taken at sea, but always on board ship, where local influences are less numerous than on shore, and far more uniform.

Latitude.	Sun's Altitude.	Temp. of Shade.	Sun's Rays.	Difference.	State of the Weather.
° ′	° ′	°	°	°	
0 26	77 30	80·5	120·5	40	Atmosphere clear and fine.
5 56	69 4	80·5	111	30·5	Clear and fine: a fresh breeze.
8 8	66 29	80·5	107	26·5	Cloudless: a moderate breeze.
13	61 5	78	104	26	Clear: a fresh breeze.
17 47	55 44	75·5	109·5	34	Clear: a light breeze.
20 59	51 10	75	102	27	Clear: a light breeze.
21 34	48 53	74·5	107	32·5	Clear and fine: a calm.
33 9	48 10	70	112	42	Clear: a light breeze.
44 27	68 41	66	118	52	Light fleecy clouds: a calm.
46 19		66	108	42	Clear: a moderate breeze.
46 19		77	119	42	Clear: nearly calm.

In pursuance of the established fact, that many causes of climate are affected very similarly on elevation as in increasing the latitude, experiments were next made to ascertain the laws of radiation in the former. By those of Major Sabine, at a height of 4000 feet in the island of Jamaica, the force of radiation was 57°, being a much greater intensity than was observed at the level of the sea. Saussure observed that the power of the sun's rays was greater in elevated stations on the Alps than on the plains below. He at that time could not possibly appreciate the value that meteorologists would, at some subsequent period, place on such data; they were then but a fragment of the mass of irregular information which great and industrious minds are always accumulating, and which at some future day find an appropriation, whilst they also become an answer to the sceptic who is continually exclaiming "*cui bono?*" at every addition to our knowledge.

Among the Himma-leh mountains Mr. Royle considers he has obtained results similar to those of Saussure, inferred from the small deposition of snow in some localities, and its very speedy removal.

By radiation*, then, the depression of temperature in high latitudes and on ascent is in some measure counteracted, since the temperature of radiation and of the atmosphere are inversely different. The former carries with it light, and its operation is powerful for a time, as in the polar regions, where its duration is considerable; and on high mountain chains, where it bursts through the rarefied air, and lasting only for a few hours disappears. Can any circumstances of difference in polar and alpine floras be traced to this? The most probable answer will be found in the duration of life among plants of the same species growing naturally in both regions, or by a comparison between two nearly allied species of the same genus. Any inquiry on this subject should be directed to the periods occupied from the fall of the seed to germination, thence to flowering, to defloration, and to the shedding of the seeds.

Many circumstances are continually developed which must be attributed to the power of radiation, though, being so closely connected with light, the latter must be allowed a portion of the agency. Plants transferred from bright clear climates lose much of the brilliancy of their colours in a clouded one like our own; many of our garden favourites have thus

* In experiments on radiation the bulb of the thermometer exposed to the sun's rays is covered with cotton or wool dyed black, and the instrument is fixed on a surface admitting free movement in two directions, vertically and sideways, thus allowing the thermometer to be placed at all times to receive the direct rays. To ensure this more completely, a style about two inches long is attached, and when the surface is so moved that this throws no shade, the sun's rays impinge directly on the covered bulb. The bulb may be covered with black paint, or any other substance of this colour, and it is to be regretted that a particular material has not been generally adopted. Another thermometer for comparison should be placed in an unexceptionable situation in the shade.

The amount of radiation varies so rapidly from trifling causes, that it is very necessary to register the exact circumstances under which the experiments are conducted. A small difference in inclination—a passing cloud over the sun—the accession of a breeze—may make a difference of some degrees. Sometimes the thermometer is placed in a tube of white paper, which also has an important influence. I have also observed, that after a short exposure the mercury rises to a certain height and soon falls again two or three degrees. I believe this to be invariable, and must be attributed to the unequal expansion of the mercury and the glass at the commencement of the observation. It is therefore requisite to wait till the mercury has become settled to a certain point before the instrument is read off. No observations require more minute attention or a greater regard to circumstances than those of radiation.

but a remnant of their proper beauty. James, among the Rocky Mountains, observed the colours of the flowers to be surpassingly brilliant; the usual weather of the year was also proportionately transparent. With us, in clouded and dull summers, fruits and corn do not ripen with anything approaching the rapidity they otherwise would. The whole progress of the fruit is thus aided or retarded, from the setting to perfect maturation, and on it the flavour of edible kinds entirely depends. No latitudes produce flowers of greater richness of colouring than the warmer temperate regions; here cloudless weather prevails a greater part of the year; an Italian sky has become proverbial, and such a sky is found in similar latitudes all over the world. From Chili and California many of our most favourite ornamental flowers have found their way; the former has lovely species of *Fuchsia, Calceolaria, Lobelia, Escallonia,* and *Loranthus*; in California abound *Clarkia, Eschscholtzia, Vauchneria,* some very glowing species of *Ribes, Ceanothus,* and *Lupinus,* and others equally attractive; indeed both abound in beautiful flowers. It would be needless to mention the vegetable beauties of the Cape of Good Hope which revel in a similar climate.

II. Vegetation is subject to a proportionately reduced temperature from the agency of terrestrial radiation. Dr. Wells found, that a thermometer placed among growing plants fell during the night many degrees below the air, and on some occasions the difference amounted to as much as eleven degrees. Like solar radiation it is influenced by latitude and elevation, and seasons also have a controlling power. The depressions arising from these have been accurately observed by Mr. Daniell for each month of the year in our own climate, and his results for a period of three years are contained in the table.

Month.	Mean minimum of the Air.	Mean depression from radiation.	Maximum depression from radiation.	Month.	Mean minimum of the Air.	Mean depression from radiation.	Maximum depression from radiation.
January...	33°·6	3°·5	10°	July	52°·1	3°·6	13°
February..	33·7	4·7	10	August ...	52·9	5·2	12
March	37·7	5·5	10	September	50·1	5·2	13
April	42·2	6·2	14	October ...	42·1	4·8	11
May	45·1	4·2	13	November.	38·3	3·6	10
June	48·1	5·2	17	December.	35·4	3·5	11

Here there is a depression surpassing that of Dr. Wells, and, from legitimate deduction, not yet at its excess; approaching nearer the poles there is every probability of its still taking a lower station in the summer months. Lower latitudes are also found to have a smaller range of depression below the air, and the maximum in the tropics is perhaps not far from 12°. As the subject expands desirable observations rapidly become scarce, and though many reasons lead us to believe that terrestrial radiation increases on elevation, a solitary experiment alone supports it. Among a few observations at the mountain-station in Jamaica, already mentioned, one has a depression of 18°. From these statements Mr. Daniell is led to infer, "that the same cause which obstructs the passage of radiant heat in the atmosphere from the sun, opposes also its transmission from the earth into space."

Latitude then cannot be refused the first station in the diffusion of heat; as it is increased, or as the path of the sun is distanced on the surface of the earth, temperature progressively decreases. Such is the general feature of its distribution; but every spot possesses a number of circumstances continually active in modifying it. These vary so much in different places, that it becomes necessary, in estimating the temperature of any one place, to take an assemblage of circumstances into consideration which perhaps hardly occur in any other. Europe naturally becomes with us a standard for comparison as to climate with other portions of the globe; but Europe is situated among a union of favourable influences, which render its climate milder than that of any other large surface of land: hence deductions made from it will be too favourable. Besides, from the mildness of the European climate, errors are daily made as to the qualities of others; they are hastily condemned as severe and extreme, when in all probability only a fair mean of the general climates of the earth. Comparisons of this kind will establish no similarity; their chief value and importance consists in eliciting facts. Resemblances have long been sought between the northern and southern hemispheres, but every inquiry has only added fresh proofs that a different distribution of temperature takes place, such as might be expected from the relations of land and water, elevated lands, and other minor causes. The mean annual heat also does not explain what these are, nor the range of their influence; a deeper search is necessary to obtain only a small acquaintance with them.

Differences have been traced between the diffusion of heat in the old and new world. North America is a country subject to a climate of extremes; it has been described as combining a tropic summer with an arctic winter. The distribution of its heat is very different to that experienced in Europe; an estimate from the thirtieth to the sixtieth parallels gives for every ten degrees the relative proportions of 3, 9, 12, 16 in favour of the old world; this however informs us little. Dr. Mitchell during many years investigated this subject; his results announce a difference in the mean temperatures, which would require a compensation of 15° of latitude. Nothing could display more completely the futility of comparisons; it is only by a knowledge of local circumstances combined with latitude that satisfactory information can be attained useful for practical results.

II. Humidity.

On reviewing the processes continually going on in the kingdoms of nature, we cannot fail to observe an apparent vast consumption of material; but this consumption is only apparent. Following an element of a body in the state of decomposition, we shall soon find it under a new shape, and perhaps ere long again forming a constituent of a similar substance to that it first started from. The various tribes of quadrupeds, insects, and birds are constantly drawing large quantities of food from the vegetable kingdom; at first view it seems to disappear, but it is only undergoing one of the changes in the circle of its utility. Taking man as an instance: a large portion of his food is soon cast off by the respiration, by the skin, or in the excrement; the small quantity appropriated to the growth and support of the body is only detained something longer in its course. In time even his body has run its race, and when decomposition sets in, the constituents, dissolved in air, hasten to new uses; perhaps to give beauty to the gem, or strength to the pride of the forest. Again, the ore cast into the smelting furnace loses bulk and weight; escaping in an aërial torrent, and diffusing itself over the habitations of men and their fields and gardens, it is greedily seized on as the food of organized beings. Not a particle escapes, every molecule has its use; and we do not strain the truth when we assert, that since the world was made habitable for man and clothed with living things, not an atom has been added to or taken from our globe. The chemist, assisted by his noble science, can often produce surprising combinations and disunions, but is as unable to destroy or generate the smallest particle of matter, as the mechanic is to produce power.

Such reflections naturally arise on tracing Humidity through the different conditions it is destined to occupy. Its changes are developed in a circle, and wherever the investigation is commenced it will ultimately lead us back to the starting-point. It is first raised from the surface of the globe, both the aqueous and terrestrial portions, and occupies the atmosphere in an insensible state. Next, by changes occurring here, it assumes a visible form and returns to the earth as rain. Again, whilst on the earth it has to fulfil a variety of uses, furnishing all organized beings with moisture, feeding especially the vegetable kingdom with large quantities, supplying numerous lakes and rivers, and multitudes of streams in all parts of the world, the greater number of which descend to the ocean. Thus it happens that the ocean and organized matter are the last stages in its migration, and hence the chief sources of evaporation.

Humidity or moisture may then be conveniently studied under three conditions;—1st, in the state of vapour; 2nd, as rain and dew; 3rd, in its subsequent distribution on the earth.

I. The different parts of the globe, according to their structure and investments, furnish sources for the production of aqueous vapour; from the proponderance of the ocean over the dry land, and the situation of its deep gulfs and bays along the coasts of the large continents, it is undoubtedly the most fruitful source, and must be always regarded as the chief origin, of the insensible vapour suspended in the atmosphere. A vast quantity is daily absorbed when the temperature is moderately warm, for a surface with a diameter of eight inches, exposed on a summer's day, has been found to lose as much as six ounces in twenty-four hours; and when the surface becomes much increased the accumulated amount is truly surprising. After the ocean, tracts of country covered with forests yield the greatest quantity, for trees are continually taking up and giving out moisture, and the amount they contribute will be in proportion to the luxuriance of the vegetation, the temperature being the same. When the condition of a territory is such as to yield little or no vegetation, the vapour it contributes to the atmosphere is very trifling, and in some of the herbless tracts and deserts it would be a difficult task to appreciate the very small portion resigned. The excessive aridity of the air over the African deserts has been a source of great annoyance to travellers, who complain of the dryness and roughness of the skin occasioned by it, and also of a very sensibly increased thirst from the rapid transpiration in an atmosphere greedy of moisture.

Owing to evaporation, the extremes of temperature are modified to favourable conditions; great heats are kept under by the quantity of caloric becoming latent in the transition from the sensible to the insensible state; and lest such an enormous evaporation should take place to disturb the proper equilibrium in nature, it has been so ordered, that in proportion as the air becomes loaded with vapour, vaporization proceeds with less energy. In the extremes of low temperature the former circumstances become reversed, and are thus a further compensation; when the temperature is sufficiently depressed the insensible moisture is precipitated, and the caloric necessary to its existence as an aëriform body is given out and becomes sensible.

The relative proportion of moisture in the atmosphere varies with circumstances; temperature has a powerful influence over the quantity suspended, and a change in the amount occurs as the temperature alters through the seasons. Alterations of temperature in small intervals of time have but a trifling effect, and it is rather the mean heat of a reasonable portion that it follows. Between the conditions of the vapour of the atmosphere and the circumstances of evaporation there are such points of resemblance, that an estimate of one puts us in possession of the chief features of the other. The mean temperatures have been seen to advance as the latitude is diminished, or as the equator is approached, and the activity of evaporation and the quantity of suspended vapour proportionately increase from the poles to the equator. The higher the mean temperature, other things being the same, the greater is the force of evaporation, and necessarily the quantity of moisture suspended in the air.

Not many data have hitherto been obtained as to the amount of evaporation in different latitudes, or under a variety of mean temperatures. To supply this deficiency a table has been calculated for the rate of evaporation for every 5° from the equator to the pole; it has been constructed on the admission that the deposition of moisture takes place in England at 6° below the mean temperature. It is not improbable that the mean point of deposition below the mean temperature varies very little in different latitudes, and that a depression of 6° below the mean will be nearly as correct for the tropics as for our own climate.

Latitude.	Mean Temp.	Evaporation in inches.		Difference in the Yearly Evaporation.	Latitude.	Mean Temp.	Evaporation in inches.		Difference in the Yearly Evaporation.
		Daily.	Yearly.				Daily.	Yearly.	
0	85°	·18938	69·10		50	53°·3	·07312	26·71	4·18
5	84·6	·18717	68 32	·78	55	48·8	·06327	23·09	3·62
10	83·4	·18085	66·01	2·31	60	44·5	·05517	20·14	2·95
15	81·4	·17073	62·32	3·69	65	40·6	·04860	17·74	2·40
20	78·7	·15786	57·62	4·70	70	37·3	·04362	15·92	1·82
25	75·4	.14133	52·32	5·30	75	34·6	·03990	14·56	1·36
30	71·5	·12769	46·61	5·71	80	32·6	·03732	12·62	·94
35	67·2	·11222	40·96	5·65	85	31·4	·03584	13·09	·53
40	62·7	·09785	35·72	5·24	90	31	·03537	12·91	·18
45	58	·08463	30·89	4·83					

This table is theoretical, and constructed on the foundation of one solitary observed fact, for a variety of situations where the progression is by no means regular; it can only be regarded as an approximation, in the absence of regular observations. Several remarks might be elicited by it, but it will be sufficient to place by its side a few observed results on the same subject.

At Cumana....	Lat. N.	10°	28′	the annual evaporation is	100	inches.
Guadaloupe	,,	15	59	,,	97	,,
Toulon......	,,	43	7	,,	40	,,
Paris........	,,	48	50	,,	32	,,
London ...	,,	51	31	,,	24	,,

I am especially desirous of drawing a line between the theoretical deductions of the closet and the real practical results of observations. Without disparaging the labours of those who have devoted their time and abilities to the construction of theoretical tables, we must add, that a close adherence to them is more likely to lead to false than correct conclusions. There is a "fatal facility" about the formation of some of them in leading us to important conclusions, that it is not surprising we have tables for mean temperatures, and the annual amounts of evaporation, rain, &c., for every latitude from the equator to the poles, in many of which we are greatly deficient in any practical observations whatever. The use of them consists in offering approximations to what is the real condition of the subject when observations are wanting, and this is their chief advantage; no modifying circumstances are taken into consideration, yet in the case of rain we can select a parallel of latitude where in one part of it rain never falls, and in another a dry day is an unusual luxury. It cannot even be allowed that some of these tables furnish a correct mean for any given latitude, after setting aside all those circumstances which are continually combating a regular progression. If they did so far unfold circumstances they would prove of the greatest possible use, as henceforth every modifying agent could have its proper value applied.

In England some pains have been taken to estimate the amount of evaporation during the different months of the year, and to discover their several evaporating powers. Mr. Hoyle and Mr. Dalton used a method which is perhaps as little objectionable as any for this purpose is likely to be; it is thus described:—" A cylindrical vessel of tinned iron, ten inches in diameter and three feet deep, having tubes soldered to it for conveying off into bottles the water which is received, was buried in the ground in an open situation, and then filled with gravel, sand and soil; the whole being covered with grass and other vegetables, it was allowed to receive the rain, and to suffer evaporation from the surface as in ordinary circumstances. A register was kept of the quantity which made its way through the soil into the bottles; and a rain-gauge of equal surface was placed close by for the sake of comparison." The results obtained by this instrument are given in the following table.

Month.	Water through the two Pipes in 1796.	1797.	1798.	Mean.	Mean Rain.	Mean evaporation from Ground.	Mean evaporation from Water.
January	1·90	·68	1·77	1·45	2·46	1·01	1·50
February ...	1·78	·92	1·12	1·27	1·80	·53	2·00
March	·43	·07	·34	·28	·90	·62	3·50
April	·22	·30	·18	·23	1·72	1·49	4·50
May	2·03	2·44	·01	1·49	4·18	2·69	4·96
June	·17	·73	—	·30	2·48	2·18	4·49
July	·15	·03	—	·06	4·15	4·09	5·63
August			·50	·17	3·55	3·38	6·06
September ...		·98		·33	3·28	2·95	3·90
October		·68		·23	2·90	2·67	2·35
November ...		1·04	1·59	·88	2·93	2·05	2·04
December ...	·20	3·08	1·88	1·72	3·20	1·48	1·50
	6·88	10·95	7·39	8·41	33·55	25·14	44·43
Rain	30·63	38·79	31·26				
Evaporation	23·75	27·84	23·87				

The figures express the quantities in inches and hundredths; in the first three columns the amount of the water found in the bottles attached to the cylinder is expressed; deducting this from the rain found in the gauge, the remainder becomes the quantity evaporated. The next three columns contain means which are interesting sources of comparison; for the same reason the last column is also valuable, as enabling us to compare a surface of water unprotected by covering with the condition of the water in the experiment.

Raised from the earth by evaporation, the aqueous vapour mixes with the atmosphere and becomes henceforth a constituent portion; its existence here is entirely dependent on the presence of a certain temperature, and the higher this is, the greater will be the quantity of moisture found suspended: hence occurs, from the equator to the poles, a progressive decrease of the aqueous vapour. The circumstance observed here on a large scale also happens with the progression of the seasons: as the temperature fluctuates the atmosphere holds in solution a greater or less quantity of vapour; changes occurring rapidly in short periods of time are not what affect it so much as the general mean of the season, of the month, or even of the day. In the latter months of our summer a good deal of rain falls, and this is greater as the previous weather has been warm, and the air become saturated with moisture; the heat of the summer has favoured the absorption of an unusual quantity of aqueous vapour, and ultimately the air becomes so saturated that a small decrease of temperature produces precipitation.

The quantity of vapour dissolved in the atmosphere from the equator to high latitudes is very regular in its progression, and we are fortunate in being enabled to maintain this position by a reference to an extensive series of observations, in the Appendix to Beechey's 'Voyage,' from a small portion of which the next table has been compiled. A period has been selected when the continuity of the observations was very little broken, and which embraced high latitudes in both hemispheres; the whole were obtained in the Pacific Ocean.

Date.	Latitude.	Temperature of Air.	Dew-point.	Weight of Vapour in a cubic foot of Air.	Winds.
	° °	°	°	grains.	
Sept. 25 to Sept. 29	55—50 S.	42·6	36·7	2·9141	Westerly
Sept. 30 to Oct. 1	50—45	45·8	44·	3·7365	and
Oct. 2 to Oct. 3	45—40	49·48	Precipitation.		South-west.
Oct. 4 to Oct. 8	40—35	53·31	47·	4·0767	...
Nov. 1 to Nov. 6	35—30	62·59	53·6	5·0368	Southerly.
Nov. 7 to Nov. 24	30—25	69·8	65·6	7·2185	...
Nov. 25 to Dec. 5	25—20	74·5	71·9	8·8272	S.E. trade.
Feb. 1 to April 25	20—15	80·21	77·9	10·4883	...
April 26 to May 1	15—10	81·34	78·4	10·3293	...
May 2 to May 5	10— 5	82·60	79·8	9·6099	...
May 6 to May 8	5— 0	80·9	78·5	10·9278	...
May 9 to May 11	0— 5N.	80·24	79·	10·9945	...
May 12 to May 14	5—10	78·85	78·	10·6745	...
May 15 to May 16	10—15	78·97	75·5	9·8837	N.E. trade.
May 17 to May 18	15—20	78·2	73·	9·2363	...
May 19	Sandwich Is.	77·29	70·5	8·1921	...
June 3 to June 12	25—30	75·49	66·3	9·3803	...
June 13 to June 18	30—35	70·82	67·7	7·3920	...
June 19 to June 21	35—40	73·27	70·5	8·5171	Variable.
June 22 to June 24	40—45	56·33	59·	6·6082	...
June 25 to June 27	45—50	45·12	45·	3·7480	...
July 6 to July 11	50—55	47·10	47·4	4·1933	...
July 12 to July 15	55—60	45·97	46·5	4·0713	...
July 16 to July 19	60—65	43·52	43·6	3·6972	...
Aug. 19 to Aug. 26	65—70	40·01	38·7	3·1634	West.

These results are obtained from a number of daily observations, meaned to every 5° of latitude, from which the weight of vapour has been calculated. The whole of the details offer much material for comparison; they include a period of four years, and comprehend an extensive range of the Atlantic and Pacific Oceans, with numerous ports and harbours on their coasts. On running the eye over the column containing the weight of vapour, it is not a little surprising to see the regularity with which the amount of the atmospheric moisture increases on approaching the equator. From the high latitudes of both hemispheres the same occurs, nor can we perceive that the trades make any notable difference. The value of this table over the manufacture of the closet is immense; here we have a set of results such as they really were at a certain period of the year, and in every probability conducted with such a regard to correctness that implicit confidence can be placed in them. Such numerous details induce us to draw comparisons between the circumstances of humidity in the two oceans, and one at the equator will be among the most interesting.

	Temp.	Dew-point.	Grains.
Atlantic, June	79°·6	73°	9·8560
Pacific, May	80·24	79	10·9945
„ April	79	75	9·8550

The two first are from Captain Beechey, and are his means for 5° north of the equator; the latter I observed myself within a few miles of the equator some ten years afterwards. As it was not unlikely that further comparisons might show me some practical results of the influence of the seasons, I selected another parallel, but only for the reasons that it was frequently traversed, and that it approached closely the latitude of England. Like the former, they are a set of means for a series of 5° in the North Pacific Ocean between 50° and 55°. The similarity in the months and the difference in the seasons are marked.

	Temp.	Dew-point.	Grains.
1826 July	47·10	47·4	4·1933
„ October	44·9	40·7	2·4131
1827 July	49·12	48·1	4·0161
„ October	40·36	35·	2·7697

The atmosphere over such a surface as the ocean may reasonably be considered as having more aqueous vapour in solution than will be found elsewhere in the same latitude, and on this account the observations for any particular spot may be regarded as nearly the excess for that season of the year. The humidity of the air over the ocean being so great, every wind which blows from it towards the land carries with it a quantity of vapour; and wherever sea-breezes blow over elevated land, this is rendered visible; for the atmosphere, previously clear and transparent, becomes on its accession obscured with light clouds, and the surface of the high land supports wreaths of them which increase during its continuance. The aspects exposed to those refreshing winds, the Trades, display a superiority in their vegetable productions, arising from the moisture they are constantly conveying; the group of islands called the Galapagos, notwithstanding their position, are not remarkable for fertility, but those situations exposed to the trade-wind surpass the other parts of the islands in the vigour of their vegetation.

For some time it was an admitted circumstance, that the quantity of aqueous vapour diminished in a regular progression from the earth upwards. But Mr. Daniell was led, first of all, he tells us, by theory, and subsequently by direct experiment, to consider that this was not the real state of its suspension. The chief experiments on which he founds his conclusions were made in an aëronautic voyage in the month of September. On attaining an elevation of 9890 feet the dew-point was exactly the same as at the surface of the earth; and on ascending 1100 feet higher, the dew-point had fallen thirty-two degrees. Some further observations were made at elevations, the greatest little more than half the height of this, and as none of them reached the point of sudden depression, they are destitute of the chief part of their interest. Considering this as the correct view of its conditions, we have nothing to add as to the circumstances connected with its regular diffusion.

II. The aqueous vapour of the atmosphere is continually meeting with circumstances which disturb its suspension; depressions of temperature are of course the most usual, and will be frequent in proportion as it approaches saturation. It is evident that changes of temperature occurring near the surface of the earth are soon propagated through the atmosphere, as is shown in some of the causes influencing the formation of dew. Howard was of opinion that rain was generally produced by electrical action, and many of the instances which externally seem to produce rain by decreasing the temperature, are capable of being attributed to alterations in the electrical conditions. On the contrary, dews are deposited solely by wanting a sufficient temperature to maintain their suspension. The agents influencing this, and the circumstances attending the deposition, are among the most interesting, and associated by all with the name of Dr. Wells. It has been shown that the diminution of temperature has not its origin in the air, since by terrestrial radiation the different substances on the surface of the earth become cooled below the atmosphere, and as portions of it come in contact, they part with that moisture which the diminished temperature does not permit them to suspend. These two modes of precipitation will be best considered separately.

1. Rain falls in proportions having such a relation with the latitude that the circumstances of the latter considerably affect it; but local causes have a great influence over the amount. In countries situated in high latitudes and composed of high lands, the amount of rain and rainy days is great. In the mountainous districts of the north of our island rainy days are very numerous, and in some parts of Norway they are still more so. About Cape Horn, Staten Land, and the islands of the surrounding seas, the number of rainy days is very great, and it is rare to see a day on which some rain does not fall. At Sitka or New Archangel, the prevalence of rainy weather is such, that a Russian officer is induced to say there is perhaps not a spot on the whole earth where so much rain falls; a dry day, he adds, is a perfect rarity. I have been enabled to form an opinion of this delectable climate, and during a visit the rainy days were to the fine as thirteen to three, and this the residents regarded as unusually fine weather. Mountainous countries generally are favourable to the fall of rain, particularly in high latitudes; and we are not surprised at this, knowing that the progressive decrease of temperature occurs more rapidly for given heights than in lower ones. Our own island does not contain any very great mountain ranges, but those we have influence the quantity of rain; at Kendal, where the surrounding land is elevated, observations through twenty years give the mean annual fall of rain as 53·94 inches, and in London, for a period of forty years, the annual rain was only 20·68 inches.

In low latitudes also there are instances of almost constant rains. On the coast of Africa, between 4° and 10° N. lat., there is a range of surface which, from local causes, is subject to variable winds and very frequent storms and showers, on which account it has been called 'The Rains.' In a similar latitude on the west coast of South America is the Bay of Choco; here for ten months of the year rain falls almost daily, leaving vegetation a short repose of two months of dry weather; the flora of this region is unsurpassed for its denseness and magnificence.

A reversed condition of climate as to rain is equally prevalent; in many places and districts a rainy day would be looked on as a novelty and a blessing, whilst there are others where the habits and customs of the people are so directed by its absence, that a heavy shower would completely disconcert them, and bring incalculable mischief. In some parts of the world are extensive level surfaces removed from the ocean, and left by nature destiture of moisture; over them the atmosphere is dry to an extreme, and they are free from changes of temperature, cold winds, or currents of air; as instances may be mentioned the large deserts, as those of Africa, Egypt and Arabia, and the great central desert of Asia. The sandy plains or karroos, which stretch to the north from the Cape of Good Hope, rarely witness rains, whilst so greedy are they of moisture, that rivers are absorbed by their sands.

Exposure to a wind constantly blowing from one direction is another source of freedom from rain; in the trade-winds rain is said to be seldom seen, they being usually regarded as having a tolerable exemption. Though rain is certainly not so frequent here as elsewhere, yet, in crossing the trades at several different periods, I have generally witnessed occasional showers, and these sometimes heavy, whilst they also occur more commonly in the night. They are more frequent in the Pacific than in the Atlantic Ocean, and when prevailing, the force of the breeze will be observed to fluctuate a good deal. To the same cause is attributable that remarkable absence of rain from a surface of territory in Peru, of which Lima forms a portion: the *garuas* which supply the soil and vegetation with moisture resemble dense mists; during the night and early part of the day they fall heavily, and a person exposed to them is soon thoroughly wetted, whilst they convey much chilliness to the feelings. This fine precipitation of moisture sometimes borders very closely on fine rain; it commences about 2 A.M., and is often very heavy early in the morning; perhaps during the day the sun succeeds in penetrating it, but this is by no means always the case. This kind of weather continues from May to August, and the thermometer ranges from 60° to 70°, which is cold and chilly compared with the remainder of the year. Instead of the garuas, were the city of Lima to be visited for any length of time by the rains usual in its latitude, many of the buildings would be completely destroyed; for aware that they are not subject to rains, the inhabitants occupy houses built of a material very like hardened mud, and all the houses being flat-topped would retain much of the rain that fell. So great indeed is the usual torrent of rain in the tropics, that in those towns exposed to them the houses are supplied with a number of shoots to carry off the water with all possible speed; and as it often happens that these are decorated with fantastic colours, the perspective of the streets is unique to a foreigner. Ulloa has laboured to prove that the rarity of rain in the region of the garuas is attributable to the constancy of the south wind. At the season of the year, he observes, when the garuas prevail, a very light north wind is frequent*. Thunder and lightning are equally rare with the rain. The extent of country subject to these features lies between the Cordilleras and the coast, to the north is limited by the bay of Guayaquil, or 4° S. lat., and to the south extends through Peru into Chili; in the latter it gradually merges into the climate of the latitude, but even at Valparaiso its influence has not entirely ceased; for though this place has its rainy season, it is of short duration, and the dews are exceedingly heavy.

Within the limits of the garuas there is a remarkable absence of the larger vegetation; trees in a natural state are rare, the usual woody plants being bushes; I do not mean to trace any connexion between the two, for I could never discover any—it is merely a coincidence. Even at Valparaiso, the only trees to be seen growing, as planted by nature, are a few of *Cocos Chilensis* in some of the more sheltered valleys. That large trees will grow is very evident from the number of fruit-trees in many places, and from the fine avenues which shade the roads and promenades about Lima; still this tract of coast, it must be allowed, has been left by nature adendrous.

The atmosphere of the trades is so nearly saturated, that slight circumstances are sufficient to cause a precipitation; frequently the groups of islands in their influence can produce such a depression as to bring on heavy showers; but islands in the trades are not usually exposed to much rainy weather. In one of the group of the Sandwich Islands, I was able to witness the gradual formation of clouds and rain after a long interval of dry weather; the breeze blew rather on the end of the island and over its whole length, which is intersected by a number of beautiful valleys; the most elevated portion was to windward, and around this light vapours collected, gradually thickening into clouds, which, swept by the breeze over the mountain heights, soon became too heavy for suspension, and fell in heavy but partial showers; so that whilst one portion of a lovely valley was glowing under the full blaze of the sun, another was drenched in rain. It was curious to observe how very regularly the deposition increased to leeward; the valleys in this direction received a good deal more rain than those more to windward, and are looked on as proportionately more fertile, and property in them is more valuable. As the circumstance was soon very evident, it became of practical importance in making botanizing excursions, and a look at the weather and the summit of the island de-

* Ulloa, Voyage to South America, vol. ii. p. 67.

termined whether the day was to be spent in the valleys to leeward or to windward. But even in this group the islands have peculiarities confined to each; though rain had been rare on the above island, Oahu, on visiting shortly after the island of Taui, we learnt that for the last six months, in one part of it, not a single day had occurred without some rain. In all of the islands the vegetation is rich and fascinating, but the portion of Taui subject to such plentiful rains surpasses the others.

Another instance of the rare occurrence of rain is mentioned by Sir Francis Head as taking place at Uspallata, but is not to be easily accounted for. Uspallata is famed for its silver-mines, and is also the last inhabited station on the eastern side of the Cordilleras, on the Mendoza road; around is nothing but desolation and barrenness; those who have lived there never saw rain, and other facts are mentioned showing its usual absence.

Notwithstanding these illustrations, the fall of rain in most countries has a relation to the latitude, and decreases in amount as we recede from the equator. The manner in which this occurs will be best seen in a tabular form.

Place.	Latitude.	Mean Temperature.	Rain in inches.	No. of days on which rain fell.
Para	° ′ 1 28N.	° 84	80	...
Ceylon . . .	8 32 ,,	......	84·3	...
Cumana . . .	10 28 ,,	81·2	8	...
Grenada Island .	12 3 ,,	......	112	...
St. Domingo . .	18 30 ,,	......	150	...
Vera Cruz . .	19 12 ,,	77·7	63·8	...
Calcutta . . .	22 34 ,,	......	81	...
Madeira . . .	32 37 ,,	65	31	73
New South Wales	33 51 S.	70·6	......	107
Rome	41 54N.	59·5	39	117
Pisa	43 43 ,,	......	45·6	...
Florence . . .	43 47 ,,	......	31·6	103
Venice . . .	45 26 ,,	......	36	...
Columbia River	45 30 ,,	54	53·6	157
Great St. Bernard	46 ,,	......	63	...
Geneva . . .	46 12 ,,	50	42·6	...
Paris	48 50 ,,	51·9	19·9	...
Reading . . .	51 27 ,,	51·5	22·9	123
London . . .	51 31 ,,	50·4	22·7	178
Berlin . . .	52 32 ,,	......	20·6	...
Carlisle . . .	54 54 ,,	......	34·32	234
Kinfawns . .	56 23 ,,	46·8	25·6	201
Upsal	59 52 ,,	42	16	...
St. Petersburg .	59 56 ,,	38·8	16·17	...
Ullaborg . . .	65 3 ,,	33	13·5	...

Between the amount of evaporation and precipitation there is necessarily a considerable connexion; this is observable in the quantity of rain in different latitudes, and again in our own climate, where more rain falls in the warm than in the cold seasons; towards the end of our summer the amount is greatest; and of two summers, one cold and the other conspicuous for its warmth, the latter closes with most rain. No regular proportion exists between the number of rainy days and the quantity of rain. In noting the rainy days of a climate, it is usual to enumerate every day of the year on which even a slight shower has been observed. The number of days on which rain falls depends much on the range of temperature which takes place in short intervals of time, particularly in extra-tropical latitudes, and if the atmosphere receives its moisture from the ocean, the number will be much increased. These days are more numerous as we advance to high latitudes, and are thus inversely to the amount of rain. In the table the general progression of both is visible.

There is a feature in the fall of rain, which, though intimately connected with elevation, we do not think is very likely to influence alpine vegetation; yet as it may in some cases contribute to account for any peculiarities this variety of flora may possess, we cannot pass it over without some notice; to the meteorologist it is of greater interest. Many years since it was ascertained, that if rain was collected at different elevations in the same perpendicular, a difference in the amount would be observed; that the portion nearest the surface would be greatest, and on increasing the height a gradual diminution would take place. Experiments were made at several places, and all with the same results. The Hon. Daines Barrington measured the quantity in Wales between the base and summit of a mountain 1850 feet high; in four months 8·766 inches had fallen below, and on the height 8·165 inches. Dr. Heberden obtained the same results, but in more decided proportions; and more recently some observations have been conducted at York by Messrs. Gray and Phillips, which give the amount at three separate heights. The particular situation of the observations, height and quantity of rain, are as follows:—

Top of Minster,	elevated	242 feet,	15·715 inches.
Top of Museum,	„	73 „	20·182 „
Grounds of Museum	„	29 „	23·785 „

To account for this increase, it has been advanced, that the drops of rain in their descent, owing to their lower temperature, condense around them the aqueous vapour in the atmosphere through which they pass.

In speaking of the effects of cultivation on the temperature, its influence on the production of rain has been in some measure anticipated; wherever large tracts have been cleared of forests, as in the United States, some parts of the Canadas, and the West India islands, the quantity of rain has materially diminished. From two causes vegetation favours the formation of rain, by supplying an abundance of moisture, and increasing the daily range in the temperature; as an instance of the increase of rain, the island of Ascension has been mentioned, where the introduction of a trifling extent of cultivation has perceptibly increased the deposition.

2. That depression of temperature which gives rise to the formation of dew is produced by terrestrial radiation; substances radiate with varying intensity according to their structure and colours, and of all, none has been found to radiate so freely as the green parts of plants; they are hence well provided with the means of supplying themselves with moisture. Dews are of the greatest importance to vegetation, particularly in those situations where rain is rare, or falls copiously only in one season; during the dry seasons of low latitudes, it is to them that vegetation is indebted chiefly for moisture. Whilst the sun is absent plants imbibe it freely, and by this change of action a period of repose is allowed to vegetation, which may be compared to a man who gives rest to one set of muscles by putting another into activity.

In our climate the amount of moisture which falls as dew has been estimated as equal to five inches, and the quantity is considerably greater in lower parallels. The excess of deposition occurs in those climates which have long dry seasons, and, judging from appearances, the quantity here must be very great. Its good effects on vegetation are not entirely in proportion to the quantity, but more to the gradual and perfect manner in which small portions are applied at intervals to the organs after the exhaustion of a burning sun. In the morning, when the full nocturnal amount has been precipitated, every substance is covered with pearls of moisture; the trees drip as after a heavy shower: so completely is the dusty surface of the roads moistened, that a water-cart seems to have passed over them, and all the smaller vegetation is laden with drops of dew. As the sun rises all this soon vanishes; but whether resumed by the atmosphere again, or, aided in energy by the light and heat, the vegetation absorbs it, is, I think, doubtful. Dew commences to form soon after sunset, and sometimes, when the air is well saturated, even before; it continues progressively through the night, accompanying the gradual diminution of temperature, and occasionally till after sunrise, but at this time decreasing in quantity. That more dew falls on clear, calm nights than under opposite circumstances, is as old an observation as the days of Aristotle, though he was unable to account for it with the correct yet curious intricacy of the present day. A still state of the atmosphere favours the terrestrial radiation in which dews originate; breezes of wind disturb the formation: thus, in spots which are sheltered, dew forms with most rapidity and freedom.

A small diminution of temperature is sufficient for the existence of dew; hence most substances are capable of appropriating some to themselves during the night. Vegetation surpasses all others in the depression it is capable of producing; with us this can be observed from 10° to 20° below the temperature of the air, and in the tropics it is still greater. When the atmosphere is for the time so constituted that some of the bodies on the surface of the earth cannot radiate sufficiently to attach dew, whilst others are covered with a thin film, the different substances become so many indices of their respective powers in facilitating deposition, and it is not difficult to appreciate the different shades of their radiating properties in this way.

Not only is vegetation within the tropics dependent on dew for a large proportion of its moisture, but in all latitudes it is the same; it is here perhaps that the most visible effects are seen; and, before the heat of the day plants exhibit much vigour and freshness; yet beyond the tropics, and in those bright latitudes where clear blue skies prevail, the dews are also intense. In California and Chili, countries in similar situations in each hemisphere, a person exposed to the dews soon becomes as wet as after a shower of rain; it is late in the day in the latter before the sun has obliterated the dew of the previous night. The soil in sheltered situations seems to retain a perennial moisture, and the rains are rare and of short continuance.

III. Moisture is so great a blessing to the earth, that nature everywhere acknowledges its beneficial properties; and those parts of the world without it are so dreary and desolate as to be totally unfitted for the habitation of man, and even for the existence of animated beings or plants. The large desert tracts which cover occasional portions of the earth, without water, are rendered so thoroughly destitute of life, that not an insect occupies the air or an animal lives on the surface; man alone, urged by the love of gain, hastily traverses them, taking with him every necessary for the support of life. Yet perhaps there are few situations which, with a plentiful supply of moisture, would not support a vegetation: much of the coast of Chili and Peru has not a plant on it; the soil is further rendered ungenial by a copious admixture of nitre and muriate of soda; a few valleys alone intersect the surface, carrying a stream or a river to the ocean, but here often is a lively vegetation.

The activity of man has in some measure compensated for the sterility of nature; large districts have been subjected to a methodical and well-regulated irrigation, and rendered capable of bearing crops and fruits; in Egypt irrigation was in former times carried to a considerable extent, as it is in many parts of the world at the present day. Some plants require a certain submersion for their growth: rice, which of the various grains supports the greatest portion of mankind, requires this either by natural or artificial means; and with *Caladium esculentum*, the root of which is the taro and staple food of the Pacific islanders, it is the same.

Estimates have been made as to the various ways in which the moisture which falls on the land has been appropriated; these are sometimes very vague, and disagree among themselves. In this manner it has been stated that evaporation again removes a fifth part, and that vegetation disposes of another fifth, the three remaining being carried off in a fluid form by streams and rivers. These proportions do not agree with what has been advanced respecting the relative amount of rain, dew, and evaporation in different latitudes, and we are further assured of their slender claims to correctness on finding one person stating the quantity passing off by rivers in England to be equal to four inches, and another authority fixing it at thirteen. An important part of the water which finds its way into rivers is still destined to administer to the wants of vegetation. In those hot climates where most of the large rivers are found, they periodically overflow their banks and inundate the adjoining plains; no rain may fall anywhere near these parts of the rivers, which are usually in the neighbourhood of the mouth, but at great distances, frequently among the mountainous countries whence they take their origin, as is the case with the Nile in a remarkable degree, and with the Ganges. The natives residing near their banks are eminently alive to the great benefit conferred on their cultivated grounds by the rising of the waters, and frequently regard the river, especially at the period of its swelling, with much reverence and religious awe. Large quantities of vegetable substances in different stages of decomposition are swept down in the increasing current, and, spreading over the surface of the submersed country, are left behind on the subsiding of the river.

Frequently the water itself is supposed to contain nutritive qualities, which, though not distinguishable to the eye or taste, are unquestionable from the superior luxuriance of the subsequent vegetation. It is not improbable that vegetable matter may become so mixed up in the water of some of these rivers, as not to be perceptible to ordinary examination. It must be remembered that they often take their rise in high and mountainous regions, and have to pursue a course to the ocean sometimes of thousands of miles, continually deflected from the straight course by chains of hills, falling in frequent cascades, tumbling over huge rocks, and boiling in eddies and whirlpools. A dense vegetation covers the country through which they roll, and overhangs its banks; trees, undermined or falling through age, are precipitated into the stream; the large sear leaves of the autumn of a tropic forest are wafted there by every breeze, and before they find their way to the ocean much has become comminuted and dissolved. It is easy then to account for the luxuriant vegetation on the banks of the Ganges, Niger, Amazon, and similar rivers, and to appreciate the vast fertility which their overflowing waters carry with them, and the misery and sterility consequent on a sparing wet season.

Vegetation is capable of appropriating a large quantity of moisture, particularly in the active stages of its growth: numerous experiments have been made to ascertain the amount a plant will take up; in one of these, by Hales, a pear-tree weighing 71 lbs. was allowed to imbibe as much moisture as it was able for the space of six hours, when it was found that fifteen pounds of water had disappeared. It is interesting to observe how very much the parts of plants are fashioned according to the kind of climate they are destined to live under: in the tropics, where the climate is warm and moist, plants are clothed with large flaccid leaves in great numbers, and flowers are not very abundant in this variety; if the air is warm and tending to dryness the foliage is much smaller; Leguminosæ and their compound leaves prevail, and the structure is leathery and dry. Very peculiar is the vegetation of a country eminent for dryness: its plants are adapted in their organization to the circumstances around them; the leaves are provided with comparatively few stomata or evaporating pores, and are so many magazines of moisture; the leaves are also small in size, or if large, cut and divided, to offer the more surface for absorption. The flora of the Cape of Good Hope is very peculiar, and has much of this character; among its numerous bulbous and succulent plants, heaths, and Proteaceæ, the features of its climate are easily read. I have chanced to see the vegetation from the equator to high latitudes in both hemispheres under some variety of circumstances, and the only families of plants which I could perceive followed humidity through many different parallels were Hepaticæ and Lichens; from the moist pine-forests of the north to the warm sunny clime of the equator, wherever the atmosphere is humid, these abound. In the former, the surface of the large vegetation, the soil, and denuded rocks have each their investment; whilst in the latter it is the trunks of the trees chiefly which support many brilliant and fascinating species.

[To be continued.]

XXXVII.—*On the Conferva which vegetates on the skin of the Gold-fish.* By John Goodsir, Conservator of the Museum of the Royal College of Surgeons in Edinburgh*.

Lady Brisbane having observed that a gold-fish which had lived for some time in a glass vase presented a very unusual appearance, as if a quantity of cotton were attached to its dorsal fin and tail, requested Mr. Bryson to explain the circumstance. That gentleman, having seen in the 'Microscopic Journal' a notice of the occurrence of vegetables parasitic on living animals †, at once suspected that the cotton-like substance was a plant. Lady Brisbane kindly allowed him to remove the fish to Edinburgh for more accurate examination. Mr. Bryson sent it to me, with the information that the peculiar substance had made its appearance on the animal six weeks before.

The fish had been conveyed to town in a jug of water, but had died on the journey, so that I lost the opportunity of observing the parasite during the life of the animal. The water had begun to be tinged with blood and colouring matter from incipient putrefaction. The results of the examination were not, therefore, so satisfactory as I could have wished.

The parasite, when examined under water, presented to the naked eye a continuous mass consisting of minute filaments about three-quarters of an inch in length, and extending all along the dorsal and posterior edge of the tail-fins. The filaments, although individually transparent, were so close to one another and so numerous, that the mass appeared opake. When the lateral portions of the mass were separated along the median line, so as to display the free edges of the fins,

* Read before the Botanical Society of Edinburgh, Jan. 13, 1842.

† See Ann. and Mag. Nat. Hist., vol. viii. p. 229, and p. 10 of this volume.—Ed.

these edges were observed to be shrivelled, not, as appeared to me, by a process of ulceration, but by an irregular interstitial absorption. This absorption was more evident along the bounding edge of the parasitic mass, where it presented the appearance of a furrow, in which the parasite grew with more luxuriance than elsewhere.

What was the exact state of the surface to which the parasite adhered I am not prepared to say. I could detect no substance corresponding to the false membrane described by certain observers as constituting the soil on which vegetate those parasites which infest the air-cells of birds; neither could I satisfy myself that the substance which formed the infested surface was merely the mucous covering of the fish. I am inclined however to lean to the latter opinion, for two reasons; first, because the surface exhibited the pigment cells of the skin; and secondly, because I detected solitary individuals attached to the broad scales of the back.

Each plant consists of a jointed filament, in some individuals single, in others dividing dichotomously towards the attached extremity, but more frequently near the summit. The filament tapers gradually from the base to the summit. The former is very slightly dilated, rounded and closed at the extremity, which is destitute of appendages. The latter varies in different individuals under different circumstances, as will be afterwards described. The articulations are elongated, varying in length from ten to fifty times their breadth. Basal articulations were met with, having a breadth of the 800th of an inch; acute or barren terminal articulations were about the 2000th of an inch. The length of the articulations increased towards the summit, the basal being in general the shortest. Each articulation was tubular, filled with a transparent fluid in which floated granules. Their walls appeared to be homogeneous, I could detect no double membrane; but at the spot where the neighbouring articulations were connected, the internal surface of each appeared to leave the external surface of the filament so as to form by conjunction the flat diaphragms. It would appear, then, that the walls of the cells are originally double, but have coalesced in the progress of growth. Towards the basal extremity of each articulation, generally close upon it, but sometimes a little removed, is a globular transparent vesicle. This vesicle varied in size, directly as the diameter of the articulation. I did not observe this vesicle in any instance exhibiting a nucleus or granular contents. I occasionally observed it floating free in the fluid of the articulation; but this might have been the effect of violence. The fluid of certain of the articulations contained granules about the 5000th to 6000th of an inch. Others again contained no granular matter. These granules did not exhibit molecular motion. I, on more than one occasion, observed a steady onward motion of the granules and transparent vesicle; but this appeared to depend on unequal pressure and level of the object plates.

From certain spots on the external surface of the articulations—spots which appeared to be arranged in no appreciable order, there sprung bundles of very numerous, cylindrical, elongated and transparent filaments. These were so numerous and so convoluted and twisted as to defy every attempt to disentangle them; in fact, they occasionally obscured altogether the stems or primary filaments of the plant. They arose from all the articulations except the basal and terminal, at least I never saw them springing from the latter, although I occasionally saw them arising from what I took to be the upper end of a basal articulation. They were quite cylindrical, as thick at their free as at their attached extremities, and about $\frac{1}{4000}$th of an inch in diameter. In structure they were homogeneous, apparently gelatinous, and covered with a fine membrane.

This parasite propagates by spores formed in its terminal articulations, which become developed into spore-cases for that purpose. Having observed terminal articulations in all stages of development, I may state the changes they undergo to be the following:—

1. A perfectly barren terminal articulation is elongated, spear-shaped, transparent, without granules.

2. A terminal articulation which is destined to become a spore-case does not elongate so much, and is from the first, or at least from an early period of its growth, full of granules, which give it a gray colour. It is also elongated, fusiform, and connected to the penultimate articulation by a narrow neck.

3. It becomes more distinctly fusiform, retaining its other characters.

4. The granules appear here and there to increase in size, or at least larger granules appear diffused through the mass. These larger granules or vesicles are more or less transparent. The articulation now becomes cylindrical, with rounded extremities and a constricted neck.

5. The articulation increasing in dimensions, but retaining the same shape, contains a packed mass of perfectly transparent globules, which are uncompressed and without appreciable internal structure.

6. The fertile articulation or spore-case bursts: that is, I

have seen it with its contents hanging together from a rupture in its walls.

Proceeding to observe the changes which the spore itself undergoes, I detected lying here and there, among the attached extremities of the primary filaments, groups of spores corresponding in numbers and characters to those which I had seen escaping from the spore-cases.

The most careful examination revealed no nuclei or contents of any kind in these transparent vesicles, which in this their perfect state were about $\frac{1}{2000}$th of an inch in diameter.

The first step in the development was an opacity of the spore, due to the development of granules similar to those which have been so often mentioned.

2. The vesicle elongates.

3. It appears double; that is, two-celled.

4. Both cells elongate and acquire additional cells at the extremity, which is known to be the terminal extremity by secondary filaments appearing on it.

A sufficient number of examples could not be met with to trace these changes with greater minuteness, so that certain circumstances which I was anxious to detect, and to which I shall allude immediately, escaped observation.

I may state that I met with one example of the incipient development of a dichotomous primary filament. It occurred at the point of attachment of a fertile articulation, and might therefore be considered, in some measure, as one mode in which the primary filament or axis of the individual is continued, when its elongation would otherwise have been interrupted by the development of the former terminal articulation into a spore-case.

This incipient lateral filament appeared as a conical projection from the side of the upper extremity of the penultimate articulation. I could not make out the existence of a diaphragm at the base of the little cone; as however it, as well as the penultimate articulation, was full of granular matter, a diaphragm might have existed, although I did not observe it. A clear vesicle, such as I have formerly described, was situated at the terminal extremity of the penultimate articulation; but whether it belonged to the new articulation or to the old one, I could not determine.

I have been unable to determine in a satisfactory manner the exact nature of the clear vesicle which is found in each of the articulations. It may be the nucleus of the original cell of the articulation; but if it be so, it must be considered as a barren nucleus; having increased in size proportional to its cell, having lost the normal appearance of a nucleus, and having never performed the function of one. May it not, with greater propriety, be considered as some form of the endochrome, a result of development of the granules of the articulation? It exactly resembles the spores of the terminal articulations, which, as has been already stated, originate in the granular endochrome of this articulation.

The parasitic plant I have now described resembles in many respects those found by Hannover and Stilling on the newt and frog. As in these, the filaments swarmed with infusorial animalcules, *Monads*, *Bursariæ*, &c. Some of these doubtless lived among the filaments while the fish was still alive; others, again, as the *Bursariæ*, must have taken up their residence there after the commencement of putrefaction. Hannover in Müller's 'Archiv,' 1842, page 73, has described the development of the conferva of the frog and newt, and has mentioned the animal-like movements of the spores. Mr. Daniel Cooper ('Microscopic Journal') has frequently observed a cotton-like conferva on the gills and fins of gold-fish. From a preserved specimen, an examination of which was afforded me by Prof. Balfour, I am inclined to believe in the existence of more than one species of this genus of parasitic Algæ.

BIBLIOGRAPHICAL NOTICES.

Gould's Birds of Australia. Parts I. to VI. Folio. 1841–42.

One hundred plates of this magnificent work are now before the public; it seems therefore high time that some notice of its contents should be given to such of our readers as may not have seen the original. Great as is the excellence of Mr. Gould's former publications, there can be no doubt that the present work exceeds them all, both in an artistic and in a scientific point of view. Additional practice in designing and additional opportunities of studying animated nature have greatly improved his pictorial powers, while his recent excursions in the wilds of Australia have supplied him with a mass of novel and original information of the highest value to the ornithologist. Students in that science too often have to regret their ignorance of the *natural history* of exotic species of birds. With no other data before them than a dried skin, they can only *conjecture* the real affinities of a species, while if they were acquainted also with its habits, food, nidification and anatomy, they might in general fix its true place in the system with the greatest certainty. As far as Australian ornithology extends, this desideratum will now be supplied by the labours of Mr. Gould and of those whom he will induce to tread in his steps; and if his efforts should in some degree allure our countrymen in the other hemisphere from the race-course and the gaming-table to a study of the works of Creation, the moral influence of his work will not be one of its least recommendations.

Mr. Gould's designs show a remarkable freedom from *mannerism*. Whether he wishes to represent the torpor of the drowsy *Podargus*, the dignified repose of the eagle, the pert *Malurus*, the restless parrakeet, or the lean and anxious wader, he is equally successful in his efforts. No attitude of action or of repose which is consistent with natural habits comes amiss to him, and in this respect he preserves a happy medium between the stiff formality of Temminck's 'Planches Coloriées,' and the occasional extravagances of Audubon. We may refer to the figures of *Lathamus discolor*, *Melopsittacus undulatus*, *Meliphaga australasiana* and *Falco frontatus*, as particularly good examples of elegance of attitude and successful fore-shortening.

This correctness of taste is no less exhibited in the accompaniments to his figures than in the figures themselves. Zoological artists are apt to fall into the extremes either of depicting nothing beyond the mere object itself, or of introducing so much detail into the surrounding scenery as to distract the attention from the principal figures. Here, on the contrary, Mr. Gould, with the true feeling of a lover of Nature, introduces as much of the surrounding landscape as serves to illustrate the manners and haunts of the bird, but takes care not to overload the scene with details of drawing and vividness of colour.

Mr. Gould has however very properly relaxed this rule in the case of *Ptilonorhynchus holosericeus* and *Chlamydera maculata*, two birds whose extraordinary manners well deserve the double-sized plates which he has devoted to them. The designs of these two magnificent plates fully equal the most successful efforts of Audubon, while in point of execution (from the vast superiority of lithography over copper-plate in depicting *plumage*) they far exceed the works of the American artist. We should indeed be proud to call in the aid of frame and glass, and decorate our study with these two beautiful pictures.

In no respect is this work more valuable than on account of the extraordinary correctness with which the tints of plumage are represented. We have often had occasion to lay specimens of the actual bird by the side of Mr. Gould's plates, and the identity of their tints is perfectly surprising.

The numerous Australian plants also introduced into the plates render the work almost as valuable to the botanist as to the ornithologist. Among the more striking of these, we may mention the figures of *Eucalyptus gibbosus*, *Epacris impressa*, *Beaufortia decussata*, *Billardiera longiflora*, *Leptospermum squarrosum*, &c.

Among the curious examples of nests figured in these plates, we may refer to those of *Rhipidura albiscapa* and *Dicæum hirundinaceum*, the one resembling a wine-glass, and the other a retort, as being highly interesting novelties. We could have wished indeed that Mr. Gould had more frequently introduced the eggs and nests into his plates, which would have tended to make his family groups more life-like, besides being a valuable addition to our scientific knowledge. Let us hope that he will supply this desideratum by hereafter publishing an "Australian Oology," for which he is known to possess very ample materials.

It would be endless to refer to the mass of new and interesting facts in natural history which are detailed in these pages. Many of them have been communicated to the Zoological Society, whence they have made their way into this and other periodicals. But we cannot pass over in silence the extraordinary habits of the bird distinguished by the rather clumsy name of *Megapodius tumulus*. [Why not have called it *tumulator, tumulorum*, or *tumulificus*?] This singular bird, like its congeners *Talegalla* and *Leipoa*, has the habit of leaving its eggs to be hatched by solar or terrestrial heat; but not content with covering them moderately with leaves, it forms vast mounds of sand from five to fifteen feet high. Into these it burrows to a very considerable depth, where it deposits the egg and fills up the excavation with soil precisely in the manner of certain species of bees and wasps in this country. In due time the young bird is hatched, and, aided probably by its powerful feet and claws, makes its way to the surface without parental assistance! Had such a statement been made by old Marcgrave or Hernandez it would doubtless have passed for a traveller's tale, but the study of Nature is continually lowering our pride by showing that facts are more wonderful than fiction.

Critics assert that even Homer sometimes nods, and we trust, therefore, that we shall not greatly disparage this splendid publication if we point out a few examples of defective drawing which occur in the course of the work. In the plate of *Leipoa ocellata* the artist has omitted to show the feet of the hindmost figure, whereas, judging by the rule of proportion, a considerable part of those members ought to have been in sight. There is also an inaccuracy in the figure of *Stipiturus malacurus*, the lateral rectrices being represented as curved, while, in the specimens which we have examined, those feathers are quite straight.

With the exception of these trifling defects, the plates probably form as close approximations to living nature as it is possible for art to attain to.

Florigraphia Britannica; or Engraving and Descriptions of the Flowering Plants and Ferns of Britain. By R. Deakin, M.D. 58 Nos. 8vo. Sheffield. 1835–1842.

The work which we now propose to bring before the notice of our readers, having been published in a provincial town, has only recently attracted our attention; for although we well remember some of its earlier numbers having been shown to us, we cannot say that at that time they exhibited such a promise of usefulness as to make us consider it as deserving of notice. Shortly afterwards we learned that the work had been discontinued, from a want of commercial success as we then supposed, but, in reality, from the ill-health of the author, and an interval of about a year and a half having passed, it was recommenced and has since been published regularly.

The contrast exhibited between the earlier portion and that part which has appeared since the resumption of publication is such as, we think, fully to justify its early neglect, for we do not consider ourselves called upon to notice every book upon English botany that may appear, but only such as prove themselves to belong to that class which is likely to promote the advancement of true botanical science in this country. Fifty-eight numbers of the 'Florigraphia' have now been published, of which the earlier half can only be considered as a collection of moderately good and cheap figures of British plants, accompanied by descriptions, which, although apparently original, do not show much if any acquaintance with the writings of the more modern and eminent continental authors; shortly afterwards, however, proofs may be discovered that the author had become acquainted with several of them. Probably the first indication of this occurs in No. 28, where the name of *Verbascum floccosum* (W. and K.) is given, we believe for the first time by an English author, to the plant which has been usually considered as identical with the *V. pulverulentum* of Villars. Here we find what is probably to be considered as evidence that the author's health had already driven him to a warmer climate, in which it is understood that he has found it advisable to remain, thus unfortunately depriving his book of the benefit of his personal revision during its progress through the press, and causing the occurrence of misprints in some of the names of authors, places, &c. We refer to the fact, that although the name of *V. floccosum* (W. and K.) is placed at the head, still *V. pulverulentum* (Vill.) is continued as a synonym, and some portions of the description appear intended to refer to that plant; the specific character also, we suspect, was prepared before the author became acquainted with the true nomenclature; and here we must protest against the introduction into our native flora of the true *V. pulverulentum* (Vill.) which immediately follows, accompanied by its correct specific character, for we cannot look upon the *var. β nigro-pulverulentum* of Smith's 'Flora' as that plant, since he expressly states that his plant has a violet-coloured fringe to the filaments, whilst in the real *V. pulverulentum* the same part is white. Smith states that his variety lies between his *pulverulentum* (*floccosum*) and *nigrum*, whilst the plant of Villars takes its place between *floccosum* and *Lychnitis*. In justice to Dr. Deakin we must however state, that he refers (apparently on his own authority) to Yarmouth as a station for his *V. pulverulentum*, and should there have been no mistake, we may really prove to be possessed of both these plants in England.

In succeeding numbers we find occasional references to Koch, Reichenbach, Wallroth and other distinguished German botanists, as well as frequent remarks which show an acquaintance with the plants of the South of Europe. At p. 479, *Ornithogalum pyrenaicum* is correctly referred to *O. Narbonense*; but we must be allowed to express our doubt of those plants being distinct species. *Epilobium virgatum* (Fries) appears for the first time as a British plant at p. 548 and fig. 624, having been found by the author in "marshy places about Lincoln;" it may be distinguished from *E. tetragonum*, its nearest ally, by having its stem-leaves rounded at the base and not at all decurrent. We have long expected that this plant would be found in Britain, and have searched diligently for it in many parts of England, Scotland and Ireland, but without success; and it gives us much pleasure to learn that Dr. Deakin has had the good fortune to meet with it. In the genus *Polygonum* we have again a strong proof of the care with which the author is now preparing the descriptive portion of his work, but at the same time evidence that he is not acquainted with the more recent publications upon English botany. He here introduces three species, two of which he considers as new to our flora, and the third he identifies with a plant noticed as a variety by Smith, and not previously adopted as a species in our books, although all the three will be found in the fourth edition of Hooker's 'British Flora,' which was published in 1838. They are, *P. mite* (Schrank), obtained by him in the neighbourhood of Lincoln; *P. dubium* (Deakin), which is *P. Raii* (Bab.); *P. Roberti* (Hook.), *P. marinum* (Ray), and *P. aviculare* ε. (Sm.); and *P. maritimum* (Linn.), of which, although the characters, description and figure are correct, the synonyms, and we fear also the localities, all belong to the preceding species.

The figures are usually six in each octavo plate, and certainly do much credit (particularly the later ones) to the author, by whose own hand we believe all the drawings were made. Although small they are generally clear and characteristic, and are usually accompanied by dissections of the flower. Some of them are of peculiar excellence, and will nearly all of them prove of considerable value, when referred to in conjunction with the full descriptions, to those young botanists who have not access to the plates of 'English Botany.' It grieves us to be obliged to add, that the colouring is so very far from good, that the uncoloured copies published at half the price are decidedly superior to those which are coloured.

After what we have already said, it will create no surprise that several of the plants which have been recently detected in this country have not found a place in the present work; we trust, however, that they will be included in an appendix. The system adopted is that of Linnæus, and the last number that we have seen (58, April 1842) concludes with the genus *Scleranthus*. The numbers are published monthly, and contain two plates and eight pages of description.

In conclusion we may be allowed to express a hope that the author will continue the work with care equal to that which he has shown in the portion already published, and then, we venture to foretell, that this book must ultimately well repay both him and also the publisher, as, in that case, it cannot fail to obtain the approbation of the older, and to be generally used by the younger, botanists of Britain.

Transactions of the Botanical Society at Edinburgh. 2 Parts, 8vo, pp. 132, with 7 Plates. Edinburgh, Maclachlan, Stewart and Co.

We are happy to find that the Botanical Society at Edinburgh has commenced publishing a volume of Transactions, of which two parts have already been printed. They contain several papers which will prove highly interesting to botanists.

A report, by Dr. Greville, on the progress and state of Botany in

Britain, from March 1839 to February 1840 inclusive, is ably drawn up, and contains, in the form of an appendix, an arranged catalogue of all the works, papers and monographs which were published in Britain during that period. If such reports are prepared in a similar manner in future, they will be interesting records of British botany, and will prove valuable works of reference. We understand that Dr. Balfour has recently continued this report, and that it will be brought up to the present date by Dr. Graham. Mr. Babington has contributed several papers. The first is on the British *Atripliceæ*, in which he endeavours to elucidate the species contained in this neglected tribe. He has included the species under the genera *Atriplex* (Linn.) and *Halimus* (Wallr.). Under the former he notices the species *littoralis* (Linn.), *marina* (Linn.), *angustifolia* (Sm.), *erecta* (Huds.), *prostrata* (Bouch.), *patula* (Linn.), *microsperma* (W. et K.), *deltoidea* (Bab.), *rosea* (Linn.), and *laciniata* (Linn.). Under the latter he describes *H. pedunculatus* (Wallr.) and *portulacoides* (Wallr.). The distinctions between the species are founded chiefly on the form of the leaves and of the calyx of the fruit, and of these correct delineations are given.

In his next paper Mr. Babington treats of another difficult genus, viz. *Fumaria*. The British species are noticed under the names *capreolata* (Linn.), *officinalis* (Linn.), *calycina* (Bab.), *parviflora* (Lam.), and *Vaillantii* (Loisel.); and he has, in our opinion, cleared up many of the difficulties connected with the species and produced a monograph of great value. The paper is accompanied with wood-cuts, showing the characters derived from the calyx, the comparative lengths of the peduncles and bracts, and the forms of the fruit.

In addition to these communications Mr. Babington has also furnished a third on the true *Hypericum quadrangulum* of Linnæus.

Dr. Greville has taken up the subject of the botanical characters of the British Oaks, and has given excellent delineations of the various forms of the leaves and fruit, thereby showing that it is not as yet determined if we possess one or three distinct native species in this country, and pointing out the necessity of further observations.

Mr. Edward Forbes, honourably known for his zoological as well as for botanical papers, has supplied observations on the specific value of the antherine appendages of the genus *Viola*. He shows that, by the form of the nectaries, (either lanceolate, rotund, or linear,) combined with characters taken from the leaf and colour, a very natural arrangement may be made of the species of *Viola*.

Mr. Hewett Watson's paper on the Distribution of British Ferns is one of great interest, and is accompanied by detailed lists showing the range of the species.

A new *Jungermannia* is described and figured by Dr. Taylor, the well-known and celebrated coadjutor of Sir W. Hooker in the 'Muscologia Britannica,' under the name of *J. Lyoni*; and a new fossil, supposed to be allied to the genus *Orthos*, and denominated *Orthocites Grantonii*, is noticed and figured by Dr. Robert Paterson.

Dr. James Macaulay gives a sketch of the botanical regions in the Island of Madeira, and Mr. Dickie makes remarks on the structure and morphology of *Marchantia*. The metamorphoses of plants are elucidated by Dr. Giraud in the case of a variety of *Antirrhinum majus*, and by Mr. Leefe in the transformation of the pistil of *Salix capræa*.

Besides these there are various interesting communications, particularly by Mr. Shuttleworth, on the *Diatomaceæ*, and by Mr. Brown of Thun, on *Gentiana amarella* and *germanica*.

The third part of these Transactions is in progress, and we have reason to believe will be published in the autumn of the present year. From an excellent regulation of the Society (which now consists of about 400 members), those members who may desire to obtain an early perusal of the papers selected for publication, may obtain the sheets by post, as soon as printed, by making a small deposit of money in the hands of the treasurer, to meet the necessary expenses incurred by affording them this advantage. Accordingly we have before us a portion of the third part, and can assure our readers that the forthcoming part bids fair to be fully equal to those which have preceded it.

In conclusion we must congratulate the Society upon so auspicious a commencement, and feel satisfied that by continuing the publication of its Transactions with similar spirit, not only will credit be conferred on the Society, but also a decided benefit will accrue to botanical science.

Linnæa, ein Journal für die Botanik, etc. 1841.

[Continued from vol. vii. p. 434.]

Part I.

Algological observations; by J. G. Agardh.—On the American *Proteaceæ* of the Berlin collection; by J. F. Klotzsch.—Remarks on the occurrence of Amylum in Cryptogams; by Dr. Vogel.—Additions and corrections to his Synopsis of the genus *Cassia*; by Dr. Vogel.—Remarks on some species of *Thymus* and *Origanum*; by Dr. Vogel.—Revision of *Artemisiæ* of Berlin collection; by Wilibaldo de Besser.—On a collection of plants from Bahia.—On New Mosses from Southern Africa; by F. Hornschuch.—Information and invitation respecting the publication of a Repertorium Botanices Specialis.

Part II.

Prodromus Floræ Timorensis; by J. B. Spanoghe.—Phytophysiological observations; by J. Muenter.—Plants of Caucasus, Georgia and Armenia; by Dr. C. Koch.—Observations on certain new genera; by N. Lilja.—Instance of Antholysis in the flowers of *Trifolium repens*; by T. Schmitz.—On *Torula fenestralis*; by L. H. Schwabe.—Invitation to Physiologists; by Dr. Schmalz.

Part III.

On *Tetradiclis*, Stev.; by Dr. E. Fenzl.—On the structure of certain Mosses; by L. C. Treviranus.—*Acanthaceæ* of Southern Africa; by C. G. Nees von Esenbeck.—On the Flora of Hercynia; by E.

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On the Genesis of Spiral Vessels; by Dr. Unger.—Monstrosities of certain plants; by Schlechtendal.—Critical revision of *Leptospermeæ* cultivated in Germany; by S. Schauer.—On Mexican plants; by Schlechtendal.

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Part VI.

On *Lactuca*; by C. H. Schultz.—On *Ceramium*; by Dr. Kutzing.—On the anatomical structure of *Casuarinæ*; by Dr. Göppert.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

October 12, 1841.—Professor Owen, Vice-President, in the Chair.

A letter from John Parkinson, Esq., was read. In this letter Mr. Parkinson encloses a communication which had been forwarded to him by Mr. Commissary General Coffin, tending to prove the disposition of the woodcock to return, not only to the same district but to a once-frequented spot. The communication is as follows:—

"In the year 1833 a woodcock with white feathers in the wings was observed in a cover on the manor of Monkleigh, near Torrington, in the county of Devon. The same bird, or one of exactly similar plumage, re-appeared in the same place during the four succeeding seasons, in which period it was so repeatedly shot at by different persons without effect, that it at last acquired among the country-people the name of 'the witch.' In the year 1837 however it was killed by John Piper of Monkleigh, while following the owner of the property which it frequented, the Rev. J. T. Pine Coffin of Portledge, who has now the stuffed specimen in his possession.

"The white feathers are the primary quills and bastard winglets of each wing, the remainder of the plumage being of the ordinary hue. These feathers are all of a pure white, and seem to be of a closer and stronger texture than usual, but no other peculiarity is observable. It is however worthy of notice, that the cover which formed its constant haunt, when not disturbed, is a piece of wood not exceeding fifty acres in extent; thus proving the disposition of the woodcock to return, not only to the same district but to the same spot which it has once frequented, and to which it is probably first directed by the parent bird, or by other companions older than itself."

"Barnstaple, 17th July, 1841."

A letter from Sir Robert Heron, Bart., was next read. It states that two Rheas in Sir Robert Heron's menagerie had laid thirteen eggs; but as they showed no inclination to set upon them, eight of them were placed under four turkeys. "When the young Rheas were hatched," observes Sir Robert Heron, "the turkeys appeared to think them monsters, and in every instance attacked them; but upon their being placed under the turkeys the ensuing night, they took proper care of them." But one, however, of the young Rheas survived, and this was allowed to range loose with the turkey. It employed its time in catching insects, which is remarkable, since the adult Rhea does not feed upon insects.

The eggs of the Rhea were hatched in five weeks, whilst the Emu sits nine weeks, and Sir Robert Heron supposes the difference of time required to hatch the eggs of these two species may perhaps arise from the difference in the thickness of the shell of their eggs, the shell of the Rhea being thinner than that of the Emu.

Mr. Gould exhibited four new species of Kangaroos from his collection, and pointed out their chief distinguishing characters. These four species Mr. Gould proposed to name *Osphranter Antilopinus*, *Osphranter* (?) *Isabellinus*, *Halmaturus agilis*, and *Lagorchestes conspicillatus*. The first of these Kangaroos is of large size, and remarkable for the great expanse of the nasal cavity, and consequent dilatation of the bones which inclose that cavity. The bony palate is destitute of the large posterior openings found in the skulls of the typical *Halmaturi*. The incisors are comparatively small; the foremost incisor on each side is rather broader than the second, and the posterior incisor is about equal in width to the other two taken together. On the outer surface of the first and second incisors may be perceived faint traces of longitudinal grooves, and the hindermost of these teeth has a distinct vertical fold situated rather in front of the middle of the tooth. The adult skull presents false molars $\frac{1-1}{1-1}$; true molars, $\frac{4-4}{4-4}$; and the skull of an aged individual has the false molars $\frac{1\cdot 0}{0\cdot 0}$; true molars, $\frac{3\cdot 3}{3\cdot 3}$.

The muffle is broad and naked; the muzzle is broad and rather short; the ears are moderate and rounded at the apex. The fore-limbs are comparatively long and stout, and the toes and claws are very strong. The hind-limbs are short and muscular; the middle toe of the hind-foot is very large, whilst the lateral toes are but little developed; the two small inner toes (which are united in one common integument as in other Kangaroos) terminate in a line with the small outer toe, or very nearly so. The under surface of the feet is very rough, being covered with small horny tubercles.

These characters, especially the great expansion of the muzzle and the comparatively small development of the lateral toes of the hind-feet, and increase in size of the central toe, Mr. Gould is of opinion should be regarded as generic, or subgeneric, rather than specific; he therefore proposed for the animal the new sectional title of *Osphranter*. The specific name *Antilopinus* was suggested by the peculiar texture of the fur, which resembles that of an Antelope. The principal characters are as follows:—

OSPHRANTER ANTILOPINUS. *Osphr. rhinario lato, nudo; rostro lato, amplificato, cavis nasalibus amplis; caudâ elongatâ, validâ, pilis brevibus adpressis indutâ; tarsis posticis mediocribus, digito intermedio permagno, digitis lateralibus parvulis, et inter se eâdem longitudine; vellere brevi, aliquanto rigido et adpresso (sicut in Antilope videtur); colore rufo, artubus pallidioribus; corpore subtùs, gulâ, aurium, artuumque partibus internis, nec non caudæ basi infrà, albis vel flavescenti-albis.*

Fœmina *vellere flavescente, apud dorsum fuscescente; capite supernè fusco, albido adsperso, occipite, et auribus externè fuliginoso-fuscis; genis, gulâ, artubus internis corporeque subtùs pallidè flavescentibus; caudæ basi infrà flavescenti-albâ.*

	Masc.		Fœm.	
	unc.	lin.	unc.	lin.
Longitudo ab apice rostri ad apicem caudæ..	87	0	66	0
——— *caudæ*	33	6	26	0
——— *tarsi digitorumque*	13	0	11	0
——— *antebrachii* et *pedis antici*	15	0	9	0
——— ab apice rostri ad basin auris	7	9	5	9
——— *auris*.....................	4	3	3	6
——— tibiæ	17	6	13	6

Hab. Port Essington, North coast of Australia.

Mr. Gould observed that the *Petrogale robusta* should also be referred to this section.

Of the second species Mr. Gould regretted he was not able to lay before the meeting a perfect specimen; the skin, however, which he exhibited, though imperfect, in his opinion exhibited characters not found in any species hitherto described: they are,

OSPHRANTER(?) ISABELLINUS. *Osphr. vellere aliquantò brevi, molli, splendidè fulvo; gulâ, corpore infrà, artubusque albidis, hic atque illic flavescente levitèr tinctis.*

Longitudo corporis circiter 36 unc.

The general colour of the skin is bright fulvous or sandy red; the fur is rather short and soft to the touch; the hairs are uniform in tint to the base: the throat and under parts of the body are white, faintly tinted with yellowish in parts. The fur on the belly is long and very soft: the white or whitish colouring of the under parts, and the uniform fulvous colouring of the upper parts and sides of the body, do not blend gradually. The colour of the tail is nearly the same as that of the body, but is rather paler, and is nearly uniform. The fore-feet and toes above are covered with brown hairs, but on the sides of the toes the hairs are yellowish. The size of the animal is probably about equal to that of the *Macropus Bennettii.*

This skin was procured at Barrow Island, on the north-west coast of Australia, by Capt. Stokes, of H.M.S. 'Beagle,' and transmitted by him to Mr. Gould, that its characters might be published.

The third species is thus named and characterized.

HALMATURUS AGILIS. *Hal. fulvus, suprà nigro adspersus, infrà* *sordidè albus; aurium apicibus externis et margine antico nigris; strigâ fuscescente utrinque ab oculis usque ad nares productâ, et infra hanc lineâ albâ; clunibus lineâ albidâ notatis; caudâ longâ pilis brevibus albidis, ad basin suprà flavidis, ad apicem nigrescentibus, indutâ.*

	unc.	lin.
Longitudo ab apice rostri ad apicem caudæ ..	63	0
——— *caudæ*	30	0
——— *tarsi digitorumque*	9	3
——— *antebrachii* et *pedis antici*	9	6
——— ab apice rostri ad basin auris	5	6
——— *auris*	2	9

The above are the principal characters of a male specimen procured at Port Essington: its fur is rather short, adpressed, and harsh to the touch: the general colour is sandy yellow, but the upper parts of the head and body are freely pencilled with blackish, the hairs being of this colour at the point. The chin, throat, and chest are nearly pure white; and the hairs on these parts are uniform to the base: on the belly the hairs are sandy yellow next the skin, but whitish at the point. The limbs are of a pale sandy yellow tint externally, and white on the inner side. On the fore-feet the hairs are also of a pale sandy yellow tint, but they are pencilled with blackish. The hind-feet are nearly white, but on the toes many of the hairs assume a rusty hue. The upper surface of the head is rather paler than the body; the lips are whitish, and a whitish mark extends backwards from the lips and terminates beneath the eye: running parallel with, and joining this mark, is another mark, which is of a dusky hue. The ears are of moderate size, somewhat pointed, white within, and of the same colour as the upper surface of the head externally, excepting at the apex, where they are rather broadly margined with black, and a narrow black line runs along the anterior edge. On each side of the rump is an oblique whitish line. The tail is rather sparingly clothed with short adpressed hairs, and these are nearly white, excepting on the upper surface at the base, where they are of the same hue as those on the back, and along the dorsal surface is a yellowish line: on the under surface the hairs of the tail are of a dirty white colour, and at the apex they are black.

The last species belongs to the division of the Kangaroos to which Mr. Gould has applied the name *Lagorchestes*, and is remarkable for the circle of bright rust-coloured hairs which surround the eyes, a character which suggested the specific name given.

Lagorchestes conspicillatus. *Lag. vellere ut in* Lepore timido; *artubus parvis; caudâ ferè quoad longitudinem cum corpore coæquali; capite corporeque suprà fuscescentibus et flavescenti-albo nigroque adspersis; corporis partibus inferioribus sordidè albis; lateribus ferrugineo-flavescentibus; caudâ pilis brevibus sordidè albis parcè indutâ; tarsis sordidè albis; auribus intùs pilis flavescenti-albis; oculis pilis ferrugineis circumdatis; vellere corporis superioris ad radicem nigro.*

		unc.	lin.
Longitudo ab apice rostri ad apicem caudæ	..	32	6
——— *caudæ*	....	13	6
——— *tarsi digitorumque*	....	5	3
——— *antebrachii* et *pedis antici*	....	3	0
——— ab apice rostri ad basin auris	....	3	3
——— *auris*	....	1	3

This little animal was procured at Barrow Island, on the north-west coast of Australia; in size as well as in the colouring and texture of the fur it very nearly resembles the Common Hare (*Lepus timidus*, Auct.). From *Lagorchestes leporoïdes* it may be distinguished by the shortness of its ears and the want of a black patch at the base of the fore-leg. As in *L. leporoïdes*, it has the eyes encircled with reddish hairs; but these are of a more brilliant rusty-red colour than in that animal.

The fur is very long, dense, and rather soft to the touch; on the back it is of a black colour next the skin, yellowish white towards the apex, shaded into deeper yellow still nearer to the point, and black at the point. On the hinder part of the back the portion of each hair, which is yellow on the back, is replaced by white, and there is an oblique white mark on each side of the rump. The fur on the side of the body is deep grey next the skin, brownish yellow in the middle, and this is followed by black, then whitish, and at the point black. On the under part of the body the fur is ash-coloured next the skin, and white externally, excepting on the sides of the belly, where they are of a rusty yellow hue externally. The hair on the upper surface of the head is black, freely pencilled with yellowish white; a broad space round the eye is covered with bright rusty-red hairs, and this hue, though less bright, is extended backwards beneath the ear. The lips and chin are dirty white; the throat is white. The ears are very small and somewhat pointed; internally they are clothed with whitish hairs, and externally with dirty white hairs on the apical portion, but towards the base there is an admixture of black. The fore- and hind-legs and feet are pale, the hairs being dirty white at the point and brown next the skin. The tail is slender, and being but sparingly clothed with short dirty white bristly hairs, exhibits scales; on the under surface it is more densely clothed, and the hairs are longer and of a dirty yellowish hue.

This new species was transmitted to Mr. Gould for description by Capt. Wickham, of H.M.S. 'Beagle'

ROYAL IRISH ACADEMY.

January 10, 1842.—Mr. Ball, referring to his paper read before the Academy in November 1839, relative to a *Loligo*, to which he gave the specific name of *Eblanæ*, exhibited the following Acetabuliferous Cephalopoda, with the view of showing the increased knowledge of species of the Irish seas, and of placing on record the very interesting discovery of two of the genus *Rossia*, which he had reason to believe had not before been noticed. He then exhibited specimens of

1. *Sepia officinalis.* Dublin bay.

2. *Sepia Rupellaria?* A dorsal plate, being one of three specimens found by G. Hyndman, Esq., at Magilligan. See Ferussac and D'Orbigny's Cephalopoda, plate 3 of Sepia.

3. *Loligo sagittata.* Leith. Obtained by W. Thompson, Esq., of Belfast.

4. *Loligo sagittata,* var.? This was in the former paper considered as a variety, but on comparison with the true *sagittata,* No. 3, it seems to be a distinct species. It was obtained by G. Allman, Esq., on the coast of Cork.

5. *Loligo subulata,* var.? Was obtained by John Montgomery, Esq. of Locust Lodge, on the coast of the county Down.

6. *Loligo subulata,* var. No. 2. Somewhat shorter than No. 5. Youghal, 1832.

7. *Loligo media.* Youghal, 1819.

8. *Loligo media,* var. It approaches the form of *sagittata* in the termination of its visceral sac.

9. *Loligo Eblanæ.* Of the former paper. Obtained by T. W. Warren, Esq., in 1836; and other specimens of greater beauty and larger size obtained in the bays of Belfast and Dublin by W. Thompson, Esq., and Mr. Ball. As it now appears that the animal possesses both eyelids and a lacrymal sinus, characters not ascribed to the genus *Loligo,* it may require to be placed in another genus.

10. *Eledone ventricosa.* Youghal, 1820, and Dublin. A very fine specimen was found by Mrs. Lyle at Kingstown.

11. *Octopus vulgaris.* Plymouth, 1841. Mr. Ball.

12. *Sepiola Rondeletii.* Youghal, 1819. Dublin, 1829. Mr. Ball.

13. *Rossia Owenii.* Was obtained in 1839 by Mr. Ball, from a fishwoman who had found it in a Dublin bay fishing-boat. It is remarkable for the great size and distinctness of its acetabula, which are placed on long peduncles, and may be compared to the pearls in a diadem: they are ranged in three rows, those of the centre row being not more than half the diameter of those on each side; on the first pair of arms the acetabula are more numerous, more equal in size, and smaller than on the others. The specific name has been given in honour of R. Owen Esq., the founder of the genus *Rossia.*

14. *Rossia Jacobii.* Was obtained from the same woman as the foregoing, in 1840, by A. Jacob, Esq., M.D., who kindly sent it to Mr. Ball. It is much larger, but differs considerably in its proportions from *Rossia Owenii*; its acetabula are smaller; its arms proportionably shorter; the membrane round the mouth forms a hexagonal figure from each angle, of which a ridge runs, which is decurrent in six cases; on the second, third, and fourth pair of arms, and in the seventh the ridge passes upon the web between the first pair of arms, where it bifurcates, and runs out on each side. Its specific name is given in honour of Dr. Jacob, from whom Mr. Ball has in many instances received kind and valuable aid in zoological pursuits. The fins

of both these species of *Rossiæ* are like in form and position to those of *Sepiola Rondeletii.*

15. *Spirula australis.* Shell found at Youghal, 1820.

The following are the Measurements of the Rossiæ *in inches*:—

	Rossia Owenii.	Rossia Jacobii.
Length of body	1·7	2·1
Breadth over fins	2·0	2·7
Length of fin	0·7	1·5
Extreme breadth	0·45	0·7
Breadth between eyes	0·9	1·2
Extreme breadth of head	1·1	1·4
Length of head	0·5	0·7
Length of tentacula	4·0	5·7
Portion of tentacula occupied by acetabula	0·9	1·5
Length of first pair of arms, counting from top of head...	2·1	2·2
Length of second pair of arms, counting from top of head	2·4	2·3
Length of third pair of arms, counting from top of head	2·7	2·6
Length of fourth pair of arms, counting from top of head	2·3	2·4
Depth of fin between first pair of arms	0·2	0·4
Depth of fin between first and second pair of arms	0·3	0·5
Depth of fin between second and third pair of arms	0·42	0·6
Depth of fin between third and fourth pair of arms	0·4	0·8
Depth of fin between fourth pair of arms	0·04	0·03

BOTANICAL SOCIETY OF EDINBURGH.

This Society held their seventh meeting for the season on the 12th instant, at the Botanic Garden, Professor Christison in the Chair.

The following communications were read:—

1. On *Fumaria parviflora*, as a native of England. By Mr. C. C. Babington, M.A., F.L.S., &c., Cambridge.—Mr. Babington, in reference to an opinion formerly expressed by him, that this species was a very doubtful native of England, not having then seen any specimens agreeing with the true characters of it, now states that he has obtained satisfactory proofs of its being a native, but that most botanists have been in the habit of calling *F. Vaillantii* by that name. He says, however, that the flowers of English specimens of *F. Vaillantii* are decidedly smaller than those of some which he possesses from Montpelier, and that in some white-flowered English specimens of the same plant he perceives traces of an apiculus; also, that in French specimens of *F. parviflora* the flowers are of the same size as those of *F. Vaillantii*; but the fruit has an apiculus. Mr. Babington then proceeds to give a minute description of the principal characters which distinguish this and other allied species of the genus, among which there has hitherto been much confusion.

2. On the occurrence of *Gelidium rostratum*, Harv., at Aberdeen. By Mr. George Dickie, Lecturer on Botany, Aberdeen.—This remarkable plant, which Mr. Turner was disposed to consider, though with some hesitation, as merely a variety of *Delesseria alata*, but which Dr. Arnott and Mrs. Griffiths refer to *Gelidium*, Mr. Dickie states to be abundant at Aberdeen, though it has not hitherto been

found *in situ*. It occurs on the large stems of *Laminaria digitata*, and appears to be an inhabitant of deep water, being only found cast up after storms. Mr. Dickie says, "After comparing numerous fresh specimens of *G. rostratum* and *D. alata*, I feel convinced that there is no essential difference in the structure and outward form of the fruit in these plants. In both the ternate granules are terminal and axillary, and the capsules occupy the same position. The seeds, however, differ in form, those of *D. alata* are mostly oval; in the other they are spherical."

3. On some anomalies in form in *Scolopendrium vulgare*. By Mr. Joseph Dickson.—The fronds exhibited by Mr. Dickson presented every possible variety of shape, from lanceolate to reniform, and from entire to lobed or rather digitate. The more usual form is certainly entire and *oblongo-lanceolate*, and it is difficult to account for the freaks of form which not unfrequently occur in this species of fern.

After these papers were read, Professor Graham exhibited some very beautiful and interesting specimens of exotics from his own green-houses, and the Society then accompanied him in a walk through the garden, which presented a most gratifying appearance.

GEOLOGICAL SOCIETY.—MR. LONSDALE.

We regret to hear that the Geological Society of London will shortly be deprived of the services of their invaluable Curator and Librarian, Mr. Lonsdale. Intimately connected as we have been for many years with this Society, we can well appreciate the sorrow which this announcement has caused to all the members,—who thoroughly estimate the high qualities of this eminent person, and entertain the deepest gratitude for the devotion and unrivalled skill with which he has, during the last thirteen years, arranged their collections and conducted the publication of their volumes. Mr. Lonsdale's retirement, we are grieved to say, is occasioned solely by the state of his health: and to this notice of the loss which the Geological Society is very soon to suffer, we shall only add our hope, that a naturalist and man of letters may be found competent to succeed him as editor of the Geological Transactions*.

MISCELLANEOUS.

STERNA ARCTICA.

A flock of the *Sterna arctica* made its appearance on the 8th inst. on the river Avon in this county. Several specimens were shot, three of which I have had an opportunity of examining, and it is remarkable that all these were females. Their ovaries being very slightly developed, it appears that their breeding time was still distant, and we may therefore conclude that these birds were on their

* Upon this subject we believe that application may be made to the President and Council of the Society at Somerset House.—[Edit.]

return to the northern regions, after a winter sojourn in the south. Whatever the cause, the appearance of this species so far inland, and at such a season, is I believe a very unusual circumstance.

H. E. Strickland.

Worcestershire, May 16, 1842.

Since I sent a few days ago a notice of the occurrence of the Arctic Tern on the river Avon in this county, I have obtained evidence of the simultaneous appearance of this bird over a large extent of country. No less than forty specimens procured on the 8th and 9th inst. were brought to one bird-stuffer at Evesham, and the Bristol papers state that on the same day (the 8th) these birds were so abundant at Clevedon, Weston and Bristol, that more than 200 individuals were killed at the latter place. They have also been obtained in considerable numbers higher up the Severn, as at Tewkesbury and Worcester, and it is said also at Hereford, Devizes, and Trowbridge.

My friend J. Walcot, Esq., informs me that near *seven hundred* were seen at Cofton Hall, near Bromsgrove, and that those obtained near Worcester consisted of about as many males as females.

These facts indicate that the Arctic Tern migrates in large bodies from south to north at the return of spring. We may attribute their unexampled appearance so far inland to the westerly winds which prevailed on the 7th and 8th, combined with the peculiar funnel-shaped form of the Bristol Channel, which seems to act like the "pipe" of a decoy-pond. Let us suppose a flock of Terns or other sea birds to have past the Land's End with the intention of migrating northwards through St. George's Channel, but to be driven by westerly winds into the wider parts of the Bristol Channel. Their locomotive instincts being as it were in a state of *polarity*, they would refrain from retracing their lost ground to the westward, but would be tempted to follow the estuary of the Severn, trending as it does gradually towards the north. But alas! as the direction of the delusive stream becomes more favourable to their object, so do its shores contract, till these arctic wanderers find themselves on a narrow river winding its way through verdant fields and woods. Bewildered by the novelty of their situation and deceived in their hopes of a north-west passage, the poor birds fly in despair over the surrounding country and fall victims to the gun of the ornithologist or of the idle poacher. Few, if any, succeed in crossing the midland counties to the Mersey, and in revisiting the beloved shores of the Orkneys.

It is, I think, a probable supposition, that we are indebted to the peculiar form and position of the Bristol Channel for the frequent occurrence of various marine birds in the central parts of England.

H. E. Strickland.

Worcestershire, May 23, 1842.

During the high winds that prevailed on Sunday last, our harbour and floating-docks were visited by large flights of a rare and beautiful species of bird, the *Sterna Arctica*, or Arctic Tern. The birds were assembled in such vast numbers, that two or three hundred were killed with stones and other missiles, whilst several were caught alive; and so tame were they, that many were observed to pitch on the backs of passers-by. This tern, as its name indicates, is a native of the higher arctic regions, and has been met with in all the late expeditions to the Polar Seas. It is a summer visitant to the coasts of Scotland and the north of England, but is rarely met with more southerly, and until the present, there was no instance on record of a specimen having been obtained in this neighbourhood. The appearance of such vast flights of Arctic birds, rare as a species, in the very heart of a large city, is an occurrence as remarkable as it is interesting. Flocks of these birds were also observed the same day at Clevedon, Weston, and other places along the channel coast.—*Bristol Mirror.*

[We have heard from other correspondents that these Terns have also made their appearance in numbers at Swansea and Monmouth on the west of the Severn, and in Dorsetshire, Cornwall, and at Bridgewater on the east.—Ed.]

NORFOLK BIRDS.

J. H. Gurney, Esq. of Norwich, favours us with the following information :—

I beg to mention that a specimen of the Stilt Plover which has not been killed in Norfolk for many years, was shot a few days since at Hickling near Yarmouth; it is apparently a bird of last year, and is a female, containing ova of about the size of a shot.

A specimen of the Avocet was also killed at or near Yarmouth a few days since. This bird is now extremely rare here, though within the memory of many now living it bred plentifully every spring on some parts of our coast.

Since my last I have had a second specimen of the Richard's Pipit killed at Yarmouth, and also a specimen of the Hoopoe killed at Trimingham near Cromer.

A Shark was caught off the latter place about six weeks since, which I believe to be of the species described as the "Greenland Shark." It is about five feet long and of a dull purple colour, and is now in the Norwich Museum.—J. H. Gurney.

Norwich, May 9, 1842.

Since writing to thee a few days since, I have seen a specimen of the Grey-headed yellow Wagtail (*Motacilla neglecta*) which was killed about a fortnight since at Sherringham on this coast. It appears to be a male bird, and I have some reason to think that another Wagtail which was killed about the same time and place, but which unfortunately was not prepared, was the female belonging to it. As I believe this to be the first instance of the bird having been noticed in this county, I think it may perhaps be worth recording.

I am, respectfully,

May 16, 1842. J. H. Gurney.

MR. HASSALL ON SHOWERS OF POLLEN.

The American Journal of Science and Arts for January 1842 (p. 195), contains some interesting remarks relative to two showers of pollen, one of which fell at Troy, New York, the other in the harbour of Picton, a portion alighting upon a vessel in the harbour on a serene night in June, and having to be collected and thrown over by the bucket-full in the morning. A small quantity of each of these powders was preserved and sent to Professor J. W. Bailey to submit to microscopic examination; this gentleman ascertained that the powder which fell at Picton was wholly composed of the pollen of a species of pine; and that that from Troy was made up of pollen from various trees, but Professor Bailey was not able to state positively what plants furnished it. Figures of the three forms of pollen granules met with in the powder from Troy accompany Professor Bailey's letter: from an examination of these I find that two of them are to be referred to some endogenous plant, one of them most probably to a species of grass, the other perhaps to the genus *Nymphæa*, and that the third form is undoubtedly the pollen of an exogen not unlikely to be the *Corylus*. Professor Bailey thinks that no part of the powder can be sporules of *Lycopodium*, because he remarks our species of that genus do not flower until July or August, whereas the powder in question fell in May. I arrive at the same conclusion, but for a different reason; the sporules of *Lycopodium* do not present at all the structure of any one of the three figures. It is beautiful to observe, and observe it we ought wherever we can, how simply, and yet how effectually, nature contrives for the fulfilment of all her varied purposes.

In Monœcious and Diœcious plants the male and female flowers are placed either on different branches of the same tree, or on different and sometimes distant trees, and consequently much less within the influence of each other; whence the ordinary provision of pollen might often be ineffective. To avoid this an immense quantity of stamina is provided for the elaboration of a corresponding quantity of pollen, and we find also that these stamina are generally placed in pendulous and graceful tassels moved by the slightest breath of wind which dislodges clouds of pollen from them to be diffused far and near through the atmosphere, and finally to alight upon the destined point of almost microscopic proportion. So great is the quantity yielded by the different species of pine, that not unfrequently the ground beneath them may be observed to be entirely covered with saffron-like dust of the pollen. There are, I believe, well authenticated tales of date trees having been fertilized though distant from the male tree some miles. A. H. Hassall.

Cheshunt, Herts, March 20th, 1842.

CRATERIUM PYRIFORME.

A supposed microscopic fungus, *Craterium pyriforme*, is mentioned by Prof. Bailey, in p. 195 of Silliman's Journal, as having been sent from Clapham Common by Dr. Mantell; and is described as being found adhering to the surface of flints, and emitting a blood-red liquid on being punctured.

From the examination of some specimens at the meeting of the Microscopical Society, it proves to be the operculum of the nidus of an *Acarus*: some were found in the act of hatching.

PHOTOGRAPHY.

A valuable application has been made by Captain Ibbetson of a Photogenic process for rapidly producing perfect drawings of fossil shells on metallic plates, from which, when fixt by the engraver's tool, lithographic transfers may be rapidly multiplied to an almost indefinite extent. This process promises to be applicable to organic remains of every kind, and consequently of great utility in Palæontology. 'From a beautiful fossil starfish I sent by one day's mail to Captain Ibbetson, in London, I received, by the next mail, a parcel of most exact impressions, taken from a photographic drawing, transferred to stone by the process above mentioned.—*Dr. Buckland's Anniversary Address to the Geological Society*, 1841.

BIOGRAPHICAL NOTICE OF BLUMENBACH.

The death of Blumenbach was briefly recorded in our sixth volume, p. 234. The account of this distinguished man is from Dr. Buckland's Anniversary Address to the Geological Society.

Professor Blumenbach died at Göttingen on the 22nd of January 1840, in the 89th year of his age: he was born at Gotha, May 11, 1752, and early imbued with a taste for natural history and medicine by his father, a native of Leipsic, who died in 1787, in the office of Pro-rector and Professor in the Gymnasium at Gotha. At the age of 17, A.D. 1769, he began his academical career at Jena by the study of literature under Baldinger, and of natural history and archæology under his relative Professor Walch, and three years after proceeded to Göttingen to complete his studies, where he immediately became intimate with Heyne, Professor Büttner, and Michaelis, whose son was then a fellow-student in medicine. The rich collection of voyages and travels to which he had access in the library of Professor Walch, suggested to him, as the subject of his exercise for his Degree of Doctor, a dissertation on the native varieties of the human race, which became the first germ of his future extensive researches in Anthropology, in which he derives the three great varieties of the human family from a primary stem of the Caucasian race. His first public employment was a gratuitous undertaking to arrange the cabinet of natural history which the University had purchased from Professor Büttner, which soon brought him favourably to the notice of the minister and curator of the University. In 1775 he was appointed a Private Teacher in Natural History; in the following year an Extraordinary Professor, and in 1778 an Ordinary Professor of Medicine and Natural History in the University of Göttingen.

In 1784 he became a Member of the Royal Society of Göttingen; in 1788, a Counsellor; and in 1812, perpetual Secretary of the Class of Physics and Mathematics in the same Society. In 1816 he was appointed a Member of the Superior Council of Medicine, and in 1821, a Commander of the Guelphic Order. His talent as a lecturer, and profound knowledge of medicine, anatomy and natural history, soon made Göttingen a centre of attraction to the students of all Germany; nor did this attraction cease during a brilliant career of more than fifty years. In 1784, his celebrated lecture on the eyes of the White Negro* awakened an intense interest throughout the scientific world, and, together with his Inaugural Essay upon the native varieties of the human race, became the nucleus of his future works on the Natural History of Man.

In 1790 appeared the first Decad of his collection of skulls of different nations, a subject which continued among the most favourite themes of his study, from its first commencement in his Inaugural Dissertation, to his last essay upon a Macrocephalus in 1833.

On the celebration of the Jubilee of his Doctoriat, Sept. 19th, 1825, the company of the most distinguished naturalists and medical practitioners of Germany then assembled at Göttingen resolved, on the suggestion of Rudolphi, to testify their gratitude for the benefits they had individually received from his oral instructions and published works, and to perpetuate the memory of this remarkable assembly, by the foundation of a travelling Fellowship in honour of Blumenbach, and by a medal†, bearing on its obverse three skulls of the European, Ethiopic and Mongolian races.

The expressions of piety, gratitude, and affection which are recorded in the elder Sömmering's celebrated Inaugural Dissertation give utterance to feelings, in which the pupils collected around him during more than half a century have, without exception, participated.

He was the great precursor of Cuvier in comparative anatomy, and was the first to demonstrate the value of this science in its relation to pathology, and to convince mankind of the truth of the observation of Haller—that physiology has been more illustrated by comparative anatomy than by the dissection of the human body, so that henceforth this subject must become an essential part of medical education.

The present is not the fit occasion to enter into a discussion of the unrivalled merits of his lectures on pathology, comparative anatomy, natural history, and physiology; nor to set forth the number and nature of his multifarious publications on these subjects, and also on archæology, literature, and the fine arts, which, during a period of sixty years, enriched the Commentaries of the Royal Society of Göttingen, and the medical, literary and philosophical periodicals of Germany; nor does the time permit me to enter on an analysis of his lucid and instructive Manuals, which were soon translated into foreign languages, and became the text-book of teachers of comparative anatomy and physiology throughout Europe; I shall rather call your attention to his acute perception of the value of organic remains in relation to geology, as affording evidence of past changes and revolutions which have affected the surface of the globe.

* De oculis Leucaethiopum et iridis motu. Soc. R. Gott., v. vii. p. 29—62.

† With the following inscription, "*Naturæ Interpreti, Ossa Loqui Jubenti, Physiophili Germanici,* 19 Sept. 1825."

In his two celebrated Essays on the Archæology of the Earth, 1801 and 1806, he expresses his concurrence with Leibnitz in comparing the petrified remains of organic bodies to the documents which historians discover in medals, inscriptions, and monuments of ancient art; and regards them as affording no less certain chronological evidence of physical changes during the construction of the earth, than we extract from coins and medals respecting events which they record in the history of mankind.

He judiciously explains the occasional discovery of human bones and works of art in contact with the relics of extinct species; and views the changes that occur in the fossil remains of the successive strata as true indications of consecutive changes in the past condition of the globe.

"Mundi naturam totius ætas
Mutat, et ex alio terram status excipit alter."
LUCRET.

The frozen rhinoceros of Pallas, and remains of herds of extinct elephants on the ice-bound shores of Siberia; the bones of the same extinct species of elephants and of rhinoceros, mixed with those of lions and hyænas in the caverns of the Hartz, and in the gravel beneath the very town of Göttingen, led him to infer, as we have now additional reasons for doing, the former existence of a nearly tropical and uniform condition of climate over the now temperate and frigid portions of northern Europe, wherein these animals were formerly indigenous; and in further evidence of high temperature in these northern latitudes, he appeals to the quantities of fossil amber so abundant in the north of Germany, and to the extinct species of insects which the amber so frequently contains.

He had carefully inspected in the Museum of Schaffhausen the fossil remains of Œningen, and recognized their proximity to the existing flora and fauna of Switzerland; among these he enumerates small rodent animals, birds, frogs, numerous aquatic insects, and leaves and blossoms of plants, which more recent discoveries have referred to a freshwater formation of the Meiocene period.

He had distinctly recognized the fossil beaks of extinct cuttle-fish in the muschelkalk of the Heimberg, and the septa and siphon of the Orthoceratites of Clausthal; and from the family of Ammonites, which he knew to be numerous in species beyond most other fossil shells, he had selected that remarkable example from the Himalaya mountains called the Salagram*, specimens of which were subsequently placed in our museum by the great oriental scholar Mr. Henry Colebrook. The Salagram is a hollow cavity or mould bearing the impression of Ammonite, included in concretions of lias from the bed of the Ganges near Patna, which Indian superstition has sanctified as a mystic symbol of the Metamorphosis of Vishnu. (Specimen Archæologiæ Telluris, § 10.)

* This specimen was given to him by the chaplain of a Hanoverian regiment who brought it from India.

He duly appreciated the differences between the remains of the copper-slate, and muschelkalk and transition limestone within the limited vicinity of Göttingen; and further observed the degrees of perfection in the structure of fossil animals, receding gradually into more and more simple forms of organization, as he traced them backwards from the extinct Mammalia of the caverns to the remains of molluscous and radiated animals in the transition rocks; and though his premises were few, he rightly drew from them conclusions, less extensive, but similar to those which forty years of further observation over large portions of the earth have more fully established, as to the antiquity of the globe.

His love for archæology led to his making a collection of antique gems. He had also a collection of engravings by the older masters, and of ancient woodcuts, which he valued as indices of the progress of science at the time when they were made.

Blumenbach was a wise and good and profoundly learned man; born with considerable talent, and well educated from his childhood, he passed his whole life in the best literary and scientific society; and being placed in an influential academical position, he poured forth daily, during more than half a century, from his rich reservoirs of knowledge unceasing streams to instruct and benefit mankind. His biographer Mark (Göttingen, 1840) enumerates more than a hundred distinct publications of his on various subjects, among which are some biographical sketches of professors and other distinguished men. He possessed a happy, lively and cheerful disposition; was a man of most punctual and temperate habits, ate always the same moderate quantity of food, and was never intoxicated in his life. He abandoned smoking at 66; at 86 he left off taking snuff; and could read small print without spectacles at 88. Blumenbach seemed born for the express functions of a Professor; from morning till night, his academic duties were his daily occupation and delight; and the works of his leisure hours are a register of the progress of discovery in many branches of natural science during more than half a century in which he flourished. As a lecturer his style was familiar, playful, and not unfrequently jocose, always animated and sometimes eloquent, leaving a clear understanding and deep remembrance of the matter he wished to impress upon his hearers; he was the personal friend, as well as preceptor, of all his pupils, of whom great multitudes have expressed their gratitude in dedications of their works to the teacher from whom they derived the rudiments of their knowledge.

In 1791 he visited London, which he named the sixth quarter of the world, and was honourably received by Sir Joseph Banks and the Royal Society, where he assisted at the opening of six mummies, respecting which he published a paper in the Philosophical Transactions; he was also honoured with a command to visit King George the Third at Windsor. In 1803 he accompanied the King of Bavaria on a tour to the Hartz and Magdeburg. In 1806 he went to Paris on diplomatic business connected with the University of Göttingen, and was introduced by Lacépède to the Emperor Napoleon. At the celebration of the centenary jubilee of the University of Göttingen, in 1825, the King of Hanover forgot not to visit the house of his old preceptor, which, in 1786, he had so often frequented as a student together with his two royal brothers, the Duke of Sussex and the Duke of Kent.

In Professor Blumenbach the world has sustained a loss of one of those men of extraordinary genius whose talents are destined to exert a large influence on the knowledge and opinions of the age in which they live, and to advance permanently the progress of those sciences to which they have devoted their attention.

METEOROLOGICAL OBSERVATIONS FOR APRIL 1842.

Chiswick.—April 1. Heavy clouds: rain: slightly overcast. 2. Rain: clear and cold, with brisk N.E. wind. 3. Very clear: cloudy: slight hail shower. 4. Cold and dry: clear and frosty at night. 5. Clear and cold, with very dry air: sharp frost at night. 6. Slight haze. 7. Cold and dry: densely overcast. 8. Cold and dry: sunshine through slight haze: clear and frosty at night. 9, 10. Cold and dry. 11. Slight shower: clear and cold. 12. Cold and dry: cloudy. 13. Cold rain. 14. Showers, partly hail. 15. Bleak and cold. 16. Clear and cold, with parching N.E. wind. 17, 18. Overcast. 19. Dry haze: clear and frosty at night. 20, 21. Slight haze: very fine. 22. Foggy: dry haze: clear and fine. 23. Very fine. 24. Very fine: heavy thunder storm in afternoon, with partial showers of rain, and large hail in some parts near London. 25. Very fine. 26. Clear and dry. 27. Fine: air exceedingly dry: slight frost at night. 28. Hot and dry. 29. Slight haze: fine. 30. Fine.

Boston.—April 1. Cloudy: heavy rain early A.M.: rain P.M. 2. Stormy: rain early A.M. 3, 4. Cloudy. 5, 6. Fine. 7. Cloudy. 8—10. Fine. 11—13. Cloudy. 14. Rain: rain early A.M. 15. Cloudy. 16. Cloudy: rain P.M. 17, 18. Cloudy. 19, 20. Fine. 21—23 Cloudy. 24. Fine. 25. Fine: foggy early A.M. 26—28. Fine. 29. Fine: foggy early A.M. 30. Cloudy.

Sandwick Manse, Orkney.—April 1. Showery. 2. Snow showers. 3. Clear: aurora. 4. Clear: cloudy. 5. Cloudy: rain. 6. Clear and warm. 7. Fog. 8. Cloudy and warm. 9. Cloudy. 10, 11. Clear. 12. Clear: aurora. 13. Cloudy: clear. 14, 15. Clear. 16, 17. Cloudy. 18. Drops. 19. Cloudy. 20. Clear. 21. Fine. 22. Clear: fog. 23. Cloudy. 24. Clear. 25. Very clear. 26. Very clear: aurora. 27. Very clear and warm. 28. Very clear: fog. 29. Very clear. 30. Fog: cloudy.

Applegarth Manse, Dumfries-shire.—April 1. Showers. 2. Hail. 3. Frost: slight A.M. 4. Fair and clear: frost A.M. 5, 6. Slight frost A.M. 7. Fair, but cloudy. 8. Fair and fine. 9. Fair and fine: slight frost A.M. 10. Fair and fine: no frost. 11. Fair and fine: frost A.M. 12. Fair and fine, but withering. 13. Cloudy and droughty. 14. Droughty, but threatening rain. 15. Droughty: still fair. 16. Droughty. 17. Droughty: frost A.M. 18. Droughty. 19. Droughty: frost A.M. 20. Droughty and warm. 21. Droughty. 22—30. Droughty: very withering.

Sun shone out 30 days. Rain fell 1 day. Hail 1 day. Slight frost A.M. 9 days. Fair 28 days.

Wind north 1 day. North-north-east ½ day. North-east 5½ days. East-north-east 3 days. East 7 days. East-south-east 1 day. South 2 days. South-west 3 days. West-south-west 2 days. West 1½ day. North-west 2 days. North-north-west 1½ day.

Calm 14 days. Moderate 9 days. Brisk 1 day. Strong breeze 6 days.

Mean temperature of the month .... 45°·8
Mean temperature of April 1841 .... 44 ·4
Mean temperature of spring-water .... 47 ·00

Meteorological Observations made at the Apartments of the Royal Society, LONDON, *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; *by the* Rev. W. Dunbar, *at Applegarth Manse,* DUMFRIES-SHIRE; *and by the* Rev. C. Clouston, *at Sandwick Manse,* ORKNEY.

Days of Month.	Barometer.								Thermometer.										Wind.					Rain.					Dew-point.
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		Orkney, Sandwick.		London: R.S.			Chiswick.		Boston 8½ a.m.	Dumf.-shire.		Orkney, Sandwick.		London: R.S. 9 a.m.	Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	London: R.S. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Lond. R.S. 9 a.m.
1842. April		Max.	Min.		9 a.m.	9 p.m.	9½ a.m.	8½ p.m.	Fahr. 9 a.m.	Self-reg. Mx.	Self-reg. Mm.	Max.	Min.		Max.	Min.	9½ a.m.	8½ p.m.											
1.	29·310	29·457	29·303	28·90	29·11	29·37	29·22	29·57	45·0	57·6	43·4	51	32	40	49	31	41	39	s.	w.	w.	w.	w & n.	·172	·02	·87	......	·11	45
☾ 2.	29·606	29·780	29·576	29·21	29·69	29·81	29·81	29·82	41·8	48·6	38·0	47	31	42	45	35½	35	33	nw.	n.	n.	nnw.	n.	·088	·02	·14	......	·17	42
3.	29·836	30·012	29·819	29·50	29·88	30·09	30·06	30·26	38·4	46·5	34·2	47	35	37·5	49½	29½	40	40	nw.	ne.	n.	nnw.	n.	......	......	......	......	·14	36
4.	30·188	30·309	30·182	29·82	30·20	30·21	30·20	30·17	40·7	46·0	37·0	47	27	40·5	51	31	41	44	nw.	ne.	calm	nw.	sw.	......	......	......	......	......	36
5.	30·392	30·355	30·286	29·98	30·20	30·17	30·16	30·18	41·7	46·7	36·5	50	23	41	55	30½	47	45	n.	ne.	calm	nw.	sw.	......	......	......	......	......	35
6.	30·200	30·188	29·957	29·81	30·15	30·00	30·20	30·16	42·4	47·5	35·3	54	37	41·5	57	30½	48	45	ne.	ne.	calm	n& ne.	w.	......	......	......	......	·09	36
7.	29·862	29·907	29·800	29·48	29·91	29·92	30·12	30·15	43·7	52·0	39·6	58	35	46	55	38	45	42	n.	ne.	e.	ne.	se.	......	......	......	......	......	42
8.	30·094	30·190	30·053	29·70	30·08	30·63	30·20	30·31	44·8	56·9	39·4	58	27	46·5	57	35½	45	45	ne.	e.	e.	s.	sw.	......	......	......	0·13	......	43
9.	30·358	30·331	30·307	29·87	30·25	30·25	30·38	30·41	44·2	52·7	37·0	57	31	45·5	56	31	50	43	e.	e.	calm	sw.		......	......	......	......	......	36
● 10.	30·388	30·355	30·281	30·03	30·28	30·23	30·31	30·31	43·2	46·6	37·0	46	29	43·5	55	33½	45	42	e.	e.	calm	wsw.	se.	......	......	......	......	......	33
11.	30·248	30·216	30·137	29·89	30·20	30·21	30·31	30·38	43·7	46·3	36·7	49	31	43	52	31	48	41½	ne.	e.	e.	e.	se.	......	·01	......	......	......	37
12.	30·118	30·104	30·023	29·77	30·21	30·12	30·36	30·34	42·0	46·7	37·6	46	36	41	51	31	45	38	ne.	ne.	e.	ene.	se.	·050	......	......	......	......	33
13.	29·990	29·992	29·957	29·67	30·10	30·12	30·36	30·38	39·2	44·4	37·8	47	36	39·5	48½	31	45½	40½	n.	ne.	e.	ene.	ne.	......	·08	......	......	......	36
14.	29·932	30·025	29·940	29·60	30·12	30·11	30·34	30·39	41·2	43·6	37·8	52	39	41	49	36½	47½	41½	n.	ne.	ne.	ne.	n.	·063	·01	·29	......	......	38
15.	30·084	30·068	30·052	29·72	30·15	30·20	30·45	30·42	44·3	47·6	40·3	51	36	42·5	49½	39	46	41½	n.	ne.	calm	ne.	ne.	......	......	......	......	......	39
16.	30·144	30·147	30·113	29·83	30·22	30·21	30·34	30·33	44·6	49·0	39·5	51	31	46	55	38½	47½	46	ne.	ne.	e.	ene.	nw.	......	......	......	0·00	......	38
☽ 17.	30·206	30·182	30·164	29·79	30·20	30·10	30·27	30·21	14·4	48·7	37·8	51	41	45	59	31	46	45	n.	ne.	calm	s.	w.	......	......	·01	......	......	40
18.	30·210	30·201	30·091	29·75	30·13	30·10	30·14	30·11	44·2	17·4	42·0	47	40	43·5	59	33	48	46½	n.	ne.	calm	sw.	sw.	......	......	......	......	......	40
19.	30·232	30·199	30·154	29·76	30·09	30·10	30·11	30·05	42·3	47·8	41·3	63	26	49	51	33	48	47½	n.	ne.	calm	sw.	sw.	......	......	......	......	......	40
20.	30·182	30·150	30·093	29·69	30·09	30·09	30·11	30·16	49·4	51·8	38·7	64	33	53	68	33	50	45	n.	e.	calm	w.	sw.	......	......	......	......	......	43
21.	30·182	30·140	30·047	29·65	30·07	30·04	30·11	30·12	46·8	59·5	41·3	60	43	44	67	36	54	44	ene.	e.	calm	wsw.	sw.	......	......	......	......	......	44
22.	30·022	29·994	2)·899	29·59	29·97	29·90	30·14	30·10	46·8	56·5	45·0	66	36	51	68½	37	46	44½	ne.	ne.	calm	e.		......	......	......	0·00	......	44
23.	29·942	29·901	29·878	29·43	29·90	29·86	30·04	29·98	54·3	61·3	47·0	75	37	53·5	69	41	47½	43	nnw.	nw.	calm	ese.	se.	......	......	......	......	......	50
○ 24.	29·974	29·948	29·921	29·47	29·88	29·91	29·99	30·04	60·5	68·6	52·0	75	37	52	68½	40	50½	46½	n.	se.	calm	e.	se.	......	·01	......	......	......	54
25.	30·080	30·028	29·946	29·54	30·00	30·06	30·14	30·18	57·8	69·3	49·0	73	42	56	68	42½	52	47	e.	e.	calm	ne.	se.	·097	......	......	......	......	54
26.	30·114	30·055	30·018	29·61	30·08	30·09	30·19	30·22	56·7	67·5	47·4	66	39	54	67	43	53	47	ne.	e.	e.	e.	se.	......	......	......	......	......	52
27.	30·048	29·990	29·959	29·55	30·08	30·00	30·22	30·20	54·3	62·3	44·5	63	31	53	63	41	53	43	ne.	e.	e.	e.	se.	......	......	......	......	......	46
28.	30·100	30·050	29·941	29·55	30·02	30·01	30·18	30·18	54·7	59·4	45·8	72	35	53	66½	36	52	45	n.	se.	e.	e.	e.	......	......	......	......	......	48
29.	30·088	30·061	29·881	29·55	30·00	29·93	30·16	30·10	55·3	66·0	45·7	71	43	54	68½	37½	48½	45	ne.	e.	e.	e.	se.	......	......	......	0·00	......	46
30.	29·882	29·835	29·800	29·36	29·92	29·94	30·10	30·13	57·7	64·6	47·6	74	41	48·5	66½	43	47½	45	ene.	e.	e.	ne.	se.	......	......	......	......	......	51
Mean.	30·068	30·072	29·986	29·63	30·373	30·039	30·160	30·178	46·9	53·8	41·1	57·70	34·86	46·2	54·9	35·7	47·18	13·16						Sum. 0·470	0·15	1·34	0·00	0·51	Mean. 42

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 59. JULY 1842.

XXXVIII.—*General Features of Chusan, with remarks on the Flora and Fauna of that Island.* By Theodore Cantor, M.D., Bengal Medical Service, &c.

[Continued from p. 278.]

While engaged in examining and collecting objects of natural history in China, microscopic zoology did not altogether escape my attention. Sketches and notes were taken as often as my scanty time would permit, with a view to obtain some information about the geographical distribution of these minute animal forms, the very existence of which would have been a secret but for the revelation of the microscope. Previous use of instruments enabled me to delineate faithfully what I saw, and I have had the satisfaction to test the correctness of my sketches by comparing them after my return to Calcutta with the beautiful plates of M. Ehrenberg. To attend to anatomical structure, or the measurement of the animals themselves, lay not in my plan; partly because this branch of zoology is not sufficiently familiar to me, but chiefly because the bustle of a camp-life is anything but calculated to afford the otium indispensable to such studies. From comparison with M. Ehrenberg's great work upon Infusoria, it would appear that most of the forms observed at the island of Lantao, situated in the mouth of Canton river, and at Chusan, also inhabit Europe*. A detailed list of the localities given by Ehrenberg has been prefixed to those places where the Chinese animalcules were found.

The method I invariably followed in the examination was this: I first took a sketch of the animalcules through single lenses, of which my highest power was $\frac{1}{30}$th of an inch, and then examined the object through a compound of 210 linear, when I nearly always found the sketch to correspond. Unless the powers of the single lenses are added in the sketches, they

* See Dr. Ehrenberg's reflections on the extensive diffusion of species among the Infusoria and their insensibility to climatic variations.—Taylor's Scientific Memoirs. Part X.—Ed.

have been taken through the medium of $\frac{1}{30}$ single lens and 210 linear compound.

The few forms I have added as "dubia" are those to which I have found none corresponding among Ehrenberg's. To G. W. Grant, Esq., an indefatigable microscopical observer, who has kindly examined my sketches and notes of Chinese animalcules, I am indebted for the following list of forms described by M. Ehrenberg, which he has recognised as also occurring in fresh water in and near Calcutta:—

Sphærosira volvox.	Navicula fulva.
Closterium turgidum.	——— turgida.
Euglena longicauda.	Vorticella patellina.
Epipyxis utriculus ?	Coleps hirtus.
Arcelina aculeata.	Lepadella emarginata.
Arthrodesmus quadricaudatus.	Brachionus urceolaris.
Micrasterias hexagona.	

From what has been stated, it will appear that Indian forms (to which may be added a few Javanese) prevail in the fauna of Chusan, and that European forms make but a secondary feature. The climate of Chusan, as before observed, being that of the nearest continent, it may be inferred that Indian forms occur in central China (in those parts of course which, *cæteris paribus*, correspond with Chusan), the longitude of which is less easterly, at least up to the 30th degree north, or the latitude of that island. As the annual mean temperature of Chusan is considerably below that of tropical countries, it follows, that certain forms, and these among the lower classes of animals, which hitherto have been considered peculiar only to a tropical climate, are able to exist under a much lower temperature, and thus possess a much less limited geographical range. In what exact latitude and longitude European forms commence, is, in the present state of our knowledge of the physical condition of China, impossible to determine.

The following ably drawn up paper, which appeared in the 'Chinese Repository,' vol. iii., will serve to give a precise idea of the attention paid by Europeans to the natural history of China, from the days of the Jesuits up to the time of its publication (1834). It contains matter of general interest to naturalists, and may prove useful to those, who we may hope will ere long be enabled to engage in active investigations in that empire. "The Jesuits were the first Europeans, except Marco Polo, who made any investigation in this field. For nearly two centuries these men resided in China, and in the course of their attempts to establish themselves here, they travelled extensively throughout all the provinces. During the reign of Kanghé, a period of sixty-one years, they were permitted to investigate everything they deemed worthy of notice, and the voluminous works they left bear testimony to their diligence. Missions were established in all the principal cities, and they were ably conducted by men who were well versed in literature and in the arts and sciences, and who would not have suffered by comparison with the best scholars of Europe: and what might we expect to find in their works concerning the natural history of China? Judging by their success in other departments, as topography, history, &c., we might reasonably hope for full and faithful narrations of the vegetable and animal productions, and also of the agriculture. Concerning some of the more remarkable productions, as bamboo, tea, &c., we have details of such length as to tire the reader. They were not the men who would let anything pass by them which could adorn their pages, or excite the wonder of readers in other countries. But what do we find on perusing their accounts? So far as those descriptions are mere translations of native authors, the defects are not to be charged to the Jesuits. They wished to tell all they could concerning China, and in their desire so to do, recorded many things which further research would have convinced them were not facts. These exaggerated statements have conspired to create ideal notions of the character, policy and country of the Chinese, which future travellers, we apprehend, will find erroneous. Among all their remarks on natural history we do not find a single continued narration of facts which the author asserts as having come under his own eyes. There was no Linnæus or Cuvier who would be satisfied with faithfully recording the results of his own observation. If such had been the case, the united labours of these 'fathers' would have presented rich materials for compiling a work on the natural history of China, but which must now be reserved for others. In considering the merits and demerits of these writers, however, we must remember that they lived in an age when the public taste was satisfied with nothing but tales almost beyond the bounds of belief. Their accounts are not more improbable than what we find in Buffon; and these men flourished long before his time. Besides, it was for their interest to portray this country in as favourable an aspect as possible: their situation was such as required all the aid that interesting description could bring. The want of any well-digested work on natural history also presented itself as a serious obstacle against pursuing the science in a useful way. If observations were made, how could they be compared with previous ones and their relative importance ascertained? This was a hindrance of which we can hardly have a full conception in the present advanced state of the science. With the want of books the precarious tenure of the establishment of the Jesuits here may also be adduced as a reason why so few turned their attention to such subjects. Liable every moment to be driven out of the country, the leaders would naturally bend all their energies to secure that which had already been gained, and leave others to narrate what was seen. The erroneous ideas concerning the natural history of this country which have become current among the great mass of readers in the West is a serious evil, and one which has been occasioned chiefly by the exaggerated statements of these early writers. Every author for the last century who wished to write concerning China needed only to open the volumes of the Jesuits, and long descriptions on every subject met his eye. These he wrought into his own phraseology, and spared not to enlarge or reduce them to suit his own convenience. The consequence is, that the same thoughts, being presented in many lights and by authors of reputation, are received as accredited truths. An instance of this is found in Malte-Brun's 'Geography,' who states, on the authority of a member of the Dutch embassy, 'that the Chinese farmer yokes his wife and ass together at the plough;' and this is said in such a manner as to convey the idea that it is a common occurrence; while the instances of such brutality are as rare in China as in Persia or India, or any other country in the same state of civilization. Concerning the accounts of the Jesuits in general, we may observe, that when they are satisfactorily proved or disproved, and the truth sifted from the rubbish which surrounds them, they will be found to contain much valuable information; but until they have been carefully compared with renewed investigations, they must be cautiously received. We will now proceed from the works of the Jesuits, which for the most part were written before the eighteenth century, to consider what has been done by more recent observers. In 1750 Peter Osbeck came to China as chaplain to a Swedish East Indiaman, and made some discoveries in the vicinity of Canton. He was a disciple of Linnæus, and had imbibed his master's love for the works of nature. The freedom allowed to foreigners at that time enabled him to extend his researches in this hitherto unexplored field to a considerable distance round the city. He collected many plants in the vicinity of Canton and the anchorage at Whampoa. The remembrance of his zeal and success was perpetuated by Linnæus in the *Osbeckia chinensis*; and a friend and assistant was remembered in the *Torenia asiatica*. These, we believe, are the only instances of any persons who came to China for only a single season, that improved the opportunity to extend the knowledge of its natural history. Other ports, as Shanghaé and Amoy, were once open to foreigners, but the desire for gain was then so strong as to engross all the time of those who visited them. From the time of Osbeck till the embassy under Macartney in 1793, we read of none who explored these wide fields. No Tournefort or Pursh was found who would willingly endure the fatigues and dangers of visiting China from a love of natural history. The embassy under Lord Macartney was provided with competent naturalists, and the advantages enjoyed were many; yet the results do not appear to have been considerable. In a journey from Teentsin to Jeho (Zhehol) and then through Peking to Canton, abundance of opportunities must have been presented to enlarge our knowledge of this country. But the same causes which will retard future labourers hindered the researches of the members of this embassy; the jealousy of the Chinese government prevented them from examining most of the interesting objects which came in their way while travelling through the country. The works of Staunton and Barrow, however, contain many valuable notices of the natural history of China; and if the embassy did not open a more favourable trade to its projectors, it enabled us to form more correct ideas of the real aspect of the country, both in a political and natural point of view. The remarks were such as would naturally be made by those travelling in a circumscribed manner, and relate principally to agriculture and the natural scenery. The Dutch embassy to Peking in 1795 under Van Braam does not appear to have made many remarks concerning the natural history of the districts through which it passed. From the time of that embassy to the one under Lord Amherst in 1816, very little was done in this branch of knowledge in China. When that expedition was proposed, the advantages that would accrue from having an able and scientific naturalist were duly appreciated by the projectors. Such a one was found in Dr. Abel, and the result showed that the expectations of those who recommended him were not ill founded. Everything necessary to enable him to transport the specimens, whether on shore or on board the ship, was done, and no expense spared in affording him all the facilities possible during the journey. From Teentsin to the capital the way was closely examined; but from Peking to Canton few observations were made or specimens collected, on account of the rapidity of travelling. Besides, Dr. Abel was taken sick on his return and prevented from personal research to the extent he wished. The gentlemen of the embassy, however, brought him every specimen they saw worthy of notice. At Canton, the whole collection of plants, minerals, and other objects which had been collected were put on board H.M.S. Alceste, the ship that brought the embassy to China. The loss of that vessel in Gaspar Straits, and with her Dr. Abel's entire collection and the notes appended to it, deprived the world of much valuable information. Except a very few specimens he gave to some friends at Canton, everything he had collected perished with the Alceste. Among these preserved specimens Sir Joseph Banks found some new plants, one of which, *Abelia chinensis*, commemorates the zeal of the naturalist. Since this expedition nothing of importance has been done in any department of natural history, excepting botany. To this branch a few of the gentlemen attached to the Hon. E. I. Company's factory have paid some attention. The Horticultural Society of London in 1819 sent out Mr. Kerr, a gardener, to collect and buy living plants and send them home, but his success was only partial. Many new plants have been discovered among those which have been sent home by the residents at Canton. The steady demand for these, both among foreigners and natives, has induced the Chinese to bring rare plants to this city; they are kept for sale at Fahte, the 'flower-gardens' near Canton. The number of plants shipped to Europe and America yearly is considerable, and the demand is increasing. According to Livingstone, not one in a thousand reaches their destination; yet from the immense number sent in a long course of years, we may safely infer, that one-half of all known Chinese plants have been discovered and named in this way. Great care is necessary to preserve them on board ship in a voyage of such length, and from the want of this care consequently many of them die. Different plants require such different attention, that what saves one kills another. But the number of names probably far exceeds the number of species, for the Chinese gardeners are skilful in altering the appearance of flowers, and finding it for their interest so to do, they devote much time to the pursuit. From this short sketch it appears, that in the natural history of the Chinese empire much remains to be done. The Chinese works on this subject are voluminous, and they contain dissertations on plants of all kinds and qualities, chiefly those used in medicines; on gems, of which they are fond; on quadrupeds, birds, fishes and insects; and even shells and mollusca are not overlooked by them. On the same pages we also find accounts of tiger-elephants, dragons, and other similar fantasies. The entire range of natural science in the Chinese empire will require thorough investigation, for what has been done needs to be done again. Botany has attracted most attention, and the progress made in it from various sources is considerable; but the grasses, the cryptogamic plants and some other branches of the study, are nearly unknown. The works of the Jesuits contain notices of the larger animals of China, but with the other branches of zoology we are imperfectly acquainted. The birds and the fishes, the insects and the mollusca, will each afford sufficient materials for many interesting volumes. Mineralogy is on the same level; but the precious gems, the beautiful crystals of quartz, the white copper and the gypsum seen in Canton, show the abundance of its mineral treasures; the variety of metals cannot be small, but their full extent cannot be yet known. Of the geology of this empire very little knowledge has been gained by Europeans; and of the organic remains, which we may expect to be considerable from those found in Ava and Siberia, still less is known. It will be apparent then, that the investigation of China and its dependencies will open a field of research that is unequalled in the world. From Samarcand to Formosa and Japan, and from Saghalien to Camboja, is a field, which is nearly unknown. Peopled from the remotest antiquity with wandering nomades, who have despised agriculture and employed themselves in enslaving their neighbours, Tartary is about the same now as it was a thousand years ago. China has undergone many alterations, and the face of the country, by increase of population, has assumed the appearance of an extended garden, when compared with the countries on the western boundary. We hope this interesting and wide field will soon be carefully surveyed in all its departments. The Chinese are not so savage as the Arabs, nor so deceitful as the Moors, nor so wandering as the North American Indians, in whose countries travellers have passed many years. From the appearance of the times, we expect the Chinese empire will soon be open to foreigners, and we trust that the naturalist will not be slow to enter on a field abounding with objects worthy of his attention."

It may perhaps not be deemed irrelevant to offer a short account of the auspices under which the objects of the following descriptive catalogue were collected. In the earlier part of 1840 the Supreme Government had determined upon despatching forces to China. The opportunity thus offered of seeing service, and at the same time of visiting a field hitherto closed to science, was too tempting to be allowed to pass, and I ventured to solicit of the Rt. Hon. the Governor-General that I might become attached as Assistant-Surgeon to one of the regiments about proceeding on the Eastern expedition. In the mean time I had been ordered to march to the northern provinces with a detachment of H.M. troops, part of which had been under my charge on their passage from England, and had arrived in the vicinity of Hazareebaugh, when I was relieved with orders to proceed to the Presidency. On my subsequent return to Calcutta I received intimation that H.E. the Commander-in-chief had been pleased to post me to H.M. 49th regiment, then *en route* to join the expedition to the eastward. In an interview with the Rt. Hon. the Governor-General, I was honoured with his Lordship's commands, that I should collect objects of natural history for the Museum of the Honourable the Court of Directors, to which effect I was to be furnished with materials and instructions, that I should inquire among the medical officers of the expedition if there were a botanist capable and willing to undertake the botanical part of the future inquiries. I was further instructed to correspond upon matters connected with my charge with his Lordship's private secretary. Fully imbued as I was with a sense of the high honour which his Lordship had been pleased to confer, I became also aware of the responsibility it devolved upon me. Hitherto my labours in natural history had been of a strictly private nature, and to this as well as to the difficulties which I have had to encounter, I have always attributed the liberal encouragement with which my humble exertions have been received by some of the first philosophers. During the few days which elapsed after my interview with his Lordship, I was vigorously engaged in making arrangements connected with the execution of my scientific mission, when I was ordered to assume the medical charge of a detachment of H.M. 26th regiment, with which I, the following day, embarked for China. My sudden departure from Calcutta prevented me from obtaining his Lordship's instructions, and also a number of articles absolutely necessary for preserving objects of natural history, all of which were now to follow. Our visits to Penang and Singapore enabled me indeed to obtain a few of those necessaries, which, however, notwithstanding their exorbitant prices, proved to be utterly inefficient. Nearly during the whole month of June 1840 we were detained at the island of Lantao, in Canton River (Chookeang or Pearl River), which afforded me an opportunity of becoming somewhat acquainted with the leading features of the flora and fauna, and I commenced forming botanical and zoological collections during the hours of leisure left by my military duty. On our arrival at Chusan in July we had the good fortune of landing our original number of troops, all in fine state of health, which I chiefly attribute to the excellent arrangements of the commanding officer, Captain Paterson, of

H.M. 26th regiment. Shortly after I became exempted from military duty as long as my services could be spared, agreeably to instructions upon the subject from H.E. the Commander-in-chief of India. From the state in which I by this time found the collections I had made shortly before at Lantao, I was disagreeably apprised of the bad quality of my materials for preserving, though this was only the commencement of subsequent mortification, felt on witnessing the destruction of objects nearly as fast as I contrived to collect them. Time becoming precious as the season for collecting was rapidly advancing, and the prospects of the arrival of a supply of materials from Government being uncertain, I had only one course left, to sketch the living objects. The illustrious Mr. MacLeay has observed, that the use of the pencil and brush is as necessary to a naturalist as the power of reading and writing. I felt the truth of these words at this juncture, when I had no hopes of success in preserving collections, though I was determined upon not altogether losing the opportunity. Not having received the instructions of the Rt. Hon. the Governor-General as to the objects of my inquiries, I directed them to general features, on the same principle as the artist does who intends to produce a familiar likeness. An entire though hasty outline will better serve the purpose than if he were to produce an elaborate representation of single parts or features. I do not mean to deny that a thorough study of any single branch of zoology may prove of the greatest importance to throw light upon the physical condition of a country; but I am alluding to the peculiar position under which I was placed in a field new to science. About the end of August I was fortunate enough to receive a quantity of spirits of wine and bottles, timely enough to save part of the zoological collections from destruction. As I had not succeeded in my search for a botanist, I trained my servant to assist me in collecting plants and seeds, while my own time was divided between searching for specimens, sketching them, and taking notes. At this period the dreadful extent of sickness, ravaging during our first occupation of Chusan, rendered the assistance of every medical officer necessary, and I was ordered from my residence to perform regimental duty with H.M. 26th regiment. The Cameronians were encamped on the slope of a steep hill, at a considerable distance from the house in Ting-haé where I lived, among the collections. The large building had been appropriated to the office of the chief magistrate, and during my stay there I had the pleasure of affording medical assistance to the European establishment as well as to a number of cases among natives connected with that office, which latter circumstance afforded some opportunity of more closely observing the habits of the people. The difficulties which the Chinese language imposes upon the foreigner, the kindness of the Rev. Mr. Gutzlaff had in some measure enabled me to obviate. I had put down and numbered all questions upon which I wished information, opposite to which Mr. Gutzlaff had furnished the Chinese version. The latter I produced in my excursions to the Chinese, who, as they nearly all can read and write, seldom failed to write a reply on a blank paper, to which I attached the number corresponding to my question, and was afterwards favoured by Mr. Gutzlaff with a translation. That information of such a kind must be used *cum grano salis*, it is scarcely necessary to add. The bodily fatigue I had daily to encounter in the execution of my duty, the beyond description distressing nature of the duty itself, I have reason to believe laid the foundation of my subsequent severe illness. I had scarcely been relieved from military duty and busily engaged in turning the short remaining season to the best possible account, when I became a victim to a violent cerebral fever, and was subsequently ordered to sea by the Medical Board at Chusan, in a state, I am informed, which held out but slight prospect of my surviving. I have now but to perform the pleasing task of expressing my gratitude to Sir Gordon Bremer, K.C.B., Col. Mountain, C.B. of H.M. 26th regiment, in addition to those officers on the expedition mentioned in the descriptions, to whose kindness, during my sojourn at Chusan, I feel myself greatly indebted. To G. A. Bushby, Esq., Chief Secretary to the Government of India, I beg to express my best thanks for his great liberality, which the important avocations of a high office never prevented from rendering every assistance to facilitate my scientific task. To J. W. Grant, Esq., B.C.S., I take this opportunity of acknowledging the repeated and through years unaltered benefits which I have derived from his extensive, but unassuming knowledge of the natural history of India. In placing the Mollusks at the disposal of W. H. Benson, Esq., B.C.S., I was guided by the conviction, that I could not turn them to greater advantage to science; and while I beg to offer my best thanks for the liberality with which that distinguished naturalist has met my request, his own descriptions carry the best proof of the correctness of my estimate.

[To be continued.]

XXXIX.—*Observations on a specimen of the Black or Leading Whale,* Phocæna melas, *taken on the coast of Cornwall.* By Jonathan Couch, F.L.S., &c.

[With a Plate.]

However frequent may be the capture of the Black or Leading Whale in the more northern parts of the United Kingdom, opportunities for examining this somewhat remarkable species have not often occurred to naturalists; and those who have had occasion to publish a figure have for the most part been reduced to the necessity of copying, by which means it has happened that the representations of the species in even the most respectable works are found to be incorrect in some important particulars. On this account, and because the specimen now to be described was taken at a great distance from its most usual haunts, it is hoped that the following notice will be acceptable to the scientific public. The length in a straight line was 20 feet, but measured along the curve, from the upper lip to the end of the tail, $22\frac{1}{2}$ feet; breadth of the tail, 4 feet 9 inches; from the base of the dorsal fin to the middle of the belly, as it lay, and consequently half round, 5 feet 8 inches. Height of the dorsal fin, 14 inches; measured over the back from the margin of the tail to the dorsal fin, 12 feet 9 inches; length of the base of this fin, 3 feet 5 inches. The head is small in proportion to the body; the forehead projecting in front, wide and remarkably rounded; a depression between the front and upper lip; angle of the mouth ascending, the lower jaw a little shorter than the upper; tongue large and fleshy; teeth small, round, in height from the gums scarcely exceeding one-third of an inch, standing separate, and inclined forward; those above rather the stoutest, the whole closing alternately between each other; front of the upper jaw having four cavities in the substance of the gum to receive corresponding teeth of the lower jaw. As well as could be counted, there were 20 teeth in each jaw. The eye small, narrow, a little above and slightly before the line of the angle of the mouth. Breathing-hole on the hinder part of the head, in a depression, with the valve closed circular, the curve backward. Pectoral fin 4 feet 9 inches in length, becoming very narrow, pointed, and directed backward; in shape somewhat like the wing of a swallow. Body large, round, plump; compressed through the posterior third of its length, which is ridged on its dorsal and ventral aspect, and growing rapidly, depressed at the tail, which organ is cut in a segment at the middle. The animal, a male, with a long furrow or channel from the vent forward along the belly, enclosing the penis, which is about 2 feet in front of the vent. The cuticle is thin; the colour an intense black, smooth, like oiled silk; interrupted on the sides by several curious grooved marks, like the ridges on some species of shells; two long parallel lines low on the side united by another anteriorly. Under the throat a broad white mark, heart-shaped towards the throat, and extending backward no further than the pectoral fins, behind which it is faint and narrow. There was a notch in the dorsal fin, probably peculiar to the individual; it was otherwise falcate posteriorly.

There can be no question of this being the *Delphinus melas* of Fleming, *D. Deductor* of Scoresby, *Phocæna melas* of Bell, 'British Quadrupeds,' p. 483; and consequently, as referred to *Delphinus melas* of Trail, *D. globiceps* of Cuvier, and *Globicephalus Deductor* of Jardine; but whilst the descriptions given by these naturalists are sufficiently minute and accurate to decide the species, they in common with their accompanying figures have the misfortune to fail in some important particulars, which may lead to error if it shall be found that a nearly allied species exists. The figure in Mr. Bell's work is confessedly taken from Cuvier; and though I have no opportunity of consulting the 'Ann. du Muséum,' in which the paper of the great French naturalist is contained, or the work on Cetaceans of his brother, yet I think it fair to conclude that it is correctly copied. The singularity of position, however, given to the tail, as thrown up over the back, and the attenuated form assigned to the figure both of Scoresby and Bell (though most obvious in the latter), lead to a suspicion that the latter is indebted for its existence to the former, and consequently that the engraving of Dr. Trail, whom Scoresby has followed, is the only undoubted original.

The following notes, which were made when comparing the figures of Bell (derived from Cuvier) and Scoresby (whose description at least is from Trail) with the animal itself lying favourably before me, and my own sketch and description, will point out the differences between the former and the latter. In Mr. Bell's work the bulk is much too slender, especially on the anterior portion; and not enough compressed posteriorly, nor sufficiently ridged on that part above and below. The caudal fin is too much divided and attenuated at the sides; for though a single specimen might chance to die in the attitude given, nothing short of an error in the outline could represent the corner of the tail so long and slender. The forehead also is not sufficiently prominent and globular; the teeth are too numerous and conspicuous; the under jaw is too much projecting. Jenyns represents the teeth as conical and *sharp*; whereas in the present instance their points were blunt. The pectoral fin is not well represented in the figures; and the dorsal is placed too far behind, its exact position being, as far as the eye can judge, just above the centre of gravity. As the proper situation of this organ is an important character of the species, it is carefully given in the figure which accompanies this paper. (Plate VII.)

I am sorry that, with so favourable an opportunity, I am not able to add anything on the subject of the internal structure of the animal; but after having bargained with the possessors for the bones, especially of the head, when they should have finished their exhibition to the public, they were afterwards sold without my knowledge for a higher price.

Perhaps the manner in which this whale was taken may in some degree illustrate its history, for it has been observed that most of the cetaceous animals taken in England have run themselves on shore; a circumstance which has been ascribed, with much appearance of probability, to the influence of sickness. On the 29th of March in the present year, the specimen here described was seen to approach and strike its head against a rock on the east shore of Looe Island; and the blow was followed by a discharge of blood, it is believed from the mouth, since no wound was afterwards discovered. It afterwards moved off into free water, but returned to the shore, among the rocks of which it became entangled; thus affording the two or three men who were present an opportunity of fastening a rope round the root of its tail. As the tide receded it was left dry, and died in about the space of six hours.

Polperro, 1842.

XL.—*The Birds of Ireland.* By Wm. Thompson, Esq., Vice-Pres. Nat. Hist. Society of Belfast.

[Continued from p. 230.]

No. 13.—*Hirundinidæ.*

Common Swallow, *Hirundo rustica*, Linn. This species is by far the most common of the *Hirundinidæ* in Ireland. It arrives the second in order, the sand martin preceding it. The first week of April is the earliest time I have known it to appear about Belfast, the second week of that month being the ordinary period, and seldom is it looked for in vain upon the tenth day*.

* From newspaper paragraphs it would appear that it occasionally comes earlier. In the Belfast Commercial Chronicle of April 1835, it was stated that swallows had been seen about Larne on the 2nd of the month. The contributors of such notices rarely discriminate the different species of *Hirundo*, and the term swallow is used generically, or applied to the three

Although in the year 1836 the swallow did present itself in one locality near Belfast on the 15th or 16th of April, the species was generally late in arrival, and remarkably scarce. When walking for upwards of two hours on the morning of the 1st of May through a well-wooded and cultivated district where these birds usually abound at this season, not one was to be seen. On the 2nd of that month, when going fourteen miles along the southern side of the bay, and again on returning, swallows appeared only at one place, where a few were in company. On the 3rd, 4th and 5th I walked for miles along the banks of the river Lagan, a favourite resort of these birds, and not one was seen. In 1837 also they were very late in coming, and, as in the preceding summer, very scarce*. In the following year and subsequently they made their appearance as usual. The earliest observed by myself in 1838 were two, which on the 15th of April kept flying over the grassy margin of Belfast Bay. It was a most untoward day for them, being excessively cold with occasional heavy showers of snow, and blowing a hurricane. The storm effect was such as I never before witnessed, for as the in-coming tide flowed over the banks, the wind swept the spray (caught from the top of the small waves) before it over the shallower portion of the bay, presenting the appearance of a dense hail-shower, careering for miles over the surface of the sea. In the summer of 1840 again, swallows were remarkably scarce in the north of Ireland. This was attributed by an ornithological friend to the inclement summer of the previous year having been unfavourable to their breeding—he considered that there were fewer young birds in 1839 than he had ever before known. On making a tour through the west of Ireland in the summer of 1840, I observed that the *Hirundinidæ* generally were very scarce there†.

species. The sand martin, which is the earliest comer, was probably the bird alluded to. On the 10th day of that month I saw single swallows in two localities near Belfast.

* When travelling from Holyhead to Shrewsbury on the 12th of May 1837, and on the following day thence to London, I remarked that swallows were everywhere very scarce. Being seated outside the coach, an excellent opportunity for observation was afforded.

† May 17, 1842. Although the month of April this year was so remarkably fine and warm, swallows were a fortnight later than usual in making their appearance in the north of Ireland. It is very remarkable too, that from the first day of their arrival about Belfast until the 14th inst., or during three weeks, there was no apparent increase to their numbers. On the two following days, however, a sudden increase in all directions took place, and without any marked change in weather or wind.

The practice of hunting the wren, as it is called, in the south of Ireland, and the children carrying the victims about the streets on St. Stephen's-day, and chanting a song for the purpose of collecting money, as noticed at p. 143, had in some respects an analogue in Greece in the case of the swallow. "The children in Rhodes greeted the latter as herald of spring in a little song[1]. Troops of them carrying about a swallow sang this from door to door, and collected provisions in return."

[1] Above thirty simple and most pleasing lines, given in Hase's 'Public and Private Life of the Ancient Greeks,' English Translation, p. 24.

Dr. Jenner (Phil. Trans., vol. cix. p. 24) states that swallows on and for some time after their arrival feed principally on gnats, but that their more favourite food, as well as that of the swift and martin, is a small beetle of the Scarabæus kind, which on dissection he "found in far greater abundance in their stomachs than any other insects." Two species of gnat, *Culex pipiens* and *C. bifurcatus*, are particularised by Mr. Main (Mag. Nat. Hist., vol. iv. p. 413) as their favourite food. Sir Humphry Davy 'Salmonia' has "seen a single swallow take four [Mayflies] in less than a quarter of a minute that were descending to the water." Without having actually examined the contents of its stomach, I have so often observed the swallow in localities presenting very different species of insects, and sweeping in the summer evenings through the midst of little congregated parties of various kinds, as to be satisfied that its food differs very considerably, a singular corroboration of which is, that an angling friend once resident near the river Lagan has repeatedly captured swallows with artificial trout-flies presenting very different appearances*.

In the autumn a few years since, my friend Wm. Sinclaire, Esq., a most accurate ornithologist, remarked a number of swallows flying for a considerable time about two pollard willows (*Salix fragilis*) which served as gate-posts to a field at his residence near Belfast, and on going to the place ascertained that the object of pursuit was hive-bees, which being especially abundant beneath the branches, he had an opportunity of seeing the birds capture as they flew within two or three yards of his head†.

The insect prey of the swallow and martin kept so near the ground on the evening of the 14th of August 1827—which was fine, after a day of excessive rain—that in its pursuit several birds of both species were killed with walking-sticks and umbrellas in some of the streets of Belfast‡.

* Isaac Walton informs us, that with the rod and line swifts were in his time taken in Italy.

† In the 'British Naturalist' (vol. ii. p. 381) the sand martin (*H. riparia*) is mentioned as preying on the common wasp. In an article in the 'Field Naturalist's Magazine' (March 1834, p. 125) on the 'Enemies of the Hive Bee,' an anonymous contributor states, that having observed some swallows seize upon his bees in passing the hives in his garden, he shot them, and on opening them carefully, found that although "they were literally crammed with drones, there was not a vestige of a working bee." Instances of the *Hirundo rustica* preying on bees have been very rarely recorded. In a paper read before the Lyceum of New York in 1824, De Witt Clinton, in his amiable admiration of the whole tribe of swallows, indignantly declared that "they are in all respects innocent, and the accusation of Virgil that they destroy bees is known to be unfounded both in this country and in Europe." But from Wilson's 'American Ornithology' (Jardine's ed. vol. ii. p. 153) we learn, that even in the United States, bees constitute part of the ordinary food of the purple martin (*Hirundo purpurea*).

‡ In the year 1838, I was informed by a bird-preserver here, that he had at different times received not less than twenty swallows which had been killed in the streets with walking-sticks or rudely formed whips used by mischievous boys.

The swallow is one of the very earliest of British birds in commencing its morning song. About midsummer it is begun occasionally before half-past two o'clock. It is also continued late in the season. On the 13th of Sept. 1833, I heard one when perched beside its nest sing in as fine mellow tone as early in the summer; and on Sept. 2nd another year, out of a number congregated on a house-roof, several were engaged in going over their amorous notes. On the 10th of Sept. 1841, two passing near me sang sweetly as they flew in company with a number of others.

Common as it is to see the *Hirundines* follow in the train of birds of prey, I never but in the following instance saw any of them turned upon. On the 22nd of September 1832, when walking in the garden at Wolfhill*, near Belfast, with a friend, a kestrel (*Falco Tinnunculus*) in close pursuit of a swallow appeared in sight over the hedgerow, and continuing the chase with extreme ferocity, lost not the least way by the swallow's turnings, but kept within about a foot of it all the time, at one moment passing within five or six yards of our heads. It is idle to conjecture how long the chase may have lasted before we witnessed it; but immediately on the kestrel's giving it up, the swallow nothing daunted became again, accompanied by many of its species, its pursuer and tormentor, and so continued until they all disappeared from our view. The kestrel was probably driven to this chase by the particular annoyance of the swallows, as they and the martins were more numerous that day at Wolfhill than they had been at any time during the season. On returning from a pursuit of this kind, I have often remarked, as Mr. Main has done (Mag. of Nat. Hist., vol. iv. p. 413), that these birds "unite in a song [apparently] of gratulatory exultation."

We read of the martin (*H. urbica*) being the most partial to, and dependent upon man of all its tribe, but from a partial view only can such a conclusion be drawn. The martin, it is true, often claims for its nest the protection of the same roof that covers man himself, but it also selects for its domicile the wildest and most stupendous precipices. On the other hand, I know not any instance of the swallow selecting for its nest any place removed from man's direct influence. The situations usually chosen in the north of Ireland are sheds, gateways and outhouses of every kind, the site once determined on being generally occupied for a series of years. All other nestling-places which have come under my own observation, and so far as I recollect to have read, were within the sphere of man's works†. In the north of Ireland I have never known the nest of the swallow to be built in chimneys, although, on account of its predilection for building within them, the species has received the name of chimney swallow

* See foot-note to Swift in one of the following pages.

† Subsequently Mr. Hepburn has stated, that he has "seen nests of this species on the rocks about Tantallon Castle, opposite the Bass."—Macgillivray's British Birds, vol. iii. p. 569.

Sir Wm. Jardine mentions the *H. urbica* as building in this locality, in his edition of Wilson's Amer. Orn., vol. iii. p. 320.

in different languages*. White remarks in his 'Natural History of Selborne' (letter 18), that "in general with us this *Hirundo* breeds in chimneys; and loves to haunt those stacks where there is a constant fire, no doubt for the sake of warmth. Not that it can subsist in the immediate shaft where there is a fire; but prefers one adjoining to that of the kitchen, and disregards the perpetual smoke of the funnel, as I have often observed with some degree of wonder." It appears singular that in certain countries the *Hirundo rustica* should thus be partial to chimneys, which however I cannot think with White, are preferred for heat. In Sweden it is called *Ladu Swala*, or barn swallow, from selecting the barn for its nest; and in southern countries as in Italy it prefers similar sites, as we have indeed learned from Virgil, and to the correctness of which I can myself bear testimony†.

One or two peculiar instances of the nidification of the swallow in the neighbourhood of Belfast may be mentioned. In the summers of 1831 and 1832, a pair of these birds built their nest in a house at Wolfhill, although the door by which alone they could enter was locked every evening, and not opened before six in the morning; being an early-rising species, they must consequently have thus lost for no inconsiderable part of the season fully three hours every day. A similar fact is mentioned in Capt. Cook's 'Sketches in Spain' (vol. ii. p. 275), where it is stated that "in the southern provinces they [swallows] sometimes live in the posadas, their nests being built on the rafters, where they are shut up every night."

Under a very low shed in the hawk-yard at the Falls near Belfast, where my friend John Sinclaire, Esq., keeps his trained peregrine falcons (*F. peregrinus*), a pair of swallows, regardless of the almost constant presence of four of these birds, constructed a nest in the summer of 1832. The man in charge of the hawks tore down the partly formed nest several times, but the swallows were not to be so deterred, and persisted in completing it within about three yards of a block, on which one of the hawks constantly perched: in due time the young appeared and got off in safety. Although such places as the swallow usually prefers for its nest are not only contiguous to, but especially numerous in, the immediate vicinity of the hawk-yard, and all the other sheds and office-houses are considerably higher

* Chimneys are stated in general terms by authors[1] to be usually resorted to in England for this purpose. The sites preferred in Scotland, according to Sir Wm. Jardine and Mr. Macgillivray, are similar to those above stated to be selected in Ireland. What Mr. Hepburn says of East Lothian exactly applies to the north of Ireland. He remarks that the nest "is built under arches, gateways, caves and waterspouts, against the beams, rafters and lintels of outhouses, and under wooden bridges."—Macgillivray's Brit. Birds, vol. iii. p. 569.

† In the Morea likewise, within the town of Patras, I remarked in June 1841, that they selected similar places to what they do in the north of Ireland, their nests being built under the rude porticos in the streets.

[1] White, Pennant, Bewick, Montagu (who adds, that "it is not unusual to find the nest in outhouses, upon beams or rafters"), Selby, Yarrell, &c.

than the erection there, this singular locality was again selected in 1833, when the nest of the former year was once more used, and the brood escaped from it without any casualty. Two new nests were also built this year and successfully occupied, one of which I remarked on the 10th of August contained eggs for a second brood, and on the 19th of the same month I had the satisfaction of seeing it tenanted by young birds. This nest had for its support the wing of one of the departed falcons, on the centre of which it rested*. The entire height of the shed, which was erected solely for the protection of the hawks, is not above seven feet. The nests are about six feet from the ground, and built against a beam of timber (to this the wing just mentioned is nailed) placed on the top of the low wall supporting the roof. The height of the roof from the ground is four feet two inches, which leaves only two and a half feet clear for the swallow's flight between it and the heads of the hawks as they perch upon their blocks. One of the nests is only six feet from the block occupied by a hawk, and from which this bird has liberty to move to half that distance. The swallows however flew closely past these rapacious birds without being in any way heeded by them†.

* In White's 'Selborne' a similar instance is mentioned.

† In the Northern Whig (a Belfast newspaper) of July 2, 1829, the following paragraph appeared :—"We understand that a pair of swallows have built their nest in Mr. Getty's school-room, at Randalstown; and notwithstanding there are above forty scholars daily attending, the birds fearlessly went on with their labour, and have now out their young ones. One of the windows had been for several nights left down, at which time the swallows found admittance, and after much apparent deliberation commenced their structure, which they carried on chiefly during the hours of the school; and though they had abundance of time to build, either before the school commenced, or after it was dispersed, yet they always preferred a few hours about noon for their labour, and seemed to do little at any other time. The scholars, much to their credit, gave them as little annoyance as possible, and the window is still kept down."

Mr. Blackwall in his 'Researches in Zoology' mentions the remarkable fact from personal investigation, that swallows, house martins and sand martins not unfrequently leave their last brood of young to perish, and occasionally leave their eggs before they are incubated. He speculates on the causes of this "voluntary act of desertion," and combats the opinion of Dr. Jenner, that it is prompted by "the desire to migrate, *produced by a change in the reproductive system.*" Having given less attention to the subject than either author, I should perhaps be silent, but a few remarks on so apparently singular a proceeding may not be considered presumptuous. In the instances alluded to, the young broods and eggs were deserted late in the season, and I should suppose at the migratory period. The paramount object would then seem to be migration, and when favourable weather and wind prevail, the love of offspring yields to the stronger impulse, and the parents take their departure. Had this favourable time been long enough protracted, they would have continued to tend their offspring and bring them to maturity. It is quite different at the season when the first brood is being produced. The primary principle which then influences them is, the production of their species; and no matter how favourable every circumstance may be for migration, they do not leave the country. I have attended to

In perching, the swallow, unlike the swift, occasionally rests upon the ground by choice, roads being not uncommonly thus resorted to. I have observed a number of these birds frequenting a large mound of clay in the vicinity of houses daily throughout the month of August, or long subsequent to the time that such material is required for their nests*. On betaking themselves to trees they generally exhibit a singular choice in avoiding the flourishing branches and alighting on those which are dead. It has been remarked to me by Mr. Wm. Sinclaire, that as soon as the young can provide for themselves, they do not return to the nest in which they were reared; from which circumstance, and from seeing large flocks of swallows fly in the autumnal evenings around the highest trees at his residence, and invariably disappear in their direction, he concludes that they roost on trees. White of Selborne, speaking generally of these birds, mentions their thus roosting late in autumn.

The same author remarks that "the swallow is a bold flyer, ranging to distant downs and commons even in windy weather, which the other species seem much to dislike; nay, even frequenting exposed seaport towns, and making little excursions over the salt water." The "excursions" of the swallow over Belfast Bay are of daily occurrence throughout summer. It may be chiefly observed attendant on the in-coming tide, where we may presume its food is most abundant, owing probably to the insects being driven off the beach by the encroaching waters†. When on different occasions, in the month of June, on the low mass of rock called the Mew Island (the smallest of the three Copeland islands off the coast of Down), this species, and it alone of the *Hirundinidæ*, always appeared; thus proving a propensity to range, as there is not a spot on the islet that would afford accommodation for its nest.

Mr. White (of Selborne) remarks of the swift, that "in the longest days it does not withdraw to rest till a quarter before nine in the evening, being the latest of all day birds." In the general terms in

the departure of the *Hirundines* for many years, and to the influencing causes, and was at first surprised at the suddenness of their disappearance when favourable weather arrived. At the end of August I have known the great body to depart, and at other times remarked them evidently waiting for weeks, and on to the month of October before they would take their flight.

* Mr. Macgillivray says of the swallow, that "it sometimes alights [on the ground] as if to pick up insects, which it has observed there."—Brit. Birds, vol. iii. p. 564. On such occasions, as I have particularly remarked the circumstance, food was certainly not the object—the birds were simply resting.

† *August* 2, 1838. I have remarked during the summer of this year, that swallows course as regularly over the masses of *Zostera marina* with which the beach is covered on the western shore of Belfast Bay, as they do over any meadows. This evening they were perched in great numbers on stakes which rise above the sea, and they were likewise busily feeding over the surface of the tide, on the insects roused probably by its flowing over the *Zostera*. The stakes alluded to are just such as—were they more remote from a public road—cormorants would alight on to expand and dry their outstretched wings.

which this was meant to be understood, it agrees with my observation; but I have occasionally at different periods during their stay, seen swallows on wing at so late an hour that they could hardly be distinguished. This occurred more especially throughout the month of June 1832, which was remarkably cold and wet. On several evenings towards the end of the month I saw swallows fly about at a quarter past nine P.M. The wants of the nestlings doubtless prompted this late flight, and if my informant be correct, it was in some instances of no avail, as during this time he saw young swallows fall dead from the nest, owing, it was conjectured, to starvation, and this too in a locality where food should have been comparatively abundant. On the 12th of June 1838, I observed a swallow flying about Wolfhill at half-past nine o'clock in the evening. The day throughout had been moderately warm, without rain.

When wind and weather are favourable for migration, swallows, including many of the first brood, leave us from the end of August, but about the middle of September is the chief time of their departure. On to the middle of October some are seen every year. Mr. Templeton notes his having observed a few on the 30th and 31st of October 1813; on the 14th of November 1815, I am informed that one was repeatedly seen flying about Stranmillis near Belfast, where likewise, on the 28th of October 1819, three were seen after a severe fall of snow and a good deal of frost; in 1835, one was remarked on the 26th of October near the town just named; and on the 3rd of November 1837, Mr. H. H. Dombrain of Dublin shot one at sea near Lambay island, when it was flying towards land *.

Variety in plumage.—Very rarely do we see any departure from the ordinary colour in the swallow. The Rev. G. M. Black states, that in the month of July 1815, a pure-white one was seen flying about Stranmillis near Belfast, for about ten days.

In the years 1811, 1812 and 1813, when my friend Dr. J. L. Drummond of Belfast was surgeon of H.M.S. San Juan, then anchored close to the New Mole at Gibraltar, he every year, both in spring and autumn, saw "swallows" (the species of which is not now remembered) every day during a few weeks at the former season flying northward, and at the latter southward. They kept flying throughout the day, and invariably in autumn as well as spring were in little parties, not more than three or four being generally together†. In the course of a tour made in the year 1841, the swallow was seen as follows:—On descending the Rhone from Lyons to Avignon,

* Observations made during a number of years (and occasionally daily) on the proceedings of the swallow preparatory to migration from the north of Ireland, together with the state of wind, weather, food, &c., here follow in my manuscript, but they are withheld, as without them, there is doubtless sufficient matter upon one species!

† Capt. Cook, in his 'Sketches in Spain,' remarks of the *Hirundo rustica*, that "a few of these birds winter in the south of Andalusia. I saw them on the summit of the Lomo de Vaca, far from the haunt of man, living with the *H. rupestris*"—a species which, according to the same author, "winters in great numbers along the southern shore [of Spain]."

some appeared on the 9th of April at several places, but they were nowhere numerous. On the 13th of that month a very few were observed between Leghorn and Pisa. At Malta on the 17th they were as abundant as we ever behold them in the British Islands. On the passage of H.M.S. Beacon from Malta to the Morea, two swallows flew on board on the 22nd of April, when the vessel was about forty miles east of Malta; on the 25th, when about fifty miles from Calabria, several appeared; towards the evening of the next day about a dozen alighted on the vessel, and after remaining all night took their departure early on the morning of the 27th, when perhaps ninety miles west of the Morea: throughout the afternoon and towards the evening of the same day (at sunset we were about sixty miles from the Morea) many more arrived, and all that came having remained, they appeared about the close of day flying about the ship in considerable numbers.

On arrival at Navarino on the 28th, the swallow was observed to be common, as it likewise was, in the following month, in the island of Syra, about Smyrna and Constantinople*; in June about the island of Paros, at Athens and Patras †; in July at Venice, Verona, Milan, &c. At Trieste, where I spent ten days at the end of June, no swallows were observed, although house martins and swifts were abundant; my not seeing them however may have been accidental. About none of the southern or eastern localities mentioned are swallows, house martins, sand martins or swifts more numerous than in the north of Ireland, or the British Islands generally ‡.

In the later editions of Bewick's 'British Birds,' a highly interesting account of the familiarity of the swallow in confinement appears in a letter from the Rev. Walter Trevelyan.

[To be continued.]

XLI.—*On a new species of* Rafflesia *from Manilla.* By J. E. Teschemacher, Esq. §.

[With a Plate.]

Having just received from Manilla, preserved in spirit, several buds of that rare and singular parasite, *Rafflesia*, which

* I never met with swallows more plentiful anywhere than they were on the 16th of May, flying over some low and extremely rich pastures in which some of the Sultan's stud were grazing, between Constantinople and the *village* of Belgrade.

† On the 14th of June, the young were all but fledged here. At this date, they are in favourable seasons equally far advanced in the north of Ireland.

‡ The only localities that in the midst of summer I ever remarked all the *Hirundinidæ* to be absent from, were the South Islands of Arran, off Galway Bay. Not an individual of any of the species was seen here by Mr. R. Ball or myself, when visiting the islands on the 7th, 8th and 9th of July 1834, the weather being all the time very fine. Returning from them we had no sooner reached the coast of Clare—the nearest land—than many of the *H. rustica* were observed.

§ From the Boston Journal of Nat. History, vol. iv. p. 63.

on examination appeared to differ essentially from the species hitherto described from Java and Sumatra, I beg to offer to the Society the following account, with a drawing.

The specimens were gathered in Basei, a district of the province of Leite, on the same spot visited by Mr. Cuming for the purpose of finding this plant, during his late excursion to the Philippine Islands. Not having seen any description of this plant by him in the scientific journals, I am uncertain of the result of his visit; and although I propose the specific name of *Manillana* for this species, I would readily yield it to any other he may wish it to retain.

The only accounts of *Rafflesia* to which I have access are, that of *R. Arnoldi* from Sumatra, in the 13th volume of the 'Transactions of the Linnean Society of London,' and that given by Sir W. J. Hooker in the 'Companion to the Botanical Magazine,' of *R. Patma*, detected by Dr. Blume in Noussa Kambangan, a small island on the coast of Java, and described and figured by him in the 'Flora Javæ.'

The column of one of my specimens was sent by itself from Manilla, and of two others I have dissected buds; the larger by a vertical cut, the section shown in the figure; the second, a smaller specimen, by the removal of the whole of the envelopes, exhibiting the naked column with its processes, edge, anthers, &c. The column from Manilla, being dissected when fresh, was considerably dried when placed in spirits. Its form and several parts are therefore not very distinctly retained, but the number of anthers and several other particulars are clear enough.

The largest bud of those I dissected is two and a half inches in diameter, and arises from a cup three-fourths of an inch in depth, the outer part of which is formed of the same substance as the external bark of the root on which it is parasitic, and which is evidently of the same structure as that of the root of *Cissus angustifolia*, on which the *R. Arnoldi* was found.

It is probable that the smaller size alone would sufficiently distinguish this from the last-mentioned species, the buds of which are stated to be one foot in diameter, because, although the respective age of these buds is not known, yet every part is so perfect in the buds I dissected, even to minute and glandular hairs, that it is not probable they would have been long in this state before opening.

There are apparently in this, five series of bracteæ; the middle one, at its origin, about three-eighths of an inch in thickness, or three times the thickness of the two outer and the two inner series. These bracteæ are imbricated over, and completely envelop the perianth; they are marked by prominent veins, precisely as in *R. Arnoldi*; the tube of the perianth originates on a line with the central row of bracteæ below the two interior rows, and although in the bud at its upper part it is undivided, yet the lines of its divisions, when expanded, are clearly discernible. The interior of these divisions of the perianth is marked by tubercles of various forms, as in the other species.

The column has a convex disc, surrounded by a raised edge; on the surface of this column are eleven processes, rather more than one-eighth of an inch in height, differing from each other slightly in size and form, the summits of which are entire and hispid, the hairs much resembling pistillary projections. One of these processes is in the centre, the other ten arranged around it at about an equal distance between it and the raised edge.

The anthers, which are of the same form, with pores and cells like those of the other species described, are ten in number, and are also suspended from the under side of the upper edge of the column, in open cavities formed in the lower part or base of it; both edges of the open part of these cavities are covered with hairs resembling those on the tips of the processes on the disc, and that part of the tube of the perianth opposite to these openings is studded with thick, capillary hairs, each terminated by what is apparently a glandular knob.

Down the centre of the column are lines, evidently bundles of vascular tissue, which pass through the substance of the cup into the root of the *Cissus*; all the rest of the interior is cellular.

I could not perceive any very distinct appearances in the bud of an annular process at the mouth of the tube of the perianth, although it is not improbable, from various marks, that such a ring may be developed when the flower is open.

There is no appearance, in any of these three specimens, of the cavities exhibited in the figure of *R. Patma* which contain the spores; on this part of the structure of *Rafflesia*, therefore, these specimens from Manilla do not throw any further light. They are probably male flowers. Of *R. Horsfieldii*, which, when expanded, is only three inches in diameter, I have not seen any description.

I close this paper with the following comparisons of the two species described, and of that which I call, at present, *R. Manillana*.

R. Arnoldi. Bud, before expansion, one foot in diameter, sessile on root of *Cissus angustifolia,* the under side of its base reticulate: disc of column convex; processes on surface forty to sixty, close together, divided at the summits, which are hispid : anthers forty to sixty, with numerous cells, and furnished with pores at summits : a moniliform cord at base of column : interior of perianth covered with variously formed tubercles.

R. Patma. When expanded, two feet diameter, arising directly from the root of the *Cissus* : disc of column concave ; processes on surface of disc *numerous*, of a pyramidal form, the summits of which are entire and hispid : lower part of tube of perianth and column glabrous ; interior of perianth covered with variously formed tubercles : anthers with cells and pores ; number not mentioned : no moniliform cord at base of column : antheriferous flower containing cavities filled with spores, hence hermaphrodite.

R. Manillana. Pl. VI. Bud, before expansion, two and a half inches in diameter, arising from a cup three-fourths of an inch high, formed by the thickened bark of the root of the *Cissus* ; the bracteæ originating from the inner side of the upper edge of the cup ; no appearance of reticulation under the base : disc of column convex ; processes on surface eleven, one of which is in the centre, the rest arranged around it, their summits entire and hispid ; lower part of tube of perianth studded with thick glandular hairs ; anthers ten, with cells and pores as in the other species ; no moniliform cord at base of column ; sporiferous cavities not apparent ; flowers examined probably male ; interior of perianth covered with various-formed tubercles.

XLII.—*Contributions to the Ichthyology of Australia.* By John Richardson, M.D., F.R.S., &c., Inspector of Hospitals, Haslar.

[Continued from p. 218.]

Sebastes percoides, Percoid Sebastes.

Scorpæna percoides, Solander, Pisces Austr. ined. p. 4.
—————————, Parkins. drawings, vol. ii. pl. 16. No. 14.

This species was discovered on Cook's first voyage on the coast of New Zealand, off Cape Kidnappers, and at Motuaro in Queen Charlotte's Sound. Parkinson's sketch is unfinished, and but partially tinted, with some appended notes of the markings, but is sufficiently characteristic to leave no doubt of the fish being a *Sebastes*, and, from its slight armature, apparently allied to *inermis*. Its colours are more varied than those of any species described in the 'Histoire des Poissons.' Solander's short description includes very few details of form.

The height of the body is greatest about the middle of the pectorals, and is contained three times and a half in the total length of the fish, caudal included. The length of the head is a trifle greater than the height of the body. The curves of the back and belly are equal, and unite gradually with the profile of the head, which is moderately and regularly convex, particularly above. The eye is rather large; the orbit being a little more than one-fourth of the length of the head, and somewhat less than its own diameter from the end of the snout. There is a strong recumbent spine on the nasal bone, and perhaps a smaller one on the mesial line of the vertex, but the superciliary ridge appears to be quite unarmed, the figure merely showing a double row of dark dots or pits. The preorbitar presents three angular corners, touching the limb of the maxillary, and the preoperculum four on its curved under limb, the second being more prominent and conical than the others. The infra-orbitar ridge is not marked as it crosses the cheek, and two small eminences are the only indications of the lateral occipital ridge. The temporal ridge, as in the other *Sebastes*, is not visible. There are two short opercular spines separated by a small sinus. The scales are only partially marked on the body, and on the head they are shown on the gill-cover and upper part of the preoperculum only; but from Solander's phrase '*squamis tectum*,' we may infer that the head is, as in the other *Sebastes*, extensively scaly.

The dorsal is steeply arched at the beginning, and but slightly notched at the eleventh spine, which is only a little shorter than the twelfth: the third and fourth are the tallest, and are equal to half the height of the part of the body over which they stand: the eleventh is half their height, and the first still shorter; the membrane slopes much behind each spine. The soft part of the fin rises higher anteriorly than the tallest spines, and becomes lower behind. Its corners are rounded, and its margin slightly concave. The lower pectoral rays are thick, and project beyond the membrane. The caudal is slightly concave on the margin, with rounded corners.

The tints partially laid on the sketch are red and lake, with much orange, olive, and yellowish green. The head is marbled with olive and red. The blotches formed on the dorsal by the ends of the transverse bands are irregular, and do not reach the margin of the fin. On the spinous dorsal and pectoral there is much dark dotting not noticed in the following description:—

"Scorpæna percoides. Piscis pedalis vel infra, dilutè rubicundus, fasciis quinque fuscis: prima per basin capitis; secunda in medio pisce; tertia paulo pone secundam; quarta inter partem posteram pinnæ dorsalis et analem, supernè bifida; quinta ad basin pinnæ caudalis. Oculi magni, vicini, pupilla nigra, iris incarnato-argentea. Caput sordidè rubescens, subtus pallidum, squamis tectum: lamina posterior posticè plumbea. Pinna dorsalis colore dorsi, eodemque modo fasciata. Pinnæ pectorales latissimæ, extus basi maculâ magnâ, fuscâ, et in medio fasciâ obsoletâ, subolivaceâ. Pinnæ ventrales rubicundæ. Pinna analis rubicunda extus pallidior. Pinna caudalis rubicunda, basi dilutior." (Solander.)

Synanceia trachynis (*Nob.*), Rough-vomered Hog-fish.

No. 8. of Mr. Gilbert's collection.

According to the observations of the collector, this species is not very abundant at Port Essington. "It is mostly seen in muddy places surrounding stones or rocks. Its native name is 'Wullerinden.'"

This fish agrees in general form, in the numbers of its rays and in many of the details, with the descriptions given of *Synanceia horrida* and *brachio* in the 'Histoire des Poissons,' more particularly with the latter species; but as the posterior dorsal spines are conspicuously lower than the anterior ones, its preoperculum is armed with a spine, and it has vomerine teeth, which both these species are stated to want, I have given it a specific name expressive of the latter character, though I regret that the want of access to examples of the known species prevents me from detailing its other distinctive marks. Most of the figures of *Syn. horrida* usually referred to, having been drawn from dried and distorted specimens, are defective, but a good one exists in the Banksian Library, which was done at Otaheite, where the fish bears the name of 'Ehohoo-pooa-pooa.' From this our *trachynis* differs in the form of its dorsal, in the attachment of its pectoral fin being more restricted, and in other characters.

Its form is well expressed by a phrase used in the work above mentioned, 'a short thick club:' its height and thickness at the pectorals are about equal; its length, caudal excluded, is rather more than twice as much. The shape of the skull has a general agreement with the description of that of *horrida*. There is the same kind of bony eminence between the eyes, with a deep cavity in front, and several pits on the sides, back and top; the same sudden depression of the cranium behind the superciliary eminence; the precipitous rising of the occiput, and the oblique and irregular but somewhat rhomboidal plate on each temple. At the base of these plates in front there is a round pit on each side which might be readily mistaken for the orbits. The anterior and posterior walls of the middle depression of the skull are vertical, not curved, as in Bloch's figure of *S. horrida*. These parts are no doubt entirely masked by the thick spongy skin of the recent fish, but the description is drawn up from the dried specimen, which was moistened to elicit the forms of the cirrhi and the patterns of colour. The very small eyes are situated (as shown in the figure of *Synanceia grossa* in Hardwicke's 'Indian Zoology') in a triangular space formed between the fore and hind limbs of the frontal eminence and a transverse ligament, and have consequently a lateral aspect, differing in this respect from *brachio*, and corresponding with *horrida*. The orifice of the mouth opens upwards before the snout, in an arc of a circle, and the under jaw, when depressed, projects half its own length beyond the edge of the intermaxillary. The *teeth* are short, and densely villiform. The chevron of the *vomer* is rendered concave by the rising of its obtuse lateral edges, and its surface is armed with villiform teeth still shorter than those of the jaws. The tongue and palate bones appear to be toothless. The *first suborbitar* is composed of several smooth ridges, which radiate from a longitudinal one and enclose five or six pits: its lower obtuse point, covered with warty integument, projects partly over the limb of the maxillary: behind this a shorter but acute point projects downwards. The second suborbitar, running backwards and rather downwards from the middle of the first one, above the last-mentioned point, rises into an obtuse conical eminence under the cheek, from whence a strong ridge is continued to the angle of the preoperculum. A much less conspicuous ridge runs to the base of the preopercular spine, and a forked one tends upwards in the direction of the posterior frontal plate, to which it is joined by a fold of skin or a mucous canal representing the posterior suborbitars.

The lower limb of the preoperculum is somewhat arched, and the upper one straight and slightly inclined backwards; the angle they form rather exceeds a right one, and at their junction there is a flat, obtuse, projecting point covered with warty skin. Three smaller points similarly covered exist on the lower limb; and from the lower third of the ascending limb there rises a conical obtuse point, from behind which there issues a spine that inclines backwards over the anterior ridge of the operculum. In the 'Histoire des Poissons' it is stated of *Syn. brachio*, that "*aucune des pièces de la tête n'est épineuse.*" In our specimen the preopercular spine is a quarter of an inch long, and has the usual translucency of a spinous point, although it appears, like the other bony projections on the head, to have been well covered with warty skin in the recent fish. Three cylindrical ridges, like ribs, radiate from the base of the operculum, shine through the integument, and end in obtuse points a little within the verge of the skinny border of the gill-cover. A fourth ridge or rib, apparently belonging to the suboperculum, runs obliquely from under the tip of the second opercular ridge to the tip of the upper one, supporting the little tapering flap which forms the extreme point of the gill-cover, and lies over the upper angle of the branchial opening. These parts having been sewed up in preparing the specimen, I am unable to ascertain with certainty whether there be actually a small ring above this tip, as in *S. horrida*, or merely a loop or angle of the gill-opening, but am inclined to believe that the latter was the case.

The *skin*, when moistened, becomes mucous and spongy. The lips are fringed by many short, divided filaments, those on the lower jaw being mostly palmated. On the extreme edge of the snout, near the upper point of the suborbitar of each side, there is a little simple barbel. The body is studded with soft, rounded, wrinkled warts, each having a firm central point. These warts are largest on the shoulder, and become much smaller, and are further apart, on the belly. The skin, for a finger's breadth along the base of the dorsal, has few or no warts. The *lateral line* is furnished with about twelve thick, sessile, wart-like cirrhi, the last of which is placed on the basal quarter of the caudal, between its middle rays.

RAYS:—B. 7; P. 16; V. 1|5; D. 13|6; A. 3|5; C. 13.

Seven *branchial rays* can be counted on the left side of the fish, the two lower ones being much more slender than the rest. The pectorals are oblique, and coarsely crenated by the projection of the ends of the rays and notching of the membrane. The space between the fins on the throat is greater than that occupied by the attachment of each fin to the humeral bones. The length of the pectoral, measured from the lowest and shortest ray to the edge of the upper rounded part, is exactly equal to one-third of the total length of the fish, caudal included, or a little more than the distance between the upper lip and tip of the gill-flap. The *ventrals* measure half the extreme length of the pectorals, and are bound lengthwise to the belly up to their tips. The dorsal commences immediately behind the occiput, the three first rays rising from a depression which is flanked by the reverted temporal plates. The second spine is the tallest, and the membrane of all the three is deeply notched, particularly behind the third one, where it descends to the base of the fourth spine. These three spines also alternate more to the right and left side of the membrane than the spines which follow. The fourth spine equals the first or third one in height, and the succeeding ones shorten very gradually to the ninth and tenth, which are about one-third shorter. The three following spines increase successively in height, and more rapidly, so that the twelfth equals the first, third and fourth, and the thirteenth is the tallest of all the spines; but it is overtopped by about one-third of the soft fin: this is rounded, its three middle rays are the tallest, and the sixth and last ray is forked to the base, is shorter than the rest, and is bound to the tail by an edging of membrane which runs from its tip to the base of the caudal. The rays of the anal are very oblique, and though about as long as those of the soft dorsal, the fin does not rise nearly so high: the last ray is bound down its whole length to the tail, but the membrane does not run from its tip to the caudal: the three spines are short, curve backwards, and are not pungent. The caudal is small and rounded, and contains thirteen rays, the two extreme ones being shorter than the rest. All the fins are enveloped in thick skin, which towards the tips of the rays is rough and warty. This is especially the case on the dorsal spines.

The colour of the specimen, when moistened, was dark brown, paler towards the ventral surface. The pectorals and caudal appeared dark at their tips, and were crossed on their basal halves by two conspicuous whitish or pale yellow bands, and several streaks on a brown ground. The soft dorsal and anal were crossed by pale, oblique bands.

Dimensions.	inches.	lines.
Length from edge of snout to end of caudal fin	10	1
——— base of ditto	8	8
——— anus	6	8
——— tip of gill-flap	2	10
——— first dorsal spine	2	1
Height at ventrals	4	0
Thickness at pectorals	3	6
Height of second dorsal spine	0	9
——— tenth	0	$6\frac{1}{2}$

Dimensions.	inches.	lines.
Height of thirteenth	0	$8\frac{1}{2}$
——— of soft dorsal	1	0
Extreme oblique length of pectorals	3	6
Length of ventrals	1	$9\frac{1}{2}$
——— space between pectorals	2	2
——— caudal fin	1	5
——— from anus to anal fin	0	$6\frac{1}{2}$

Scolopsis longulus (*Nob.*), Scolopsis of Torres Straits.

No. 32. Mr. Gilbert's collection.

This *Scolopsis* was seen by Mr. Gilbert in Port Essington, but in the entrance of the harbour only. It has no striking individual peculiarity by which it can be distinguished from the known members of the genus, though none of the species described in the 'Histoire des Poissons' present the same combination of external characters.

It is an elongated species, the height of its body being only one-fourth of the total length, caudal included. The length of the head rather exceeds the height of the body. The cheeks, operculum, sub-operculum and interoperculum are covered with scales regularly disposed in oblique lines. The naked skin goes back on the forehead as far as the posterior quarter of the orbit, and, as in *Sc. temporalis*, runs out a little on the temple. The preorbitar and limb of the pre-operculum are also naked. The lower edge and rounded angle of the preorbitar are quite entire, the angle does not project, and the ascending edge of the bone is almost straight, being rendered slightly concave, merely by the projection of the spinous point beneath the orbit. The edge of the bone is armed from this point nearly to the angle by about ten small teeth; there is one small tooth on the second suborbitar, under the middle of the eye, pointing backwards, and five or six minute irregular ones farther back, but no spine on the suborbitar chain which points forwards. The anterior margin of the orbit rises into a small obtuse eminence between the nostrils and the eye, as in the *Siganoideæ*. The preoperculum has a convex under-limb, with a largely rounded angle, both quite entire. The ascending limb is equally and acutely toothed from its upper end to near the round of the angle. None of the teeth are everted. The opercular spine, very short, not pungent and placed high up, bears a strong likeness to the spine of a *Helotes*. There are no grooves on the operculum, which is entirely covered with scales, concealing completely its junction with the suboperculum. The supra-scapular resembles a scale with a strongly toothed edge, and a row of scales, distinguished from the others by darker integument and grooved bases, extends from it in an oblique direction across the nape. The naked skin of the head is full of pores.

The scales of the body are closely and conspicuously toothed on the margin. They are pretty large, there being only thirty-nine in a row between the gill-opening and the caudal, not reckoning a few small ones on the base of the fin; and thirteen or fourteen in a vertical row, two of which are above the lateral line. The lateral line runs straight until it arrives under the posterior part of the dorsal, when it makes a descending curve and becomes straight again; it is composed of scales smaller than the others, as in *Sc. Vosmeri.*

Rays:—Br. 5; D. 10|9, the last one divided; A. 3|7; P. 17; C. $15\frac{4}{4}$; V. 1|5.

The dorsal spines are slender and acute; the fourth is the tallest, and the tenth is a little shorter than the second, but one-third longer than the first, which again is nearly half the length of the fourth. The third is the longest of the anal spines, and the first is nearly half as long as the second one. The ventrals are drawn out into a short filamentous tip. The caudal is lunate on the margin, the upper lobe being a little longer than the lower one.

The colours of the dried specimen have faded, but a pale band can still be traced from the upper part of the gill-opening to the caudal fin, coinciding with the lateral line after its curve. There were perhaps two other stripes higher on the back, but the vestiges of them are very obscure. The belly below the level of the pectoral is pale. The scales of the back and sides are each marked by a dark stripe parallel to its exterior margin.

Dimensions.	inches.	lines.
Length from intermaxillary symphysis to tip of tail	6	11
——— base of caudal	5	8
——— anal fin	3	9
——— dorsal fin	1	10
——— tip of opercular spine	1	$9\frac{1}{2}$
——— centre of eye	0	11
Diameter of orbit	0	5
Length of pectorals	1	3
——— ventral spine	0	$8\frac{1}{2}$
——— ventral soft rays	1	3
Height of fourth dorsal spine	0	$9\frac{1}{2}$
——— soft rays of dorsal	0	9
——— third anal spine	0	6
——— soft rays of anal	0	8
Length of upper caudal lobe	1	5
——— central rays of ditto	0	$9\frac{1}{2}$
Depth of caudal fork	0	4

Amphiprion melanostolus (*Nob.*), Black-bodied Amphiprion.

No. 26. Lieut. Emery's drawings.

Lieut. Emery's portfolio contains a drawing of an *Amphiprion* taken at Depuch Island, which resembles the *polymnus* of Bloch. It is less elevated at the pectoral fins, and its soft dorsal and anal are rounded and not angular, but its form in other respects is much like that of *Anthias Clarckii* (Ben. Fishes of Ceylon, No. 29). Its resemblance to a Chinese *Amphiprion*, which is perhaps the *chrysopterus* of the 'Histoire des Poissons,' is still more striking, the chief difference in form being that the latter has the caudal shortly swallow-tailed, while in *melanostolus* that fin has a shallow crescentic margin with the angles slightly rounded. In colours it approaches most nearly to the *Amph. xanthurus* (C. and V., v. p. 402), which is swallow-tailed like the Chinese one.

The three vertical bands of *melanostolus* are white; the head, body and fins, the caudal and pectoral excepted, are black. The first vertical band descends from before the dorsal, nearly touches the eye, and dilates so as to take in the whole gill-cover and the cheek nearly to the mouth; it is then continued downwards to join its fellow on the under surface of the head. The posterior edge of the gill-cover is fawn-coloured, but the breast is black like the rest of the body. The second band begins by a triangular tip on the three or four first jointed rays of the dorsal, is moderately broad, and terminates on the belly immediately before the anal. The base of the pectoral is black, the rest of it primrose-yellow. The caudal is of a paler yellow tint, and a narrow oblique white band, broadest above, separates it from the black tail. The soft dorsal has a narrow yellow border.

The individual from which the drawing was made measured two inches and three-quarters in length.

AMPHIPRION? RUBROCINCTUS (*Nob.*), Red-banded Amphiprion?

No. 25. Lieut. Emery's drawings.

This fish, judging merely from its general form and the distribution of its vertical bands, is also an *Amphiprion*, though probably, from the minuteness of the specimen, the drawing does not distinctly show the peculiar form and armature of the preoperculum and gill-cover. The length of the individual, which was captured at Depuch Island, was an inch and a quarter.

The head is covered with scales, the depression of the dorsal at the junction of its spinous and jointed portions is very slight, and the caudal fin is much rounded, like that of *bifasciatus*. The mouth is lower down than that of *melanostolus* or *Clarckii*, and opens directly forwards, the snout is obtuse and fully as long as the lower jaw, and the profile from the mouth to the dorsal is boldly arched.

The body is black; the under jaw, throat and breast, the distal half of the tail, and all the fins are vermilion-red. The bars are white: the nuchal one, which is the widest of the three, narrows gradually as it descends; the middle one begins by an angular point at the commencement of the soft dorsal, is narrow throughout, is curved boldly, with the concavity towards the tail, and terminates at the anus. The third bar, which is also narrow, encircles the tail, separating the red base and membrane of the caudal from the black of the body. In Lieutenant Emery's figures of this and the preceding species, the spinous rays of the dorsal are represented as exceeding ten, the usual number in the genus.

PAGRUS LATUS, Solander's Pagrus.

Sciæna latu, Solander, Pisces Austr., p. 25. Parkins., pl. 72.
——— *aurata*, G. Forster, pl. 208?

On Cook's first voyage a sparoid fish was taken on the coast of New Zealand, which was described by Solander and figured by Parkinson under the appellation of *Sciæna lata*, but which seems afterwards to have been considered by some one as the *Sparus erythrinus* of Linnæus, that name being written in pencil under the figure. It is however evidently a *Pagrus*, and a species nearly related to *guttulatus* and *micropterus*. Solander's description, which is subjoined, with the omission of some passages relating to generic characters only, does not accord so closely with the short notices of these species in the 'Histoire des Poissons' as to permit us to refer it to either of them; yet having neither authentic specimens nor figures to compare with Parkinson's drawing, I cannot point out their distinctive characters in detail. In the soft part of the dorsal being higher than the spinous part, Solander's fish resembles *micropterus*, but that species has only two small anal spines; the size of the specimen was greater than the examples of *guttulatus* or *micropterus* mentioned by Cuvier, which were from five to nine inches in length.

"*Sciæna lata* (fig. pict.). Habitat in oceano Australiam alluente inter Opooragi et Owhooragi. Corpus ovato-oblongum, compressum. Caput breve, declive, obtusum, infra et intra oculos nudum, in vertice squamosum; squamis parvis. Laminæ operculorum squamis majusculis tectæ. Labia crassa, carnosa. Maxilla superior paulo longior. Dentes tantummodo in maxillis et fauce. Dentes maxillares duplici serie dispositi; exteriores conici, obtusiusculi, interiores rotundati, subhæmisphærici. *Obs.* Anticè intra seriem interiorem, nonnulli parvi, rotundati sparsi; faucium subulati, majusculi, parum inflexi. Oculi magni, iris argentea, nebulis ferrugineis, pupilla magna nigra. Pinna dorsalis, longa, 22-radiata; radiis 12 anterioribus spinosis paulo longioribus. Pinna ani 12-radiata, radiis tribus anterioribus spinosis, reliquis muticis, duobus posticis approximatis. Pinnæ pectorales lanceolatæ, paulò pone medium trunci extensæ, 14-radiatæ. Pinnæ ventrales, oblongæ, acutæ, pectoralibus $\frac{1}{3}$ brevioribus. Pinna caudalis 17-radiata, bifurca, lobis acutis, inferiore breviore. Squamæ majusculæ, duræ, adhærentes. *Color.* Piscis totus nitens, e rubicundo argenteus, fasciis quinque latis obsoletis, altius rubicundis: 1^{ma} pone caput, 2^{da} in medio pisce, 3^{tia} supra initium pinnæ analis, 4^{ta} inter finem pinnæ dorsalis et analis, 5^{ta} in ultimâ caudâ. *Obs.* Gula, pectus et abdomen albæ immaculatæ. In dorso, præcipueque propè lineam lateralem, maculæ plurimæ rotundæ e cæruleo argenteæ, sparsæ. Pinna dorsalis dilutè rubicunda, maculis rotundis glaucis adspersa. Pinnæ pectorales rubicundæ. Pinnæ ventrales albidæ, in medio glaucescentes. Pinna analis albida, posticè glauca. Pinna caudalis rubra, margine inferiore albo. Diameter longitudinalis piscis 16 uncias, perpendicularis $5\frac{1}{2}$, transversalis $1\frac{3}{4}$. Radii :—Br. 6; D. 12|10; A. 3|9; C. 17; P. 14; V. 1|5."—*Pisces Austr.*, p. 26.

Parkinson's sketch represents the ground colour of the body as aurora-red, with an oblong vertical spot of a deeper tint on each scale. The *Sciæna aurata* of G. Forster, pl. 208, taken in Queen Charlotte's Sound on the 18th of October 1774, may be the same species, though the fin-rays do not exactly correspond, being, as near as they can be made out from the figure, D. 12|12, A. 3|6; nor are the scales of the opercular pieces shown. Forster ascertained the native name of this fish to be "ghooparee."

[To be continued.]

XLIII.—*Some Remarks on the Structure of Dotted Vessels**. By Professor Hugo Mohl. *Translated from* 'Linnæa,' vol. xvi. p. 1, 1842, *by the* Rev. M. J. Berkeley, M.A., F.L.S.

[With two Plates.]

Notwithstanding the numerous observations which have been published on the structure of dotted vessels, the more recent treatises on the anatomy of plants show that no generally received notions prevail at present on the subject. It may not therefore be superfluous if in the following pages I submit to a more complete investigation some points in their structure to which my attention was turned last year when preparing a dissertation on the subject.

That the difference between my views and those of other phytotomists may be more easily seen, I shall briefly bring together the notions which have been more recently expressed on the subject.

Although many of the earlier observers, especially Leeuwenhoek, Hill, Van Marum, and Hedwig, were acquainted with the dotted vessels, they were first expressly distinguished from the spiral and scalary vessels by Mirbel. He considered their dots as elevations which projected on the exterior of the vessels, and were perforated by a real aperture. He was not acquainted with the articulations of these vessels, and he altogether denied the transition of different forms of vessels into one another. As he distinguished the border from the dot, and was acquainted with the uniform membrane extending between the dots, although his observations in many respects were not correct, he nevertheless laid a founda-

* Getüpfelten Gefässe (glandular fibre and in part dotted ducts, 'Lindl. Introd.' 1832.)

tion on which succeeding phytotomists might have built, and which required only a slight modification to be consistent with facts. This however did not take place, but certain German phytotomists put forth a string of notions which were so many retrograde steps in the knowledge of these vessels.

Sprengel, 'Anleit. zur Kenntniss der Gewächse,' 1802, vol. i. p. 103, first laid the foundation for many later erroneous notions, by deriving the dotted vessels, which he moreover confounded with the scalary vessels, from a confluence of the spiral threads. He was acquainted with the articulations, and attributed them to a strong contraction at different intervals.

Another view which has lately met with many advocates originated with Bernhardi, 'Ueber Pflanzengefässe,' p. 35. He had the merit of discovering the outer membrane of spiral vessels, and referred equally the formation of scalary and dotted vessels to spiral vessels, but in a different way from Sprengel. He supposed the dots to be the isolated fragments of a broken spiral thread.

Treviranus, 'Vom inwend. Bau der Gewächse,' p. 55, deserved especial praise, as regards the intimate knowledge of the structure of vessels, for his discovery of the composition of these organs of distinct coats. He considered the vascular tubes (*Gefässschläuche*) as metamorphosed ligneous tissue (*Holzzellen*), 'Beitrag zur Pflanzenphysiologie,' p. 17, and supposed that there were dissepiments corresponding with the transverse bands, though at a later period they became evanescent. As regards the structure of the dots he is uncertain. He is the first who observed that in the wood of sassafras those parts of the vessels which abut on the medullary rays are furnished with dots of a different form. He considers the dots in general as elevations, but the latter form as apertures.

Moldenhauer, 'Beiträge zur Anatomie der Pflanzen,' p. 264, like Sprengel, derived the porous vessels (*porösen Gefässe*) from spiral and annular vessels, between the threads of which transverse threads had been formed. According to his notion, the threads lay on the outer side of the primary wall of the tube. The assertion, that in the vessels of the lime-tree those sides which abut on another vessel present the form of a porous vessel, while those abutting on cells, on the contrary, have the structure of a spiral vessel, has been unjustly called in question by some later phytotomists.

G. R. Treviranus, 'Vermischte Schriften,' vol. i. p. 149, explained the structure of the dots far more correctly than any of his predecessors, when he regarded them as elevations of the walls of the vessels which are hollow on one side, and have in the middle a puncture-like depression (*Vertiefung*) with a raised border.

Meyen, 'Phytotomie,' p. 227, followed Bernhardi in the supposition that the dots are fragments of a broken spiral thread, only he made the matter still worse by considering the thread as the primary and the tube as the secondary formation.

Link, 'Annal. d. Sc. Natur.,' t. xxiii. p. 152, likewise derived the dots of the vessels from the fracture of a spiral thread. He considered the spiral thread itself as hollow. According to his views, porous vessels are not peculiar organs, the dots themselves being portions of spirals which are shorter than in the scalary vessels; in other cases they are swollen portions of the hollow spiral thread.

In certain treatises which appeared in 1831, ('Ueber den Bau der porösen Gefässe, in den Abhandl. der Acad. zu München,' vol. i. p. 445; 'Ueber den Bau der grossen getüpfelten Röhren von *Ephedra*, in der Linnæa 1831;' 'De Palmarum Structurâ,' §. 26–29), I endeavoured to prove that the structure of the scalary vessels and dotted tubes is in reality analogous to the structure of the dotted cells. I derived the vessels from membranous closed cells, on whose inner surface at a later period membranes and threads are deposited, and whose dissepiments were either completely absorbed or perforated in a reticulate or scalary fashion. With respect to the dotted vessels, I made it appear that the structure accommodated itself to the condition of the neighbouring elementary organs; that the dots were thinner portions of the wall of the vessel, and the border depended on a cavity situated on the outside of the wall of the vessel.

Latterly Link, 'Element. Phil. Bot.,' ed. sec., vol. i. pp. 117, 181, distinguished two forms of vessels under the names of porous and dotted vessels, but the difference assigned is not clear to me. The porous vessels he derived from spiral vessels, whose hollow thread at certain points contracted and then became evanescent, so that the individual fragments of the thread lost their connexion with one another. The dotted vessels are beset with dots, which are relics of spiral vessels, which however become invisible.

The two latest treatises on the dotted vessels of Meyen, 'Neues System der Physiologie,' vol. i. p. 117, and Schleiden, 'Flora,' 1839, vol. i. p. 327, nearly agree with each other. Both derive the dots from fissures which the threads of the secondary coat of the tubes leave open at certain places, in which they are not confluent with each other. Both follow my view of the nature of the border. Schleiden makes the cavity which gives rise to the border contain air, and supposes the fissure which runs above it to be at length rounded off by the further deposition of formative matter. A dependence of the formation of the walls of the vessel on the condition of the neighbouring elementary organs is altogether denied by Meyen.

After this exposition of the more important results of the more recent investigation of the anatomy of dotted vessels, I turn to my own later inquiries, and the first point which demands notice is the fact, that in the dotted vessels of most plants the individual tubes do not possess a uniform structure all round, but that their walls, according as they are in contact with different elementary organs, exhibit not unimportant modifications of structure. That such a relation between the dotted tubes and the neighbouring elementary organs does exist, is indicated by the two isolated cases cited above, observed by Treviranus and Moldenhauer; I have lately endeavoured to show that this appearance is more generally exhibited. I have shown that the structure observed by Moldenhauer in the lime is found in other plants, as in the maple (*Feld-ahorn*), and that the medullary rays in many plants exercise a powerful influence on the structure of the walls of the dotted tubes, as in those parts of the vessel which are in contact with the medullary rays, the dots have an irregular form, are surrounded by no border, are always situated in those places only to which a neighbouring cell is closely pressed, but never where the lateral walls of a neighbouring cell stand perpendicular to them; that moreover the dots of two vessels applied immediately the one to the other exactly correspond. These circumstances, as also the frequently and easily observed phænomenon, that the dots of contiguous cells answer to one another in respect of situation and form, incontestably prove that the organization of the secondary coats of the elementary organs of vegetables stands in close connexion with that of the secondary coats of contiguous elementary organs.

The truth of this position has been much contested, and Meyen especially, 'Physiol.,' vol. i. p. 157, denied that a proof of it could be derived from the structure of the dotted tubes, for he believed the appearances observed by me were analogous to the circumstance, that in the greater part of *Coniferæ* the lateral walls only of their tubes are studded with dots, but not those turned towards the bark and pith. A surprising argument surely, for the dotted tubes of *Coniferæ* show with the greatest certainty the influence which the contact of different organs has upon the organization of a third; so that, in these tubes, those portions only of the lateral walls which abut on other tubes are furnished with large dots surrounded by a border, while in the portions abutting on the medullary rays in most species of *Pinus, Juniperus*, &c., are many small dots destitute of a border, which agree altogether with those which appear on the cells of the medullary rays themselves. Not only the dependence of their formation upon the contiguous organs appears from these tubes, but also more especially from the circumstance that the organization peculiar to the dotted tubes takes place only in such parts as are not subjected to that extraneous influence proceeding from cells.

It will scarcely be objected successfully to the above position, that the influence of contiguous cells cannot be proved in the dotted tubes of all plants, since in a portion of them the dotted tubes exhibit uniform dots in every part, whether in contact with cells or vessels. This clearly proves only thus much, that the influence which neighbouring cells exercise on the formation of vessels is not so important under all circumstances as to prevent the formation of that species of dots peculiar to porous tubes, but that in some plants the power of organization peculiar to the vessels is so exceedingly strong, that, notwithstanding the influence of the neighbouring cells, the peculiar structure of the dotted tubes is effected more or less completely. But from such exceptions an inference can by no means be deduced that this influence does not exist at all *.

* If we consider generally the dependence of the organization of the secondary coats of one elementary organ on that of neighbouring elementary organs, it appears that in this respect there are many degrees of intensity, and that the circumstance is of especial importance, whether the secondary coats of an organ exhibit or not a more or less evident spiral structure. When, for instance, in an elementary organ, whether it be a cell or vascular tube, the secondary coats exhibit a very decided and regular spiral structure, we can find no trace of any influence of the neighbouring organs on the formation of these spiral secondary coats. We observe, then, dextral and sinistral, closely and distantly wound spiral vessels, containing one or more threads, lying near each other; and in like manner, spiral cells similarly circumstanced when their threads are well-developed. In either case the independence of the neighbouring organs appears not only from their threads running in different directions, but especially from the circumstance that the intervals between the threads run uninterruptedly over the angles of their own elementary organ, and over the places where the walls of neighbouring organs stand perpendicular to the outer surface of the former. If, on the contrary, the spiral structure is less decided, and the secondary coats do not any longer assume the form of isolated threads, but exhibit only a spiral streak, there commences immediately a dependence of one elementary organ on its neighbour. If under such circumstances dots are formed, they correspond exactly in their position, but only imperfectly in form, since in either elementary organ lying on the other they may be elongated in the direction

The firmer establishment of what has been asserted will be found in the facts which I shall now detail.

If we examine the organization of dotted vessels with reference to their circumference, we find that in a proportionally small number only of Dicotyledons they possess a structure independent of the surrounding organs. Hence such vessels only come naturally under observation in which, on accurate inquiry, one is really convinced that they do stand in contact with elementary organs of a different nature, and therefore all vessels must be excluded which are surrounded only by prosenchymatous or parenchymatous cells, since these always have on every side uniform walls. If we observe vessels running along unconnected with such cells, as *e.g.* is normally the case in *Rhamnus capensis, Viburnum Opulus*, we find a series of modifications of vascular structure in which the influence of the contiguous organs is in general exhibited with great distinctness.

A. The peculiar structure of the dotted vessels is most perfectly developed in those plants in which the walls of the vessels exhibit no variations, whether standing in contact with other vessels or with cells, in which they are therefore studded uniformly with dots which are surrounded by a border, as in *Elæagnus acuminata, Clematis Vitalba, Broussonetia papyrifera.*

B. To these vessels succeeds a second form, in which those sides of the vessels which stand in contact with prosenchymatous cells are in like manner furnished with equal dots surrounded by a border, but in which the influence exercised by the neighbouring cells is declared by the fact that the dots on the walls which abut on the cells are placed at greater distances. Such vessels occur in *Bixa Orellana, Acacia lophantha, Sophora Japonica.*

C. With a stronger, more decided dependence of the vessels on the cells, the walls abutting on other vessels remain

of the spiral, and, therefore, if the spirals in both are homodromous[1], they cross one another. The more indistinct the spiral structure of the secondary membrane is, and the more it approaches to a reticulate form, the more visible is the dependence of the secondary coats of one organ on those of another. The dots of both organs now correspond not only in position, but also in form and in the direction of their major axis, as for instance in scalary tubes; therefore they no longer cross with those of the contiguous organ; they no longer run over the angles of their own organ, but are closed in their neighbourhood, and are influenced in length by the size of the lateral facets of the contiguous organ. On this depends the difference which we find between the lateral walls of scalary tubes, according as they abut on a vessel or cell, &c.

[1] Compare Ann. and Mag. Nat. Hist., vol. viii. p. 19, and note.—Ed.

very thickly studded with dots; only those in contact with prosenchymatous cells are set with very remote dots, or even (at least for considerable distances) quite free from them. The portions bordering on the medullary rays have simple dots. Such vessels occur in *Sambucus nigra, Betula alba, Aralia spinosa, Corylus Avellana, Populus alba, Alnus incana, Platanus occidentalis, Pyrus malus, Gymnocladus Canadensis.*

D. With a yet stronger influence of the contiguous cells, which possess more commonly the form of parenchymatous than prosenchymatous cells, those portions of the walls only which abut on other vessels exhibit dots surrounded by a border; those portions, on the contrary, abutting on cells, have frequent and large perfectly borderless dots, altogether resembling those of the parenchymatous cells, *e. g. Cassyta glabella, C. filiformis, Bombax pentandrum* (Pl. VII. fig. 12, 13), *Hernandia ovigera.*

E. We have a mere modification of this structure, though possessing a very peculiar appearance, in the form in which the walls which abut on another vessel are fashioned like scalary vessels (Pl. VIII. fig. 2, from *Chilianthus arboreus*), in consequence of the dots being drawn out into fissures which extend the whole breadth of the vessel, while the walls which are contiguous to cells are studded with large unbordered dots (Pl. VIII. fig. 1.). This form is beautifully developed in *Chilianthus arboreus* and *Cynanchum obtusifolium.* In a less degree the same phænomena are exhibited by *Vitis vinifera* in the walls contiguous to vessels.

The greater number of dotted vessels can be referred to one of the heads just enumerated. We have however now to examine in addition a series of vascular forms which agree in the intervals between the rows of dots not being smooth, but marked on the interior wall with a spiral line.

These vessels are to the ordinary dotted vessels what the dotted tubes of *Taxus* are to the other *Coniferæ.* In these vessels not only similar variations occur, as regards the distribution of the dots, as in the lately enumerated vascular forms, but other differences occur, according as a part or all the vessels possess these spiral threads. In some of these plants we may, for instance, though not very nicely, distinguish greater and less vessels of a not always similar structure; their vessels form groups, especially in the inner part of the annular rings, and near these groups, which consist of large vessels, lie others of a far less calibre, whose tubes approach more to the form of prosenchymatous cells, and which I shall indicate in what follows by the name of little vessels.

These vessels may be arranged under the following heads:

F. Collective vessels covered with bordered dots: the larger have smooth walls; in the less, spiral threads run between the rows, *Morus alba, Ulmus campestris, Clematis Vitalba.*

G. Collective vessels closely dotted: between the rows of dots lie small threads, *Hakea oleifolia.*

H. The larger vessels dotted, the less without dots; the walls of both furnished within with spiral threads. *Daphne Mezereum* (Pl. VIII. fig. 7, 8), *Passerina filiformis, Bupleurum arborescens, Genista canariensis.*

I. Walls of vessels which abut on other vessels dotted; those contiguous to cells with distant dots or entirely free from them; walls of either kind of vessels furnished with threads. *Samara pentandra, Tilia parvifolia* (Pl. VIII. fig. 6), *Æsculus Hippocastanum, Acer Pseudo-platanus, Cornus alba, Ilex Aquifolium, Cratægus oxyacantha, Prunus Padus, P. virginiana.*

If we take a glance at what has been said, it is clear from the facts alleged, that the uniformity of the structure of dotted vessels, asserted by phytotomists, exists only in comparatively rare cases; moreover, that the single point in which dotted vessels agree (and even here we must pass unnoticed the smaller vessels mentioned under H.), and by which they are distinguished from other vascular forms, is the presence of dots surrounded by a border, and which lie at least on those sides which are in contact with other vessels.

Under these circumstances then the question arises whether all the alleged vascular forms are to be regarded as dotted vessels, or those vessels only which on all sides exhibit bordered dots, reckoning the rest as mixed vessels, or whether new divisions of vessels are to be grounded on these differences.

In my opinion the first is the proper course. All these vessels possess a common character in the structure of their bordered dots, by which they are easily and surely distinguished from other vessels; and on the other hand, considering them collectively, the presence of dots coincides with the peculiar condition of the embryo of Dicotyledons. If, on the contrary, we regard as mixed vessels all those whose walls exhibit an abnormal structure, our notions, so far from gaining, would only lose in precision. Under the name of mixed vessels, those vessels are usually understood whose different tubes, placed in a line one above the other, exhibit a different structure; *e. g.* they pass from the scalary form into that of annular or spiral vessels. So far as a distinct rule exists in this alternation of vascular forms in many plants, especially in Monocotyledons, the proposal of mixed vessels as an express division is fair enough. But if we would regard as mixed vessels those in which the different sides exhibit a different structure, we confound two things which possess nothing in common, as in the former case the structure of the vessels depends on the course of the vascular bundle, in the latter on the structure of the contiguous elementary organs.

In my opinion nothing could be worse than to have recourse to different names for every slight modification of the dotted vessels. Some modern phytotomists have, alas ! taken this path with respect to cellular tissue, a path which would soon lead to the same lamentable labyrinth of terminology in the anatomy of plants as perplexes us in systematic botany.

Most phytotomists make the difference between dotted and scalary vessels to consist in the presence of many small dots. But magnitude and number are far too relative notions upon which to ground an accurate division; we must therefore search for some better distinctive marks. Kieser believed the transverse bands (*Querbänder*) to be characteristic of the dotted vessels as well as the dots; but that such is not the case, inasmuch as these bands are merely the limits of the successive tubes, and also occur in other vascular forms, is clear from the satisfactory inquiries of Moldenhauer and others.

Since these characters also are of no value, we must look for the distinctive sign of the dotted vessels in the structure of the dots themselves, and especially in the circumstance that either all the dots, or at least those which lie on the walls abutting on another vessel, are surrounded by a border.

I should esteem it superfluous, after what I have brought forward in my earlier labours on the structure of bordered dots, to recur to this point if some interest did not appear to be attached to an enumeration of the modifications which are found in the dots of different plants.

Of all the plants I have examined, none appears so fit for acquiring a knowledge of the structure of these organs as *Cassyta glabella*, on account of the remarkable size of its dots (Pl. VII. fig. 1). In this plant, if we take delicate transverse or longitudinal slices (Pl. VII. fig. 2), we can with the greatest certainty be convinced that the border of the dots depends on a cavity (*a*) which lies between the contiguous walls, and that the dot itself (*b*) is a canal running from the inside of the vessel to this hollow, and at its outer extremity closed with a delicate membrane. It is rather more difficult to recognise the structure in other plants, yet in those whose dots are not too small, as in *Laurus nobilis* (Pl. VII. fig. 9), *L. Sassafras*, *Aleurites triloba*, *Acacia lophantha*, it is quite possible with the help of a good microscope to do so.

If we examine the walls of dotted vessels in a direction perpendicular to their surface, we find in almost all plants that both the punctures themselves and the border are extended in length, in a direction transverse to the vessel. In consequence the little cavity towards which the canal of the dots leads, and which produces the border, has an elliptic outline. The canal, on the contrary, does not form an elliptic tube of uniform width, but has a form somewhat more complicated. It is compressed in the direction of the axis of the vessel, but at the same time widened in the direction of its diameter. The inner aperture, therefore, of the canal presents a shorter or longer fissure; the outer, closed by the primitive membrane, presents an ellipse more or less approaching to a circle. If we examine the vessel on its inner surface, and look perpendicularly into a canal, we see the lateral portions of its walls running down obliquely towards each other in the shape of two gutter-like surfaces (Pl. VII. fig. 4, *Cassyta glabella*); while its upper and lower walls are invisible, being perpendicular to the eye of the observer. From this form of the canals it is clear why they appear under a different aspect according as a section is made vertically or transversely; in the former case (Pl. VII. fig. 9, *Laurus nobilis*) they exhibit a conical, in the latter (Pl. VII. fig. 2, *Cassyta glabella*) a cylindrical outline. Moreover a transverse section exhibits a very different form, according as it is made near the outer or inner aperture. In the former case it has a broad elliptic form; in the latter it has more resemblance to a linear fissure. This is clearly visible if a longitudinal section be made in an oblique direction through the wall of a vessel.

The extension in width which the canals of the dots exhibit within, is in a portion of Dicotyledons not very remarkable, so that the inner aperture is shorter than the border of the dot; *e.g.* in *Cassyta glabella* (Pl. VII. fig. 1, 4), *Bombax pentandrum* (Pl. VII. fig. 12), *Bixa Orellana, Acacia lophantha, Sophora japonica, Salix alba, Aralia spinosa*; in other plants, on the contrary, the inner aperture presents a fissure which is longer than the border, *e. g.* in *Laurus Sassafras* (Pl. VII. fig. 5), *Aleurites triloba* (Pl. VII. fig. 6, 8), *Clematis Vitalba* (Pl. VIII. fig. 4), *Cornus alba, Morus alba, Gymnocladus canadensis, Elæagnus acuminata* (Pl. VII. fig. 10, 11). In this case it very frequently happens, and in many vessels with a certain degree of regularity, that the fissures of neighbouring dots run together, so that the inner wall of the vessel is pierced with transverse or obliquely situated grooves, into which from two to six and often more canals open. Exactly the same structure as in the elliptic dots is found in the transverse fissures which in *Chilianthus arboreus* clothe the walls of the vessels which abut on other vessels (Pl. VIII. fig. 2), and give them the appearance of scalary tubes. Each of these fissures is surrounded by a border which depends upon the existence of a linear cavity running beneath the fissure, which is much wider than it, as is plainly observable in vertical sections of contiguous vessels (Pl. VIII. fig. 3). They are distinguished at first sight from ordinary scalary tubes, though so similar in other respects, by the presence of this cavity, of which no trace exists in scalary vessels, as we may convince ourselves in tree-ferns and large Monocotyledons.

Besides these bordered dots which distinguish dotted from other vessels, as we have seen above, there is, in a great number of plants, yet another modification of dots which are surrounded by no border. These are most frequently found in those situations which lie near to medullary rays; there are however also vessels in which all the walls not in contact with another vessel exhibit this form of dots, *e. g. Cassyta, Bombax pentandrum* (Pl. VII. fig. 13), *Hernandia ovigera, Chilianthus arboreus* (Pl. VIII. fig. 1). These dots have generally a far less remarkable size than those which are bordered, and generally a transversely oval form. On a more accurate examination they are found to be surrounded by a double line, so that in many cases (especially in *Aleurites triloba* (Pl. VII. fig. 7)) one might almost be forced to ascribe to them also a small border. A more perfect inspection, especially of an oblique section of the walls of these vessels, shows, on the contrary, that between these dots and the neighbouring organs no cavity exists, but that they are formed by a simple perforation of the secondary coat, and therefore accord perfectly with the dots of parenchymatous cells, reticulate vessels and scalary tubes. The double line surrounding the orifice of the dots arises from their being generally somewhat wider towards the inside of the vessel; and therefore, if we examine them in a direction perpendicular to the wall of the vessel, both the inner orifice of the canal of the dot in the inside of the vessel, and the outer closed by the primary coat, are at once visible. If, as is not rarely the case, the canal perforates the wall of the vessel in a somewhat oblique direction, if we look down perpendicularly upon the walls, both these lines coincide on the one side of the dot, or cross each other (Pl. VIII. fig. 5 *a a, Cactus brasiliensis*).

It is clear, that the dotted vessels, by means of this last kind of dots, form the transition to scalary and reticulate vessels, as they exist in vascular Cryptogams and Monocotyledons, for the walls possessing these dots agree perfectly with the walls of scalary vessels which abut on parenchymatous cells. The relation of these two forms of vessels is also indicated by the fact, that in particular Dicotyledons the dotted vessels are altogether replaced by reticulate vessels (Pl. VIII. fig. 5, *Cactus brasiliensis*). As regards the transverse dissepiments of dotted vessels, I confine myself to a few remarks, as I have before proved that the dissepiments of vascular tubes are not always, though the case is generally otherwise, absorbed in the course of the formation of vessels, but sometimes remain, though in that case pierced with real perforations. In the dotted vessels these dissepiments appear chiefly under two forms: either the original dissepiment in great part remains, and a round aperture is formed in its centre, whose diameter is about one-half or one-third of that of the dissepiment; *e. g. Cassyta glabella* (Pl. VII. fig. 3), *Ficus martinicensis, Cactus brasiliensis* (Pl. VIII. fig. 5); or they are perforated with many transverse fissures seated one above the other so as to resemble the walls of a scalary vessel.

This last form I find only in the obliquely lying dissepiments; they exist, *e. g.* in *Betula alba, Fagus sylvatica, Corylus Avellana, Alnus incana, Platanus occidentalis, Viburnum Opulus, Ilex Aquifolium*; while the first form is more frequent in those which are horizontal. The dissepiments of the same plant do not however always exhibit the same structure, but some may possess the form of a scalary wall, while others are completely absorbed. Oblique dissepiments have such a direction that their surface comes into view on a longitudinal section parallel to the medullary rays.

I shall add merely a few words on the history of the development of dotted vessels. They appear in the early period of their evolution, like the other vessels, as rows of large, cell-like, perfectly closed tubes whose skin is thin and perfectly uniform, of which every one possesses a nucleus (*Zellenkern*). At a later period we see in the lateral walls, especially those resting on other vessels, as it were a delicate fibrous net-work. A further inspection of the development shows that this does not (as one might at the first glance have been induced to believe) depend on threads deposited on the inner walls of the vessel, but that the meshes of the net correspond with the future borders of the dots, and therefore indicate the cavities which lie between the vessels; that the apparent threads which surround the meshes are formed by the places of the walls of the vessel which remain in contact with the neighbouring organ; and that at this time, as well as during the whole process of development, the vascular tubes are filled with sap, and not with air as Schleiden asserted. Shortly after the appearance of these cavities the first trace of the dot over each of them is indicated by a lighter circle, and now, by means of the further thickening of the walls the formation of the vessel speedily arrives at its extreme limit, at which time also the transverse dissepiments are absorbed. I have not observed in these vessels more than in the secondary membranes of cells, any origination of secondary coats from the inosculation of spiral threads.

It should seem from what has been adduced above as to the form of the canals of the dots,—whence it clearly appears that the apertures of the secondary coat are so much larger, and in particular so much the more drawn out in the direction of their major axis into the form of fissures, the nearer they lie to the centre of the tube,—that the different secondary coats of the same vascular tube do not accurately agree in their form. In some plants, as in *Bombax pentandrum* (Pl. VII. fig. 12, 14.), this circumstance is indicated merely by a slight conical enlargement of the canal from the outer to the inner side. It is far more remarkable in the form which I have represented from *Cassyta glabella* (Pl. VII. fig. 1, 4). The difference between the outer and the inner secondary coats attains a far more noticeable degree in *Laurus Sassafras* (Pl. VII. fig. 5), *Aleurites triloba* (Pl. VII. fig. 6, 8), *Elæagnus acuminata* (Pl. VII. fig. 10, 11), *Clematis Vitalba* (Pl. VIII. fig. 4). Here the cavities of the outer secondary coat present a dot which is shorter than the border, while, on the contrary, those of the inner coats (Pl. VIII. fig. 4, 6) are extended into such long fissures, that they are not merely longer than the subjacent border, but frequently run one into another and comprise the canals of many dots. These inner layers, therefore, represent skins, which are imperfectly divided into broad threads by long and short fissures. It is to be remarked here, that the direction of the fissures of the inner layers does not always perfectly agree with the direction of the major axis of the canals of the dots, but intersects it at a small angle (Pl. VII. fig. 6). This will be the less surprising if we remember that the threads in *Taxus* which form the innermost layer of the vessels run sometimes in an opposite direction to the spiral line in which the major axes of the dots lie; and that the bast-cells of *Apocyneæ* are composed of coats whose spiral striæ exhibit equally a different direction of volution. We find the greatest degree of difference between the outer and inner coats of the vessels in *Tilia* (Pl. VIII. fig. 6), *Daphne* (Pl. VIII. fig. 7), and other plants adduced above under F— I, in which a perfect division of the inner membrane of the vessel into spiral threads exists; a formation which clearly exhibits merely a still further development of the forms hitherto considered.

EXPLANATION OF THE PLATES.

The fractions under the figures show the degree in which they are magnified.

Plate VII.

Fig. 1. *Cassyta glabella.* The lateral wall of a dotted tube abutting on another vessel.

Fig. 2. *Cassyta glabella.* Vertical section through the walls of two dotted vessels applied to one another. *a.* Cavity between two dots; *b.* canal of dot.

Fig. 3. *Cassyta glabella.* The transverse dissepiment of a dotted vessel pierced by a round aperture.

Fig. 4. Dot more highly magnified.

Fig. 5. *Laurus Sassafras.* Portion of a dotted vessel. The canals of the dots are widened on the inner side in the form of long fissures.

Fig. 6. *Aleurites triloba.* Wall of a dotted vessel which is contiguous to another vessel.

Fig. 7. *Aleurites triloba.* Wall of a dotted vessel which is contiguous to a cell. The canals of the dots are so strongly widened within, that the dots appear to be surrounded by a border.

Fig. 8. *Aleurites triloba.* A dot from fig. 6. more highly magnified.

Fig. 9. *Laurus nobilis.* Transverse section through the walls of two contiguous dotted vessels. Funnel-shaped widening of the canals of the dots toward the inner surface of the vessel.

Fig. 10. *Elæagnus acuminata.* Portion of a dotted vessel; fissure-like form of the canals of the dots.

Fig. 11. A dot of the same more highly magnified.

Fig. 12. *Bombax pentandrum.* Wall of a dotted vessel which borders on a second vessel.

Fig. 13. *Bombax pentandrum.* Wall of a dotted vessel contiguous to a cell. The canal of the dots is widened within.

Plate VIII.

Fig. 1. *Chilianthus arboreus.* Wall of a dotted tube contiguous to a cell.

Fig. 2. *Chilianthus arboreus.* Wall of a dotted tube contiguous to another vessel. The dots are very much widened, so as to make the vessel appear like a scalary tube.

Fig. 3. *Chilianthus arboreus.* Vertical section through the walls of two contiguous vessels.

Fig. 4. *Clematis Vitalba.* Dotted vessel. *a.* Portion of the same uninjured; *b.* portion with the outer coat of the walls of the vessel removed by an oblique section, so that the fissure-like form of the inner aperture of the canals of the dots may be more clearly seen.

Fig. 5. Reticulate vessel of *Cactus brasiliensis.* The canals of the dots at *a* have an oblique direction, in consequence of which the lines which indicate the outer and inner aperture cross one another.

Fig. 6. *Tilia parvifolia.* Wall of a dotted tube contiguous to a second vessel.

Fig. 7. *Daphne Mezereum.* Large dotted tube.

Fig. 8. *Daphne Mezereum.* Small dotted tube, which is merely marked by threads without any dots.

XLIV.—*Remarks on the genus* Lepralia *of* Dr. Johnston, *with Descriptions of Six undescribed species, and notices of two other Zoophytes.* By Arthur Hill Hassall, Esq., M.R.C.S.L., Corresponding Member of the Dublin Natural History Society.

From the varied nature of the bases upon which the zoophytes comprised in this genus are found, the same species being sometimes met with on rocks, stones, shells and fuci, and from the unyielding and calcareous structure of the majority of their polypidoms, it might be supposed that the different species would be subject to numerous variations, and that the same species would not unfrequently present an altered appearance according as it was affected by either locality, age, mode of drying or injury, one or all of these causes operating upon it at the same time, and that therefore there was reason to apprehend that *conditions and varieties* of species would sometimes be described as *distinct* species. From the great number of species contained in this genus, to which I have paid a good deal of attention, which I have examined both in a recent and dried state, and from the number of specimens which I have now in my possession, I think that I have the means of ascertaining with tolerable accuracy the extent to which the *Lepraliæ* are altered by the influences alluded to; and from the evidence now about to be detailed, it will be apparent, I imagine, that the changes thus produced are neither so numerous nor so important as might at first have been surmised.

First as to locality. There are specimens before me of *Lepralia pediostoma* on granite, shale, stones, shells of various kinds, and on the root of *Laminaria digitata* and *L. saccharina*, its occurrence on these last being very rare; and in all these the characters of the species are well marked, and do not differ in any appreciable manner from the variety of the situations on which it is placed. Of *Lepralia punctata* I have examples on the same localities as the preceding species, its favourite site being however granite, and its presence on fuci being even more rare than that of *L. pediostoma*; of *Lepralia immersa* and *L. ciliata*, on granite, shells and fuci, the latter species being usually found on the roots of *Laminaria digitata* and *L. saccharina*, and of *Lepralia ovalis* on shells and granite. *Lepralia insignis** is generally met with

* I may here record the occurrence of this species on the English coast; it is probably a very widely distributed one. I have specimens of it on oyster-shells from Burnham, Norfolk, and last summer I found it among other zoophytes sent me by Miss Nolcken from Jersey. I have too within

on shells, more particularly on *Patella cærulea*; it is a delicate species, and the specimens found on this shell are usually very perfect, owing no doubt to the sheltered position which it occupies in the root of *Laminaria saccharina*, on the frond of which sea-weed it is also sometimes located. Of *Lepralia appensa** there are several examples before me; some on *Patella cærulea*, the majority on the roots of *Laminaria digitata* and *L. saccharina*, which are such great favourites with the *Lepraliæ*, and others on their laminæ: and of *L. ventricosa*, two on the smooth internal surface of a *Pecten*, and one on the rough exterior of an *Ostrea*. The numerous specimens which I have of *Lepralia nitida*, *L. coccinea* of Johnston, and *L. linearis*, are all upon granite; those of *Lepralia auriculata* and *L. semilunaris* upon shells; and the following species, *Lepralia hyalina*, *L. assimilis* and *L. diaphana*, on either the root or frond of *Laminaria digitata* or *L. saccharina*. Now the remark which I have made with reference to *Lepralia pediostoma* may be extended to the different species just enumerated thus variously situated, for not alone are all the essential characters of each of these species preserved, but I do not notice even minor differences attributable to the dissimilarity of their places of growth. The influence of locality, therefore, is so slight as scarcely to be appreciable.

Secondly, with reference to age. I have examined more than two dozen specimens of *Lepralia pediostoma* and *L. punctata*, as well as many of other species, and in all these the distinctive characters of each species are preserved; the walls of the cells present the same appearances in each (excepting only one species with transparent walls, *L. hyalina*), nor does the form of the aperture differ in any material respects, and out of so many specimens it may be fairly concluded that *some* are *young*, while *others* are *aged*. In some species, especially the following, *Lepralia appensa*, in which they are rarely absent, *L. coccinea* and *L. punctata*, situated at each upper angle of most cells are small triangular wing-like appendages, hollow, open at the top, and communicating with the interior of each cell below, one to each angle; these alæ are usually regarded as abortive cells; their presence is not constant, and may possibly depend upon the age of the polypidoms. In the same specimen

the last few days received a specimen of it from the Rev. David Landsborough, found at Stevenston, Ayrshire. Mr. Landsborough has also noticed my *L. pediostoma* at the same place, making a second English locality for the species.

* This zoophyte is also met with on the English coast. It occurs at Burnham, Norfolk, and specimens have been sent me from Jersey by Miss Nolcken.

some cells will be found to be furnished with them, while others are destitute of them. An occasional opacity of the walls of the cells of a species usually transparent, is certainly sometimes produced by age, but it is a rare effect, and the number of *Lepraliæ* with transparent cells is not great, and the other characters of the species still remain unaffected. It may be doubted how far the examination of a number of specimens of a species is necessary for the purpose of ascertaining the effects of age upon it, and whether one well-developed specimen would not furnish all the information to be acquired on this point, seeing that it presents examples of both young and aged cells, those in the centre from the circular development of most of the species of the genus being the aged ones, and those near the circumference of the crust being of course the most recently formed; and yet how little difference do we find between the central and circumferential cells! the former are, indeed, sometimes provided with opercula not present in the latter.

The changes produced in the *Lepraliæ* by age, therefore, are not numerous, nor are they such as would be likely to lead to errors in the discrimination of species; although candour requires the confession that I was once imposed upon by the altered aspect of a species, *L. hyalina*, arising from the opacity of the cells, which are generally transparent, and was led to regard it as a distinct species. This however, I feel assured, would not have occurred, had I at the time command of even a tolerable microscope. Thus my *Lepralia cylindrica* is nothing more than a peculiar condition of *L. hyalina*.

Thirdly, what are the alterations occasioned in the appearance of *Lepraliæ* produced by drying?

An alteration of colour is one: most *Lepraliæ* in a recent state are of a reddish colour, the tint varying with the species; this is in a great measure lost by drying, the specimens becoming more or less colourless. A second is, that the perforations contained in the walls of the cells of some species, visible in the *Lepralia* just removed from its native element, become more manifest and more defined, but still present in each species the appearances of size and form which are peculiar to that species; and as most *Lepraliæ* are figured and described from *dried* examples, they are therefore upon an equality in this respect, all having undergone the same process.

Fourthly, with regard to injury. The *Lepraliæ* are subject to injury and mutilation arising from several causes; thus they may be injured by the action of the waves while still attached to the objects upon which they grow, by the trituration of the shells and fuci on which they are placed upon each other as they are thrown upon the shore, or by rough and careless handling; the damage which the *Lepraliæ* sustain from these several causes is however nearly the same in all, and consists in the removal of the spines with which the apertures of most species are furnished. I consider that it is in the first way that *Lepralia punctata, L. linearis* and *L. auriculata* are injured, for of these you may remove with the utmost care very many living specimens from their bases, and yet not find one perfect, that is, having the cells armed with spines; when these do occur, they are always met with on those cells which are sheltered by some indentation of the surface upon which they have developed themselves, thus clearly indicating that they pertain *equally to all the cells*, but have been removed by violence. Sometimes the spines are so abraded that no trace of fracture can be detected; this is the case with the three species just named; in others, however, especially the following, a portion of such spines usually remains behind, as in *Lepralia appensa, L. ovalis, L. immersa* and *L. insignis*.

It cannot be doubted also but that the spines are frequently either removed or obscured by a natural cause, viz. the development of an operculum, when they will still be found however on the marginal cells: this is frequently the case with *Lepralia auriculata*.

It may be asked whether an occasional development of spines ever takes place in species usually destitute of these appendages—it is my firm belief that such never occurs: the number of species not provided with spines is but small; I am acquainted with but two species possessing calcareous polypidoms whose apertures are not armed with spines, *Lepralia coccinea* and *L. pediostoma*, and on these the search for spines, I am convinced, would be a fruitless one. *Lepralia variolosa* is figured in Dr. Johnston's 'British Zoophytes' without spines, with which I have a strong suspicion that it will ultimately be found to be furnished.

Reviewing therefore the foregoing remarks, it will, I think, be manifest that the effects of *the operation of the first three causes, locality, age, and the drying of the specimens, are not material, whether acting singly or in combination on the same species, nor such as are likely to lead to error in the definition of species*; not so, however, with regard to the *fourth* cause, the mutilation of the specimens from violence; unless great care be employed to procure perfect specimens, there is reason to fear that injured and imperfect examples of a species will be mistaken for a distinct species. The form of the apertures I consider to be one of the best characters by which to recognize species, and very little subject to even a slight variation, except from injury. Out of all my specimens I have only noticed one, of *Lepralia punctata*, in which the apertures of the cells present an appearance somewhat different from that by which it is usually characterized; in it the anterior wall of the cell is plain, and not continued up into the apertures—notwithstanding this the specimen is easily identified.

The polypes of the *Lepraliæ* resemble very closely those of the *Flustræ*; they are mostly of a pinkish colour; in one example of *Lepralia pediostoma* which I examined, and which may probably be regarded as the type of the genus, I repeatedly counted seventeen tentacula to each polype; but it is likely that I was deceived, and that the number really is either sixteen or eighteen, for there would appear to be a dislike to odd numericals in the Ascidian type of zoophytes.

On making a careful examination a short time since of a number of specimens of Irish zoophytes collected by me during the winter of 1840 and spring of 1841, and which had previously received but a partial and hasty investigation, I was gratified by the discovery of the following undescribed species belonging to the genus *Lepralia*, drawings of which will be shortly prepared and sent to Dr. Johnston for his 2nd edition of the 'British Zoophytes,' a work which, from the great progress which zoophytology has made within the last year or two, will doubtless be replete with interest, and the early publication of which is much to be desired.

Lepralia semilunaris.

Spec. Char. Crust when dry opake white; form of cells not very distinct; walls usually perforated; apertures semilunar, mostly furnished with an operculum; a single pointed tooth arises from the anterior wall of each cell about its centre.

Two or three specimens of the above well-marked species have occurred to me on old valves of *Pecten maximus*, trawled up off Bray, near Dublin; it is therefore most probably a deep-water species. Its distribution is not confined to Ireland, as I have since met with a single specimen on oyster-shells from Burnham, Norfolk. In some cells the anterior tooth is broken off, leaving an aperture in its place; there is also sometimes an appearance of two spines, one on either side the aperture, produced by the incomplete removal of the operculum.

Lepralia auriculata.

Spec. Char. Crust generally reddish even when dried, spreading circularly; cells but little raised, and their form ill defined; apertures pitcher-shaped, small, looking upwards (the spout-like prolongation being very prominent), and armed with two slender divergent teeth, the length of which rather more than equals the diameter of the mouth of the cell.

This zoophyte resembles somewhat my *Lepralia linearis**, from which it differs *principally* in the number of the teeth, rarely more than two, and in the absence of the short rounded processes placed just below the aperture met with in it. It likewise approaches, I should think, near to the *Lepralia variolosa* of Dr. Johnston, a species with the characters of which I must confess myself but ill acquainted at present. Most probably a deep-water species, being found principally on the same description of shell as the preceding, than which it is less rare, as I have met with eight specimens trawled up off Bray; teeth but seldom present, and as they are very straight and somewhat divergent, they present the appearance of ears, whence the name of the species is derived. A cream-coloured variety is occasionally met with.

This species is also English, and is found on oyster-shells from Burnham, Norfolk.

Lepralia ventricosa.

Spec. Char. Crust when dry brownish and glistening; cells defined and ventricose; apertures circular, the lower lip rising up so as to form a pointed process; armed with four short, tubular, erect teeth.

The above is a very striking species; it is evidently one of the rarest of the genus, as I have but two Irish specimens, collected in the bay of Dublin. It is likewise found on the English coast at Burnham, Norfolk.

Lepralia tenuis.

Spec. Char. Crust translucent; cells but little elevated; walls distantly perforated; apertures semicircular and mostly provided with circular opercula, which are also perforated; a small tooth arises from the anterior wall of the cell just beneath the aperture.

This species can only be distinguished from *L. hyalina* by the aid of the microscope; it is generally found upon the frond of *Laminaria digitata*, upon which it forms circular patches of about one-third of an inch in diameter.

Dublin Bay, rare.

Lepralia assimilis.

Spec. Char. Crust transparent; cells rounded superiorly; apertures triangular and mostly furnished with an acuminate operculum. A large and very blunt process is placed beneath each aperture.

It is no easy matter at first to distinguish this species from

* See Annals, vol. vii. p. 368.

the preceding, from which however, as well as from *L. hyalina*, I am satisfied that it is distinct.

Four specimens are on old valves of *Pecten maximus*: Dublin Bay.

Lepralia ovalis.

Spec. Char. Crust whitish, glistening; cells well defined and oval; apertures circular, oblique, the lower margin rising up into a short process, usually bifurcate, and furnished with two, rarely three, teeth, the length of which exceeds greatly the diameter of the mouths of the cells.

This is a distinct, and, I imagine, a very rare species, as I have but one Irish specimen attached to a piece of granite, procured at Kingstown. From *L. trispinosa* of Dr. Johnston, a species with which I am not acquainted, it differs in being very rarely provided with three spines, and in the absence of the spout-like excavation represented in the figure of that species; while from *L. immersa* it is at once known by the much larger size of the cells, discernible plainly by the unassisted eye, as well as by other characters less obvious. This is likewise an English species, being found at Burnham, Norfolk.

Discopora verrucaria.

In my Catalogue of Irish Zoophytes, published in the 'Annals,' I mentioned the occurrence of *Discopora hispida* of Dr. Fleming in the Bay of Dublin. I now find this statement to be, so far as I am concerned, erroneous, the error having arisen from my having mistaken the *Discopora verrucaria*, Fleming, not uncommon in the Bay, and a very distinct species, for that zoophyte, which has still, I believe, to be searched for in the above locality. For a knowledge of the distinctness of the two species I am indebted to the Rev. David Landsborough, who kindly presented me with specimens of both, found by him at Stevenston, Ayrshire.

Madrepora verrucaria of Otho Fabricius?

A few weeks back I received specimens of a *Tubulipora* from the Rev. David Landsborough, marked with doubt as the *T. verrucaria* of Milne Edwards; an examination of these induced me to refer to some specimens of a *Tubulipora* which I obtained in 1839 in Dublin Bay, and which I had hitherto regarded as a variety of *T. patina*. The result of this reference was, that I found that my specimens and those of Mr. Landsborough represented the same species, mine being much the larger, and Mr. Landsborough's being distinguished by a circular ridge running midway between the centre and the circumference of each disc; but that neither were the *Tubulipora patina* of Lamarck, nor the *T. verrucaria* of Milne Edwards, but a distinct species; a description of which, together with specimens, some mine and others Mr. Landsborough's, were sent to Dr. Johnston, who replied that he had long been acquainted with the *Tubulipora* as a British species, and that he considered it to be the *Madrepora verrucaria* of Otho Fabricius and the *Tubulipora Orbiculus* of Lamarck. These synonyms may be correct, but it is by no means clear that they are so. Milne Edwards considers the *Madrepora verrucaria* of Otho Fabricius, described in the 'Fauna Grœnlandica,' p. 430, as an injured condition of his *T. verrucaria*, and cites the description of Otho Fabricius in proof of his statement. The *Tubulipora Orbiculus* of Lamarck, Milne Edwards also regards as his *T. verrucaria*. Lamarck, in support of his description, refers to two figures which Milne Edwards says relate evidently to another genus, that of *Cellepora*. I have myself examined both these figures: that in plate 100. fig. 7. of that gigantic work, Seba's 'Thesaurus,' does certainly represent a *Tubulipora*, but of what species the figure is not sufficiently accurate to determine; but the second, in Esper's 'Pflanzenthiere, Madrep.,' pl. 17, fig. B, C, would appear to be a *Cellepora*, as Milne Edwards says, probably *C. pumicosa*.

Lamarck thus defines his *Tubulipora Orbiculus*:—

"Cellulis tubulosis in orbiculum hemisphericum aggregatis, osculo subdentato."

And in the notes appended to the definition he further observes:—"This species presents hemispherical and convex masses, with tubes straight, unattached and distinct in their superior half, and whose orifice is sometimes armed with from one to three teeth, and sometimes presents not one."

Now none of the many specimens of the *Tubulipora* of which I have specimens are hemispherical or anything approaching such a figure; they are but little raised from the surface of their growth; the cells are not unattached and distinct, but closely aggregated, the wall of one tube forming a portion of that of another, nor are their apertures ever smooth and toothless; moreover, the cells in the centre of each disc are far less distinct and much more closely approximated than those near the circumference, in this also differing from Lamarck's description.

Neither does the description of the *Madrepora verrucaria* of Otho Fabricius correspond entirely with the *Tubulipora* of which I am writing. Thus he says, "In aliis (exemplis) interstitia radiorum integra, in aliis et quidem majoribus porosa quasi reticulata."

I have already said that there are no interstices between the tubes in the *Tubulipora* to which I refer.

March 26, 1842.

XLV.—*Table of the Distribution of the Species described in the first four volumes of DeCandolle's 'Prodromus Regni Vegetabilis.'* By Richard Brinsley Hinds, Esq.

Natural Family.	Genera.	Species.	Europe.	Asia.	Africa.	North America.	South America.	Australia.
Acerineæ	2	32	10	11	...	12		
Alangieæ	1	3	...	3				
Ampelideæ	5	115	...	56	15	14	31	1
Anonaceæ	9	122	...	38	10	10	64	
Aquilarineæ	3	5	...	5				
Araliaceæ	13	122	2	56	8	10	42	7
Aurantiaceæ	14	44	...	41	3	1	1	
Balsamineæ	2	31	1	25	3	2		
Berberideæ	6	47	5	17	...	7	19	
Bixineæ	6	22	...	...	8	1	13	
Bombaceæ	15	52	...	9	2	12	28	1
Bruniaceæ	3	28	...	...	27	...	1?	
Byttneriaceæ	35	221	...	50	88	10	60	15
Cacteæ	7	164	2	...	...	38	125	
Calycantheæ	2	4	...	1	...	3		
Camellieæ	2	8	...	8				
Cappárideæ	17	231	3	69	46	11	98	9
Caprifoliaceæ	12	141	18	70	3	45	7	1
Caryophylleæ	29	759	385	233	70	59	40	1
Celastrineæ	19	175	4	42	54	23	53	1
Ceratophylleæ	1	2	2					
Chailletiaceæ	3	7	...	1	4	...	2	
Chlenaceæ	5	11	...	1	10			
Cistineæ	4	161	123	6	27	18	1	
Combretaceæ	18	112	...	43	28	3	38	
Coriarieæ	1	7	1	...	1	1	4	1
Corneæ	5	26	3	15	...	10	1	
Crassulaceæ	19	302	62	42	177	17	6	2
Cruciferæ	100	990	428	318	164	79	37	17
Cucurbitaceæ	25	196	5	109	33	18	36	
Dilleniaceæ	16	100	...	20	5	3	23	49
Dipsaceæ	6	115	63	41	20	1		
Droseraceæ	8	45	7	5	9	11	3	10
Elæocarpeæ	7	20	...	12	...	...	4	4
Erythroxyleæ	2	26	...	1	6	1	18	
Ficoideæ	9	357	3	9	334	1	5	8
Flacourtianeæ	9	26	...	7	11	...	6	2
Fouquieraceæ	2	2	...	...	...	2		
Frankeniaceæ	3	19	5	3	10	...	3	4
Fumariaceæ	6	53	14	24	3	11		
Geraniaceæ	5	490	45	23	399	7	8	8
Granateæ	1	2	...	...	1	...	1	
Grossularieæ	1	53	8	12	...	28	8	
Guttiferæ	21	60	...	16	4	2	38	
Halorageæ	8	40	10	6	5	12	1	11
Hamamelideæ	4	6	...	2	2	2		
Hippocastaneæ	2	9	...	2	...	7		
Hippocrateaceæ	7	50	...	10	7	8	25	
Homalineæ	9	19	...	4	9	1	5	

Natural Family.	Genera.	Species.	Europe.	Asia.	Africa.	North America.	South America.	Australia.
Hypericineæ ...	8	158	27	29	24	46	31	3
Leguminosæ ...	272	3875	633	1026	787	366	950	253
Lineæ	2	55	32	6	9	4	3	1
Loaseæ	6	31	...	...	...	7	24	
Loranthaceæ ...	4	330	3	106	19	11	181	10
Magnoliaceæ ...	9	14	...	16	...	12	9	3
Malpighiaceæ ...	17	180	...	11	6	29	134	
Malvaceæ	23	559	54	128	92	62	225	13
Marcgraaviaceæ	4	9	...	...	...	...	8	1
Melastomaceæ...	68	722	...	75	18	23	604	2
Meliaceæ	16	65	...	21	12	3	26	3
Memecyleæ	3	22	...	11	6	1	4	
Menispermaceæ	12	92	...	45	13	10	25	
Myrtaceæ	47	715	1	93	21	2	408	198
Nymphæaceæ ...	4	32	4	11	5	9	4	
Ochnaceæ	5	40	...	9	10	1	20	
Olacineæ	8	17	...	4	5	...	4	4
Onagrariæ	16	248	19	37	9	109	76	3
Oxalideæ	4	159	3	5	93	17	43	2
Papaveraceæ ...	9	54	26	15	5	7	...	1
Paronychieæ ...	22	91	36	9	29	12	5	5
Passifloreæ	11	178	...	14	9	13	138	6
Philadelpheæ ...	2	12	1	...	...	11		
Pittosporeæ	4	28	...	2	7	...	1 ?	18
Podophyllaceæ .	5	6	...	...	...	5	1	
Polygaleæ	11	265	16	35	85	36	84	9
Portulaceæ	14	90	2	17	22	12	35	3
Ranunculaceæ...	28	543	190	183	42	103	40	18
Rhamneæ	17	242	16	51	77	34	43	23
Rhizoboleæ	1	6	...	...	...	...	6	
Rhizophoreæ ...	4	23	...	13	3	1	6	
Rosaceæ	62	805	243	242	56	204	81	5
Rubiaceæ........	223	1876	124	582	216	116	822	47
Rutaceæ	30	236	12	30	88	8	58	42
Salicarieæ	27	178	10	43	11	30	87	2
Samydeæ........	3	52	...	16	1	4	31	1
Sapindaceæ	29	193	...	38	16	13	118	9
Saxifrageæ	32	309	98	69	13	52	69	13
Simarubiaceæ ...	4	13	...	...	...	...	13	
Tamariscineæ ...	2	23	2	18	4			
Terebintaceæ ...	55	252	7	65	79	38	65	6
Ternstrœmiaceæ	13	54	...	19	1	9	25	
Tiliaceæ	23	149	6	70	20	8	46	3
Tremandreæ ...	2	7	...	...	...	...	...	7
Tropæoleæ	2	14	...	...	...	1	14	
Turneraceæ......	2	31	...	...	...	1	30	
Umbelliferæ ...	160	1009	359	309	164	112	135	48
Valerianeæ	11	129	40	30	4	13	49	
Violarieæ........	18	181	35	25	18	50	58	6
Vochysieæ	8	38	...	...	...	...	38	
Zygophylleæ ...	10	52	2	10	26	5	10	2
100	1881	20094	3210	5004	3731	2111	5742	922

BIBLIOGRAPHICAL NOTICES.

Voyage dans l'Amérique Méridionale exécuté dans le cours des Années 1826—1833. Par M. Alcide D. D'Orbigny. *Botanique—Cryptogamie,* par Camille Montagne.

This is a portion of one of those splendid works which appear from time to time under the auspices of the French government. The extent of the work and the beauty of the execution necessarily make its price such as to confine it to the libraries of public institutions or wealthy individuals; we think, therefore, that it will not be uninteresting to our readers if we extract the characters of such new species as are described in it, omitting however those which have already appeared in 'Ann. d. Sc. Nat.' These are disposed under two heads, the first of which is entitled 'Sertum Patagonicum;' the latter, which is far the larger of the two, 'Florulæ Boliviensis stirpes novæ vel minus cognitæ.' The reason for this arrangement is thus stated in the introduction by M. Brongniart:—

"The botanical collections made by M. D'Orbigny during his long voyage belong to two regions so different, that it has been thought preferable to make them the subject of two local floras, rather than to confound species belonging to these two regions in one and the same scientific series. The plants of Southern America, from Monte Video and the environs of Buenos Ayres to the centre of Patagonia on the banks of the Rio Negro, growing under the influence of a temperate climate, have nothing in common with those of Corrientes, at the banks of the Parana, while these last have the strongest analogy with the tropical plants of Brazil and the lower and meridional provinces of Bolivia visited by D'Orbigny; we have therefore thought it right to publish them under two distinct heads, the first entitled 'Sertum Patagonicum,' comprising the plants of the banks of Rio Negro in Patagonia, to which are added those from the neighbourhood of Buenos Ayres and Monte Video; the other, under the title of 'Florulæ Boliviensis stirpes novæ vel minus cognitæ,' will contain those of Bolivia, whether of the low parts which have a vegetation purely tropical or of the elevated regions of the Andes, which, though differing greatly in the vegetation, cannot be separated from the others, because of the gradual transition from one region to the other, and the impossibility of fixing any precise line of demarcation; to this tropical flora we shall join the plants of the Parana near Corrientes, which, notwithstanding their extra-tropical origin, partake of the characters of the low parts of Bolivia, and even some new plants from the neighbourhood of Rio Janeiro, collected by D'Orbigny while sojourning there.

"A third part will contain the history of the Palms observed in the different regions visited, of which D'Orbigny has brought figures made on the spot, which, in addition to notes and specimens, will enable us to throw some light on the species of this part of America.

"The wish to make the publication more perfect and speedy has induced me to request some botanists well known by their labours to share the task entrusted to me by D'Orbigny; M. Montagne has in consequence undertaken the cellular Cryptogams, and M. Decaisne the monopetalous Dicotyledons, and especially the *Compositæ,* which are very numerous in the collections."

Sertum Patagonicum.

ALGÆ, *Roth.*

Nostoc microtis, Montagne. Fronde minutâ, cochleatâ seu difformi, margine acuto-sinuatâ, solitariâ, cæruleâ pellucidâ; filis internis simplicibus, curvato-flexuosis, moniliformibus.

Ad saxa inundata secus flumen Rio Negro, faciei pronæ inter radices, *Ricciæ? nigrescenti* adhærens.

*Conferva aculeata**, Mont. Cæspite basi stuposo funiformi-ramoso, filis constituto setaceis, siccitate nitentibus, radices implexos duplici origine exortos emittentibus, ramosissimis, ramis vagis, ramulisque strictis ascendentibus subsecundis fasciculatis, supremis aculeiformibus, articulis cylindricis diametro duplo triplove longioribus. Cum icone.

Ad infimum refluxus limitem in littore sinus S. Blasii.

Laminaria cæpestipes, Mont. Radice bulboso, stipite terete in laminam cuneato-oblongam crassam laciniato-multifidam expanso. Cum icone. *Durvillæa utilis*, Bory, junior?

Ad insulas Maclovianas, Gaudichaud. Littore Patagonico, D'Orbigny. Littore Chilensi (ad Valparaiso), Bertero.

Macrocystis Orbigniana, Mont. Caule tereti, foliis lanceolatis undato-rugosis margine dentato-ciliatis, vesiculis fusiformibus elongatis. Cum ic. In oris Patagoniæ.

HEPATICÆ, *Juss.*

Riccia? nigrescens, Mont. Frondibus imbricatis e centro radiantibus nigroviridibus dichotomis, laciniis expansis obovatis, margine sinuato undulato crispo ascendenti; sporangiis? in paginâ inferiore elliptico-prominentibus.

Ad terram in ripis fluminis Rio Negro.

Florulæ Boliviensis stripes novæ vel minus cognitæ.

ALGÆ.

Lyngbya ferruginea, var.? Ag. Filis æruginosis in cæspitem viridi-lutescentem cæruleumque densè intricatis.

Ad littora Peruviana.

Halymenia? Doryphora, Mont. Fronde coriaceo-membranaceâ palmato-fissâ integerrimâ segmentis acutissimè lanceolatis, undulato-crispis spiralitèr tortis.

Ad oras Peruviæ propè Callao.

Sphærococcus laciniatus, Lyngb.

var. δ, *centrocarpus,* Mont. Fronde primariâ sublanceolatâ obtusâ e margine proliferâ, laciniis cuneatis iterum prolificis; sporangiis sphæricis in ipso margine vel in processibus marginalibus undique spinulosis seu cristatis. An species?

Ad oras Peruvianas juxta Callao.

Delesseria bipinnatifida, Mont. Fronde tenuissime membranaceâ costatâ

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* Now named by Montagne *Conf. oxyclada,* a species from the Cape having been published by Suhr under the name first given.

lineari e margine bipinnatim proliferâ, pinnis lineari-lanceolatis nervosis patenti-erectis. Cum ic.
Propè Valparaiso.

Delesseria phylloloma, Mont. Fronde tenuissimâ aveniâ oblongâ e margine proliferâ, ramentis subpedicellatis basi rotundatis, apice vagè fissis, lobis emarginatis, soris in disco frondis sparsis.
Propè Callao.

Delesseria peruviana, Mont. Fronde elongatâ basi cuneatâ nervosâ bis bifidâ, segmentis lanceolatis acutis, soris in disco frondis sparsis.
Ad Callao.

ACROPELTIS, *Mont.*, nov. gen.

CHAR. ESSENT. Semina pyriformia in apotheciis clypeiformibus terminalibus nidulantia.

CHAR. NAT. Radix scutulata. *Caulis* filiformis in frondem mox explanatus. Frons linearis eandem latitudinem ubique servans margine denticulatâ vel ciliatâ, apice modò truncatâ, et tum e medio truncaturæ proliferâ, modò rotundato-ampliatâ speciem ferens peltæ cui gongyli immersi. *Fructus*: *semina* pyriformi-clavata primùm omninò intra frondis substantiam immersa, tandem erumpentia prominula, et scutam orbiculatam in quam frondes desinunt, scabrosulam reddentia.

Acropeltis chilensis, Mont. Fronde lineari planâ subsimplici vel basi filiformi tantùm ramosâ, margine denticulatâ, apice truncato interdum proliferâ, peltis gongyliferis terminalibus.

ALGÆ OLIVACEÆ, *J. Ag.*

Desmarestia peruviana, Mont. Fronde planâ membranaceâ ecortatâ margine dentatâ tripinnatâ, pinnis pinnulisque oppositis lanceolatis.
Juxta Callao.

Out of sixty-six species of *Algæ* collected during the voyage of Orbigny, M. Montagne remarks, twenty are quite new. The *Florideæ* predominate, which accords with the observation of Lamouroux, Agardh and Bory, and is confirmed by the younger Agardh, that the more we approach the equator the more rose-coloured *Algæ* prevail. The *Fucoideæ* are very few, but the number of species is in a manner compensated by the size which they attain, as for example *Durvillæa utilis* and the species of the genus *Macrocystis*. There is but one species in the Polar seas which can for a moment be compared with them.

HYPOXYLA, *DeC.*

*Sphæria portentosa**, Mont. Lignosa simplex elongato-linguiformis, atra undique peritheciis superficialibus ovato-globosis crassis papillatis tecta; stipite glabro.
Ad ligna Cochabamba in Boliviâ.

FUNGI, *L. Juss. Fr.*

Geaster (*Plecostoma*) *ambiguus*, Mont. Peridio exteriori simplici multifido rigescente subinvoluto, interiori sessili ore plano conico plicato-striato.
Ad terram in provinciâ Boliviâ de Chiquitos.

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* This and some other species have been published in late numbers of 'Ann. d. Sc. Nat.' since the text from whence the characters are taken was printed.

Hepaticæ, *Juss.*

Grimaldia peruviana, Nees et Mont. Receptaculo fœmineo completo subgloboso dimidiatoque crenato, subtùs pedicelloque brevi pilosis, masculo discoideo sessili, fronde dichotomâ latiusculè lineari subtùs ad costam esquamatâ, apice proliferâ.
Ad terram humidam et saxa in umbrosis montis excelsi propè Irupana.

Grimaldia chilensis, Lindenb. Subsimplex apiceve succrescens linearis, canaliculata, denticulata, apice emarginata, brevissimè ciliato-barbata, subtùs atro-purpurea squamisque subulato-acutis rigidulis patulis exasperata, receptaculo fœmineo (*imperfecto*) convexo quadri-quinquecrenato, obsoletè barbato.
Ad terram locis humidis propè Quillota.

Of the *Hepaticæ*, which are fifty-eight in number, twenty-one are new.

Musci.

Conomitrium Berterii, Mont. Caule fluitante filiformi ramosissimo, ramis superioribus subfasciculatis, foliis distichis, dissitis, alternis angustissimè linearibus patentibus, supremis longissimis pedunculis 1—3 axillaribus cauligenis, capsulæ ovatæ operculo acuminato. Cum ic.
Ad saxa in scaturiginibus propè Quillota.

A very remarkable circumstance is figured in this species, viz. the germination of a spore in the cavity of the capsule, from the mouth of which projects a new individual.

The Mosses described are forty-one in number, of which ten are new species. The acrocarpous and pleurocarpous species are nearly equal in number, but the proportion of mosses with a simple peristome exceeds that of those with a double peristome. The known species are mostly tropical or ubiquitanous. Several European species were found on the Cordillera of the Andes, in spots nearly isothermal with those in which they occur in Europe.

The London Journal of Botany; being a new series of the Journal of Botany. By Sir W. J. Hooker, K.H., &c. &c.

We give the contents of this journal from January last to the present time, with some brief observations.

No. I. Notes of a Botanical Excursion to the Mountains of North Carolina, &c., with some remarks on the Botany of the higher Alleghany Mountains; by Asa Gray, M.D.—Notes upon Cape *Orchidaceæ*; by Prof. Lindley. [This paper contains descriptions of 10 new species belonging to the genera *Disperis*, *Disa*, *Brownleea* and *Penthea*, sent to Prof. Lindley by the Hon. W. H. Harvey.]—Descriptions of several (16) new genera of South African Plants; by the Hon. W. H. Harvey.—Some account of the Paraguay Tea (*Ilex paraguayensis*); by Sir W. J. Hooker.—Botanical information: new British Plants. [The plants referred to are "*Equisetum elongatum* (Willd.)," found by F. Whitla, Esq. in mountain glens near Belfast; *Chara latifolia* (Willd.), found by D. Moore, Esq. in Belvidere Lake, Westmeath; *Polyporus nitidus* (Fries), near Bristol, by H. O. Stephens, Esq.]—Bibliographical Notices.—On the Plants of the Grampians, viewed in their relation to altitude; by H. C. Watson, Esq. [A most valuable paper.]

II. A continuation of Mr. Watson's paper on the Plants of the Grampians.—Description of *Trochopteris*, a new genus of Ferns; by G. Gardener, Esq.—Notices of some Plants new to the Flora of Britain; by H. C. Watson, Esq.: they are *Linaria Bauhinii*, *Lolium multiflorum* and *Bromus commutatus*.—Botanical information: containing extracts from a letter from Mr. James Drummond on Australian Botany; and from Dr. Hostmann on the Plants of Brazil.—Biographical sketch of the late Allan Cunningham.

III. Biographical sketch of the late Allan Cunningham (*continued*).—On the permanent regions of Alpine Vegetation; by R. B. Hinds, Esq.—Description of *Coptophyllum*, a new genus of Ferns; by G. Gardener, Esq.—On *Trichomanes vittaria*; by Sir W. J. Hooker.—Enumeration of Fungi collected by Dr. Hostmann in Surinam; by the Rev. M. J. Berkeley.—Enumeration of Fungi collected by H. Cuming, Esq. in the Philippine Isles; by the Rev. M. J. Berkeley.—Contributions to a Flora of Brazil; by G. Gardener, Esq.

IV. Contributions to a Flora of Brazil (*continued*).—Contributions to a Flora of South America; by G. Bentham, Esq.—Botanical information.—Notes of an excursion to North Carolina; by Asa Gray, M.D. (*continued*).

V. Notes of an Excursion to North Carolina; by Asa Gray, M.D. (*continued*).—Characters of three new species of *Chresta*; with remarks on the identity of *Pycnocephalum* and *Chresta*; by G. Gardener, Esq.—On the Plants of the Grampians (second paper); by H. C. Watson, Esq.—On the position to be assigned to the genus *Cneorum* in the natural series; by P. B. Webb, Esq.—Botanical information: a letter from Mr. Bridges on the Botany of Chili.—Biographical sketch of the late A. Cunningham (*continued*).

VI. Biographical sketch of the late Allan Cunningham (*concluded*).—On *Cenomyce retipora*; by Sir W. J. Hooker.—On a new species of *Meniscium* from China; by Sir W. J. Hooker.—Botanical information from Brazil, New Zealand and the Cape of Good Hope.—The Regions of Vegetation; by R. B. Hinds, Esq.—Notes on *Mimoseæ*; by G. Bentham, Esq.

The Phytologist: a Botanical Journal.

No. 13. June 1842. The commencement of a second annual Part.

Contents:—A History of British Lycopodia and allied Genera; by Edw. Newman (*Pilularia globulifera*).—Sketch of an Excursion to the Clova Mountains in July and August 1840; by W. Gardiner, Esq.—Notes on *Arenaria rubra*, *marina* and *media*; by S. Gibson, Esq. [The two former appear to us to be distinct species, but we cannot agree with Mr. Gibson in separating the latter from *marina*, as our own observations would lead us to believe that the characters drawn from the seeds and length of the capsule are not constant. We trust that we shall not be considered presumptuous if we hint to this very accurate observer, that a more frequent reference to the writings of continental botanists would be desirable. We say this without the least wish to detract from the value of Mr. Gibson's papers, but merely to avoid the introduction of additional synonyms into our already encumbered science, of which an instance occurred in a late number of the 'Phytologist,' where a *supposed* new species of *Monotropa* is named and described which had long since received several denominations in botanical works.]—Analytical Notice of a Treatise on the Growth of Plants in closely glazed cases; by N. B. Ward, F.L.S.—Notice of a History of British Forest Trees; by P. J. Selby, F.L.S.—Varieties.

Novitiarum Floræ Suecicæ Mantissa altera, additis plantis in Norvegiâ recentius detectis. Scripsit Elias Fries. 8vo, pp. 64. Upsal, 1839.

Through the kindness of our valued friend Mr. W. A. Leighton, we are enabled to notice this interesting Appendix to the 'Novitiæ Floræ Suecicæ;' and valuable as are all the works of Fries, this is more particularly so to the British botanist, from its containing very detailed observations on several genera that have of late attracted much attention in this country. We refer more particularly to *Glyceria*, *Epilobium*, *Polygonum*, *Hieracium*, *Orchis* and *Carex*.

It is quite impossible to give extracts from such a work as the present, every word of which is highly interesting to the European descriptive botanist, but we must take this opportunity of calling attention to the peculiar difficulty that exists in obtaining Swedish publications. We have now for more than two years been endeavouring strenuously to obtain this book, but have totally failed; indeed, we believe that the copy which has been so kindly lent to us is the only one existing in Britain.

PROCEEDINGS OF LEARNED SOCIETIES.

ENTOMOLOGICAL SOCIETY.

November 1, 1841.—W. W. Saunders, Esq., F.L.S., President, in the Chair.

The Rev. F. W. Hope exhibited a fossil inclosed in a nodule of ironstone from the coal-district near Wellington in Shropshire, collected by Dr. Stevenson, having all the appearance of the caterpillar of a large *Bombyx*, with two series of dorsal tubercles, and with a series of long, cylindrical, furcate appendages on each side of the body. Fossil plants were not uncommon in this locality, but this was the only instance of an insect having been discovered. Dr. Stevenson had also found some specimens having the appearance of the wings of insects, but these having been examined by several botanists of eminence, were pronounced to be leaves of fossil plants allied to *Cyclopteris*.

Mr. Westwood exhibited portions of a very extensive collection of insects formed by E. P. Coffin, Esq., during his residence in Mexico, which was especially rich in *Hymenoptera*, particularly in the family of bees, some of which were very singular.

Mr. Evans exhibited a drawing of a caterpillar of *Zeuzera Æsculi*, and part of a young tree which it had destroyed.

Mr. E. Doubleday brought for distribution amongst the members a large number of North American *Coleoptera*. He also exhibited portions of his collection of American *Lepidoptera*, consisting of an entire series of the genus *Polyommatus* (5 species), a new species of *Colias*, two species of *Terias* hitherto confounded together, and a singular specimen of *Saturnia Promethea*, having the antennæ and body of the male, and wings of the form and colour of those of the female.

Dr. Becker of Wiesbaden exhibited portions of his collection of German *Lepidoptera*, each species being preserved in a small case with the top and bottom of glass,—a mode much adopted in Germany.

The following memoirs were read:—

Observations on the *Coleoptera* of Port Essington, in Australia. with descriptions of the following new species. By the Rev. F. W. Hope, F.R.S., &c.

LAMELLICORNES.

Bolboceras Kirbii, Bainbridge ♂. *Castaneus, capite anticè clypeo emarginato, posticè cornu erecto apice acuto; thorace anticè et posticè excavato, cornu utrinque erecto valido, suprà denticulato, elytris concoloribus; corpore infrà castaneo, thorace pedibusque flavo-hirsutis.* Long. lin. 10, lat. lin. $6\frac{1}{2}$.

Bolboceras neglectus, Hope ♀. *Affinis* Bol. Latreillii, *at minor. Castaneus, capitis clypeo emarginato, medio lineâ irregulari elevato, posticè cornuto, cornu autem apice fisso bidentato; thorace anticè abruptè truncato, posticè convexo varioloso punctis sparsim instructo; elytris striato-punctatis, corpore subtùs flavis capillis instructo.* Long. lin. $8\frac{1}{2}$, lat. lin. 5.

Bolboceras rotundatus, Hope ♀. *Castaneus, clypeo integro, capite anticè excavato, medio lineâ irregulari elevatâ conspicuo, posticèque bidentato seu tuberculis binis instructo; thorace convexo glabro punctis aliquot in medio vix conspicuis; elytris striato-punctatis rotundatis piceo-castaneis, pedibus pallidioribus et pilosis.* Long. lin. $3\frac{1}{4}$, lat. lin. 2.

Bolboceras rubescens, Hope. *Rubro-piceus nitidus, clypeo integro, capite lineâ irregulari instructo; thorace convexo glabro, fossulâ rotundatâ utrinque fortiter impressâ; elytris castaneis, pedibus concoloribus.* Long. lin. $2\frac{1}{2}$, lat. lin. $1\frac{1}{4}$.

Onthophagus 4-dentatus, Hope ♂. *Affinis* Onth. Capellæ, Kirb., *at major. Niger, capite ferè trigono, clypeo emarginato, thorace anticè excavato, punctato quadridentato, dentibus mediis majoribus prominentibus, lateralibus minoribus seu tuberculatis; elytris striatis, spatio inter strias subtilissimè punctulato, pedibus antennisque flavo-ciliatis.* Long. lin. $6\frac{1}{2}$, lat. lin. 4.

♀. *Fœmina differt thorace integro haud dentato, angulis anticis thoracis prominentibus et acutis.*

Onthophagus Erichsoni. *Niger, capite ferè trigono, tuberculo utrinque ante oculos posito; thorace anticè valdè excavato, posticè convexo cornu medio lato antrorsum extenso; elytris striato-punctatis, pedibus, funiculoque antennarum piceis, capitulo flavescente; pedum anteriorum tibiis 3-dentatis, tarsis aurantiis capillis obsitis.* Long. lin. $4\frac{1}{4}$, lat. lin. $2\frac{1}{4}$.

This insect will at some future time be considered as the type of a distinct genus.

Onthophagus picipennis, Hope. *Piceus, thorace trigono, capite ante oculos furcato, thorace antrorsum lineâ elevatâ conspicuo, punctulato; elytris nigris nitidis, corpore infrà concolori, pedibus rubro-piceis.* Long. lin. $4\frac{1}{4}$, lat. lin. 2.

This species I have formerly received from Melville Island, and it is evidently the same as that taken at Port Essington.

Onthophagus glabratus, Hope. *Niger, capite integro, parùm excavato et subrugoso; thorace lævi sub lente subtilissimè punctato, elytris striato-punctatis, corpore infrà nigro, antennis tibiis tarsisque piceis et rufo-ciliatis.* Long. lin. 5, lat. lin. $2\frac{1}{2}$.

This species varies greatly in magnitude and in colouring: several specimens are evidently immature.

Onthophagus discolor. *Viridi-æneus clavâ antennarum flavescenti, capite integro anticè excavato, posticè convexo, lineis binis elevatis transversis, unâ mediâ, alterâ inter oculos positâ; thorace viridi, nitido sub lente punctulato; elytris atro-viridibus, striato-punctatis, punctis fortiter impressis, corpore infrà concolori.* Long. lin. 3, lat. lin. $1\frac{1}{2}$.

The above species of *Onthophagus* are all from Port Essington; and I may here mention that there are in my collection twenty-four species from other parts of New Holland which have hitherto remained undescribed.

Tessarodon piceum, Hope. *Affine* Scarabæo Novæ Hollandiæ, Fab. *Piceum, capite bituberculato, thorace inermi punctulato elytrisque striato-punctatis et subscabrosis; corpore infrà rufo-piceo, pedibus ciliatis.* Long. lin. $2\frac{1}{4}$, lat. lin. $1\frac{1}{2}$.

This appears to be an insect closely allied to the *Novæ Hollandiæ* of Fabricius, from which it differs in several points.

Copris glabricollis, Hope. *Niger, capite ferè trigono, parùm emarginato vix subrugoso, thorace lævi nitido, posticè lineâ transversâ punctorum satis notato, elytris striato-punctatis, punctis fortiter impressis: corpore infrà nigro capitulo antennarum flavescente, funiculo autem et tibiis rufo-ciliatis.* Long. lin. 5, lat. lin. $2\frac{1}{2}$.

True *Copris* in New Holland are rare; from Melville Island I possess three species, which I have named *steriocerus, corniger* and *insularis.* The insect described above is an additional one. They are all remarkable for having the punctures apparent on each side of the elytra, and therefore are closely allied to several of the African *Copridæ*, such as *C. Orion* of De Jean, and also to *Copris Bengalensis* of Hope.

Mæchidius rufus, Hope. *Rufus, capite parùm emarginato subreflexo, thorace ferè semicirculari, lateribus extrorsùm convexis, an-*

gulis posticis vix rectangulatis; elytris capite cum thorace duplo longioribus, striato-punctatis et subgranulatis; corpore infrà rufo, pedibus concoloribus. Long. lin. $2\frac{1}{4}$, lat. lin. $1\frac{1}{4}$.

PHÆNOGNATHUS, Hope, n. g.

Pachypo *affine pedibus posticis longissimis. Caput in medio cornutum, labrum porrectum, conicum, mandibulæ exsertæ, antennæ* 9-*articulatæ. Maxillæ lobis minutissimis. Prothorax anticè subretusus. Elytra conica posticè valdè attenuata.*

Phænognatha Erichsoni, Hope. *Castanea, capite unicorni, cornu nigro, posticè flavo tomentoso; thorace punctato, margine omni ciliato; elytris ad basin castaneis, posticè nigris et striato-punctatis, punctis quasi erosis; corpore infrà piloso, pedibus concoloribus et auricomatis.* Long. lin. 3, lat. lin. $2\frac{1}{2}$.

Named in honour of Erichson, who has figured some singular genera allied to *Pachypus*, as well as to the above genus.

Sericesthis Gouldii, Hope. *Affinis* S. abdominali, Hope, *at differt Castaneo-pruinosa, capite anticè excavato, posticè convexo; thorace undique lineâ elevatâ circumdato lateribus flavo-ciliatis. Elytris posticè rotundatis ultra medium incrassatis, striato-punctatis, striis parum impressis, disco sparsim punctulato; podice trigono et declivo; corpore infrà concolori pectore pedibus flavis capillis longis obsitis, femoribus segmentisque abdominis rubro-piceis nitidis.* Long. lin. 11, lat. lin. $5\frac{1}{2}$.

The above insect is one of the largest species of my acquaintance; more than forty species have fallen under my notice; about thirty-five are in my collection. They would afford ample materials for a monograph. In bloom and colouring they resemble *Serica*, and to that genus they are certainly allied. Two other species were received from Port Essington with the above.

Liparetra nigricollis, Hope. *Atra, capite anticè excavato, thorace convexo, nigro, elytris striato-punctatis piceis, pedibus concoloribus, pectore flavo-tomentoso.* Long. lin. 3, lat. lin. $1\frac{1}{2}$.

The present insect belongs to a genus of the family of the *Sericidæ*; it is rich in species, as my cabinet contains nearly twenty. There are some few other *Lamellicornes* in Mr. Gould's collection, from Port Essington, but they are in too imperfect a state to describe.

GEODEPHAGA.

Megacephala Australasiæ, Hope. *Flava, antennis palpisque luteis, capite viridi; maxillis concoloribus, apicibus nigricantibus. Thorace æneo-viridi, anticè posticèque constricto, lineâque longitudinali fortiter impresso; elytris flavo-marginatis maculâ anchorali magnâ notatâ; corpore infrà viridi ternis segmentis antepenultimis piceis, apicali autem flavo, pedibusque concoloribus.* Long. lin. $7\frac{1}{2}$, lat. lin. $2\frac{1}{2}$,

This is the first instance, I believe, of a *Megacephala* being described as inhabiting New Holland: apparently it varies considerably in magnitude.

Cicindela Ioscelis, Hope. *Atro-ænea, capite æneo fronte albido,* *antennis violaceis; thorace bronzeo ferè bilobato, posticè constricto, elytris nigricantibus, lateribus externè trilunatis, maculis albidis notatis, septem punctis viridibus in singulo elytrorum ferè ad suturam positis; corpore infrà violaceo, femoribus, tibiis tarsisque concoloribus, tibiis autem ad basin flavo-maculatis.* Long. lin. 3, lat. lin. $1\frac{1}{4}$.

The above elegant insect appears to be a form differing from any yet received from New Holland.

Carenum Smaragdulum, Hope. *Viride, capite nigro, foveisque binis impresso, thorace virescenti semicirculari, margine omni elevatâ; elytris læte viridibus glabris nitidis, marginibus externis elevatis et auratis; corpore infrà piceo lateribus æneo-tinctis, pedibus concoloribus.* Long. lin. 9, lat. lin. $2\frac{1}{4}$.

This beautiful species I received lately from Western Australia, and now describe it, as it is apparently quite unknown. It is probable that *Carenum* will be found to be peculiar to New Holland. No true *Scarites* of my acquaintance is of any colour but black or brown.

Eutomus megacephalus, Hope. *Cylindricus, niger, nitidus, capite maximo pronoto viridi, elytris lævibus cupreo-viridibus, tibiis anticis dente unico apicali externo.* Long. lin. 8.

Ænigma (Newm.) cyanipenne, Hope. *Atro-piceum, capite nigro punctulato, antennis tomentosis, quatuor primis articulis atris, reliquis fuscis; thorace cordato, anticè posticèque truncato, disco punctulato; elytris cyaneis, striato-punctatis, spatiis, inter strias punctulatis; corpore infrà piceo, pedibus concoloribus.* Long. lin. 7, lat. lin. $1\frac{1}{2}$.

This species is the second that has hitherto been described. I consider it as a true *Helluo*.

Ænigma unicolor, Hope. *Fusco-piceum, antennis tomentosis, thorace cordato punctulato, elytrisque subcostatis et striato-punctatis, corporeque infrà concolori.* Long. lin. 7, lat. lin. $1\frac{1}{2}$.

As this species is also a native of New Holland, and is unknown to entomologists, it is here described, although it was not received from Port Essington.

Cyphosoma*, n. g.

Antennæ 11-*articulatæ, articulo* 1*mo* *crasso, reliquis æqualibus. Clypeus protensus subemarginatus. Caput subquadratum fossulis binis inter oculos fortiter impressis. Thorax lateribus rotundatis, angulis anticis prominentibus. Elytra gibba. Palpi maxillares, articulo* 1*mo* *brevi,* 2*do* *triplo longiori apice subincrassato,* 3*tio* *cylindrico apice truncato.*

Cyphosoma unicolor. *Capite nigro; antennis articulis* 4, *primis piceis, reliquis subtomentosis; thorace concolori, marginibus lateralibus elevatis, lineâ mediâ longitudinali anticè interruptâ, fossulâ utrinque fortiter impressâ; scutello brevi; elytris gibbis, sulcatis; pedibus robustis, tibiisque subincurvis.* Long. lin. $8\frac{1}{2}$, lat. lin. 3.

Catascopus Australasiæ, Hope. *Viridis, antennis fuscis; thorace*

* κύφος, *gibbus*, et σῶμα, *corpus*.

hexagono lateribus marginatis concolori; elytris striato-punctatis; corpore infrà piceo, pedibus concoloribus. Long. lin. 4½, lat. lin. 1½.

This, I believe, is the first time that *Catascopus* has occurred in New Holland, and it is singular that the form of it approaches the species of Africa much more than those of India.

Gnathaphanus (M. L.?) Licinoides, Hope. *Niger, thorace fossulis posteà fortiter impressis, elytris sulcato-striatis, punctisque excavatis, corpore infrà atro nitido, tarsis infrà fusco-spongiosis.* Long. lin. 5¾, lat. lin. 1¾.

I have little hesitation in regarding this insect as a true *Gnathaphanus*; it has not hitherto been found but in the island of Java.

Cyrtoderus*, n. g.

Antennæ 11-*articulatæ, articulo* 1*mo* *quatuor proximis æquali, cylindrico, apice incrassato, subtruncato, reliquis ferè æqualibus. Mandibulæ apice subincurvatæ. Labrum quadratum medio productum subciliatum. Mentum transversum. Palpi maxillares ultimo articulo subsecuriformi, obliquè truncato. Palpi labiales ultimo articulo ferè trigono, valdè securiformi. Thorax subquadratus angulis posticis lateribusque rotundatis. Corpus gibbosum. Pedes robusti, tibiis spinosis.*

Cyrtoderus Australasiæ. *Niger, antennarum articulis tribus primis piceis, reliquis pubescentibus; thorace lineâ mediâ longitudinali, anticè posticèque interruptâ, fossulâque utrinque retrorsum fortiter impressâ; scutello parvo vix distincto; elytris striatis interstitiis elevatis, marginatis, serie tuberculorum ad margines externos approximatâ; corpore subtùs nigro, tibiis spinosis.* Long. lin. 8, lat. lin. 2½.

Hydradephaga.

Cybister insularis, Hope. *Niger, capite integro convexo, oculis albis, thorace sub lente subtilissime punctato, marginibus exterioribus flavescentibus; elytris nigris flavo-marginatis, disco binis lineis punctorum haud fortiter impresso; corpore infrà nigro nitido, pedibus quatuor anticis flavo-ornatis, posticis atro-piceis.* Long. lin. 8, lat. lin. 4½.

This is the smallest species known, being scarcely larger than a *Hydaticus.*

Colymbetes monostigma, Hope. *Ater, nitidus, elytris uno aurantio stigmate ornatis, corpore infrà nigro, pedibus rufo-piceis.* Long. lin. 3¼, lat. lin. 2.

Hydroporus collaris, Hope. *Nigro-piceus punctatus; thorace medio convexo, lateribus utrinque fortiter depressis; elytris subtilissime punctulatis piceis, corpore infrà pedibusque concoloribus.* Long. lin. 1¾, lat. lin. ¾.

Dineutes (MacLeay) Gouldii, Hope. *Nigro-æneus nitidus, thoracisque elytrorumque margine flavo, elytris trispinosis, spinâ mediâ*

* Κυρτὸς and δέρη. I know not where to place this genus; it seems allied to *Zabrus*, and unites in itself the characters of other families. I have also received it from Melville Island.

majori, binisque lateralibus minoribus; toto corpore infra luteo. Long. lin. $3\frac{1}{2}$, lat. lin. $1\frac{1}{2}$.

Gyrinus Iridis, Hope. *Atro-æneus, elytris abruptè truncatis, striatis, purpurascentibus; corpore infrà æneo, pedibus piceis.* Long. lin. $3\frac{1}{2}$, lat. lin. $1\frac{1}{2}$.

Hydrobius marginicollis, Hope. *Niger, lævis margine postico thoracis rufo-piceo, corpore infrà nigro et pubescenti segmentis abdominis utrinque maculâ rufescente notatis, pedibus piceis.* Long. lin. $5\frac{1}{2}$, lat. lin. $2\frac{1}{2}$.

Hydrobius assimilis. *Affinis præcedenti, at minor, toto corpore suprà nigro; elytris sub forti lente subtilissime punctulatis; corpore infrà nigro tomentoso, palpis tarsisque rufo-piceis, femoribus tibiis nigricantibus.* Long. lin. 5, lat. lin. $2\frac{1}{4}$.

Sternoxi.

Agrypnus grandis, Hope. *Niger, capite ferè quadrato auricomato, angulis anticis rotundatis; thorace convexo disco lateribus parum depressis; elytris atris striato-punctatis, corpore infrà concolori, pedibus piceis et auro-tomentosis.* Long. lin. 15, lat. lin. 5.

The above is the only species of large dimensions; there are also seven others from Port Essington, but as they are not remarkable in any respect, and are allied to various undescribed species, I pass them by.

Longicornes.

Mallodon insulare, Hope. *Castaneum, capite atro, antennis piceis, mandibulis denticulatis; thorace transversè quadrato, lateribus valdè serratis, disco varioloso punctato; elytris castaneis quibusdam lineis parum elevatis distinctis, corpore infrà rufo-piceo, pedibus atrioribus.* Long. lin. 21, lat. lin. $6\frac{1}{4}$.

Plocæderus Australasiæ, Hope. *Piceus, pubescentiâ griseâ tectus; thorace constricto rugoso; elytris bispinosis griseo piceoque colore irroratis; corpore infrà griseo-tomentoso, pedibus concoloribus tarsisque infrà flavo-spongiosis.* Long. lin. $10\frac{1}{2}$, lat. lin. $2\frac{1}{2}$.

There is one remarkable character apparently peculiar to this species; the male insect has the third and fourth joints of the antennæ subglobose: I can scarcely regard the appearance as a sexual distinction.

Monohammus mixtus, Hope. *Cænosus, colore nigrescenti marmoratus; thorace spinoso punctis sparsim notatis; elytris bispinosis concoloribus; corpore infrà grisescenti, tarsis suprà et infrà auricomatis.* Long. lin. 11, lat. lin. $3\frac{1}{2}$.

Stenochorus vicinus, Hope. *Nigro-piceus, antennis pallidioribus, thorace tuberculato, spinis lateralibus vix distinctis; elytris piceis disco flavis maculis notato, guttâ flavâ ovali ante apicem positâ; corpore infrà fusco-griseo, pedibus piceis, femoribus incrassatis.* Long. lin. 9, lat. lin. 2.

Stenochorus cruciger, Hope. *Rufo-piceus, antennis pallidioribus, thorace tuberculato lateralibus spinis subacutis; elytris piceis disco in medio cruce flavâ notatis, apicibus concoloribus; corpore infrà rufo-piceo.* Long. lin. 7, lat. lin. $1\frac{1}{2}$.

Xystrocera Australasiæ, Hope; *affinis* Xys. Indicæ, Hope. *Rufescens, thorace globoso, lineâ mediâ longitudinali vix notato; elytris rufo-castaneis viridi-æneis, vittâ fortiter punctatâ, femoribus atro-piceis.* Long. lin. 11, lat. lin. $2\frac{1}{2}$.

It is with hesitation that I give this insect as distinct from one received from Singapore; in sculpture, and in several minor points, it certainly differs from *Indica*, and the genus is now recorded for the first time as occurring in New Holland: it is singular that I have also lately received from Sierra Leone another species intimately allied to both of them.

Callidium Essingtoni (*Affine* Callid. obscuro, Fab.). *Brunneum, thorace lineâ longitudinali parum elevatâ, tuberculisque binis ferè mediis insignito; elytris vittâ albidâ, tuberculis variis per discum aspersis; corpore infrà griseo, pedibus pallidis.* Long. lin. $4\frac{1}{2}$, lat. lin. $1\frac{1}{4}$.

There is a third *Callidium* closely allied to the above, from the vicinity of Swan River.

Rhytiphora (Serville) piperitia. *Squamosa, nigro flavoque colore variegata; antennis plumosis articulis apicibus rufo-piceis; thorace punctato; elytris ad apicem abruptè truncatis, ad basin tuberculis majoribus nigris, aliis per totum discum aspersis; corpore infrà concolori.* Long. lin. 8, lat. lin. $2\frac{1}{4}$.

This genus seems peculiar to New Holland; more than twenty species have fallen under my notice.

Rhytiphora tuberculata. *Grisea, antennis plumosis, thorace acutis spinis insignito, elytris bispinosis, ad humeros crebris tuberculis obsitis, disco in medio albo fuscoque colore notato; corpore infrà albido piloso.* Long. lin. $7\frac{1}{2}$, lat. lin. $2\frac{3}{4}$.

Rhytiphora detrita, Hope. *Picea, capite flavo-piloso, antennis plumosis, thorace 2-tuberculato, elytris humeris prominentibus, dente elevato in singulo ferè ad basin posito; per totum discum suprà color piceus, lanugoque flava prævalet; corpore infrà concolori flavisque capillis obsito.* Long. lin. 6, lat. lin. $1\frac{1}{4}$.

Here three new species of *Lamia* ought to be introduced; unfortunately they are so changed in appearance by grease, that it is well to pass them over.

Rhagiomorpha (Newm. ?) unicolor, Hope. *Fusco-brunnea, antennis flavescentibus; toto corpore suprà et infrà fusco-brunneo et piloso, pedibus subflavis.* Long. lin. 9, lat. lin. 2.

Rhagiomorpha plagiata, Hope. *Grisea, antennis flavis articulis ultimis crassioribus; thorace griseo-piloso; elytris concoloribus, punctulatis, maculâ magnâ flavâ inter humeros positâ, secundâ minore rotundatâ haud ad apicem positâ; corpore infrà griseis capillis obsito.* Long. lin. 7, lat. lin. $1\frac{3}{4}$.

Hathlia lacteola, Hope. *Alba, antennis rufescentibus et pilosis; thorace lineâ longitudinali piceâ notato punctato; elytris cretaceis ad basin punctatis apicibus subacutis, suturâ sensim elevatâ; corpore infrà griseo-testaceo, pedibus concoloribus.* Long. lin. 6, lat. lin. $1\frac{3}{4}$.

Hathlia 4-lineata, Hope. *Rubro-picea, antennis concoloribus; tho-*

race tribus lineis albidis notato, mediâ latiori, lateralibus minoribus; elytris 4-*lineatis, lineis binis albidis externis, binisque suturalibus; corpore infrà piceo lanugine albidâ asperso, pedibus concoloribus.* Long. lin. 5, lat. lin. $1\frac{1}{2}$.

Hathlia lineella, Hope. *Brunnea albidâ pubescentiâ tecta; antennis rufescentibus; thorace mediâ lineâ piceâ elevatâ, lineisque albidis utrinque notato; elytris apicibus subacuminatis, lineisque quatuor albidis, parum distinctis; corpore infrà concolori.* Long. lin. 4, lat. lin. 1.

Hathlia melanocephala, Hope. *Albida, antennis griseis, articulis nigro-maculatis; capite nigro; thorace anticè concolori, posticè albo; elytris apice acuminatis, striato-punctatis, lineis albidis insignita; corpore infrà griseo, pedibus concoloribus.* Long. lin. $3\frac{1}{2}$, lat. lin. $\frac{3}{4}$.

The last four insects belong to the genus *Hathlia* of De Jean. I am doubtful if the characters are yet published, and of course if they are not, the name in future may be changed by the describer.

Having finished the *Longicornes*, I leave the remaining species from Port Essington for a continuation of the present paper.

MICROSCOPICAL SOCIETY OF LONDON.

At a meeting of the Microscopical Society held April 27th, J. S. Bowerbank, Esq., in the Chair, a paper was read by G. Busk, Esq., entitled, "Observations on some Infusoria contained in water from Africa." The water was procured from two localities, and contained thirteen species of Infusoria, all of which, except three species, were common in ordinary water; the other three, which were of the genus *Eunotia*, were precisely similar to those discovered by Ehrenberg as fossils in the Bergmehl of Sweden; but lately he has detected them in the recent state in earth from the neighbourhood of Labrador; thus having two localities of very different conditions as to climate for the same species of Infusoria, which the author states would tend to prove that no certainty as to climate could be deduced from the occurrence of fossil Infusoria.

Another paper was also read by the same author, "On the young of a species of *Ixodes* from Brazil." These insects, a short account of which was given at the last meeting, were sent from Rio Janeiro in a letter, and were still alive, although upwards of sixty days had been spent on the passage over; they are called by the natives Carapato, and are highly injurious to cattle. The author described minutely their suctorial apparatus and their general organization, and concluded that they were gifted with extraordinary powers of vitality, and imbibe their food through two suctorial tubes contained in the mandibles.

The Secretary read a letter from Dr. Southby of Bulford House*, near Amesbury, Wilts, which had been handed to him by Mr. R. Taylor; it contained three different samples of disintegrated chalk from Salisbury Plain; portions of each had been given to some mem-

* See p. 437 of the present Number.—Ed.

bers of the Society, and they had detected in them many forms of minute animals which were new to English microscopists.

Another communication was also read by the Secretary from C. G, White, Esq. of Poplar. It will be recollected that in October 1840. Mr. White exhibited to the Society some beautiful specimens of supposed minute fungi, which he had found in tolerable abundance on gravel stones in the neighbourhood of Old Ford, Middlesex; they corresponded in some measure with the description of *Craterium pyriforme* as given by Hooker and other botanists. Mr. White, having paid considerable attention to ascertain their true nature, has at last found them not to be of a fungoid nature, but the ova of a species of *Acarus*, with a body of a red colour and six legs; specimens of the insects, both in the egg and after their escape, were exhibited to the meeting.

DUBLIN NATURAL HISTORY SOCIETY.

The usual monthly meeting of the Members was held on Wednesday the 1st instant, J. W. Warren, Esq., in the Chair.

At this meeting a paper communicated by Arthur Hill Hassall, Esq., entitled, "A Sketch of the Freshwater Confervæ," was read by the Secretary.

On the subject of the growth of the Confervæ, Mr. Hassall makes the following observations:—

"The rapidity of growth of most species of Confervæ has been a subject of surprise to many observers of nature, and the explanation which I am about to offer of the causes of this very rapid growth has not, that I am aware of, been before noticed. Most, if not all, the Confervæ appear to me to increase in two ways; first, by the continued growth of the free extremities of the different filaments: this method is obvious and need not be insisted on. Secondly, by the repeated growth and subdivision of each cell entering into the formation of the filaments. I long suspected the existence of this mode of development, but was first convinced of its reality by an examination of those species of the genus *Conjugata* of Vaucher distinguished by the presence of spiral tubes winding round the interior of the cells, and especially of the one named *Conjugata princeps*. If the filaments of this species be carefully examined and contrasted together, it will be seen that in some the length of the cells only just exceeds their diameter, and that each cell contains three spiral tubes, which together perform from seven to eight turns in each, the coils almost touching each other; that in others the length of the cells is more than three times the diameter, but that still each cell contains only the same number of spiral turns, viz. seven or eight, which now, instead of being nearly in apposition, are widely separated, thus plainly proving the elongated cells to be derived from the growth of the shortest ones; and again it will be noticed in others that the cells have returned to their original length, but that each now contains only three or four spiral turns, thus manifestly proving the division of the elongated cell, and completing the chain of evidence which establishes to demonstration the existence of the mode of growth to which I have referred in the section of the genus alluded to. The number of spiral tubes varies in this and other species in different filaments, but not in the same, and this makes a corresponding difference in the length of the joints or cells, which are longer if there be four or five tubes instead of three. The proofs now to be adduced, that this mode of growth likewise takes place in all Confervæ which are composed of simple unbranched filaments, a large class, are little less conclusive than those just enumerated. In most of the filaments of these the cells will be observed to be of various lengths, some twice as long as others, and these again of every intermediate length. Now, by means of this law of growth, this variation in the length of the cells is at once and satisfactorily accounted for, which is not to be done in any other way. But this is not all—the progress of the formation of the septa which divide the cells may be frequently traced either in the same or different filaments, which is alone sufficient to establish the reality of the existence of this law of increase in this numerous section of the class Conferva. The only Confervæ to which I should for a moment hesitate to apply this method of development, and I believe that it is applicable to them likewise, are the branched species, to which such a means of increase is less necessary, seeing that, unlike those with simple unbranched filaments, they have innumerable terminal points of growth. Now I beg to lay particular stress on this law of development, which is evidently very important, inasmuch as it not merely goes to account for the rapid growth of many species of Confervæ—for it is simultaneously in operation in each of the many hundred cells of which each filament of most Confervæ is composed—but it likewise teaches us that much caution is requisite in determining species, as it proves that the character most relied on for this purpose is one subject to very great variation—that is, the length of the joints. There is a limit, however, to this law of development, which does not, in the section of the genus *Conjugata* to which reference has been made, allow of more than one or two divisions of each cell, unless, indeed, the spiral tubes grow likewise in an equal ratio, which may be the case, and then the division of the cells may be frequently repeated. In those Confervæ which do not contain spiral tubes, the multiplication of the cells may go on to an almost endless extent. To illustrate the importance of attention to this law of development in determining species, I may observe, that but for its timely discovery I should have described several species of *Conjugata* as distinct, which are really not so, considering the length of the cells and number of spiral tubes in the interior of each cell to be the most decided characters whereon to found specific differences. They are not so, however, one of the most certain being the diameter of the filaments. But carrying this law in view, it is not difficult to estimate the extent of the variations in length to which the cells are subject, first ascertaining what the primary length of the cell is. In the branched Confervæ there are laws of development, some of them peculiar to each species, presiding over the arrangement of the branches and cells, which have hitherto escaped the scrutiny of man."

MISCELLANEOUS.

Note on Puffinus major, *Faber. Greater Shearwater.* By W. Thompson, Esq.

In June 1837 I exhibited, at a meeting of the Zoological Society, an example of a shearwater which had been obtained in Ireland, and applied to it the scientific appellation of *Procellaria Puffinus*, Linn. (see Proceedings, 1837, p. 54). In the fourth part of the 'Manuel d'Ornithologie,' p. 507, published in 1840, Temminck has shown that this name has been applied to two species—the one frequenting the more northern, the other the more southern seas of Europe. He refers the only specimen recorded as having been obtained on the shores of Great Britain, and figured by Mr. Selby, to the northern one, *P. major*, Faber, and the object of the present communication is to state that examples procured in Ireland are likewise identical with it. Two or three species of *Puffinus* approach each other so nearly, that from the descriptions alone I could hardly have spoken with certainty as to this point; but Temminck having referred to Mr. Selby's plate of *P. cinereus* as representing *P. major*, Fab., enables me to do so, as that plate is admirably characteristic of an Irish specimen of the bird now before me*. This is the second obtained in Ireland, and both by Mr. Robert Davis, jun., of Clonmel. This specimen was received alive on the 19th September, 1839, by that gentleman, who then informed me that "it was taken one or two miles outside Dungarvan [co. Waterford], by a person fishing for hake [*Merluccius vulgaris*], with a hook and line, it having taken his bait. I kept it alive for about a week, but not having a suitable place for that purpose, killed it and set it up. As well as I can recollect the former specimen, this resembled it in every respect. It was however more lively, and ran along very rapidly with the breast about an inch and a half from the ground. Having on one occasion put it on a roof, it seemed to be more at ease on the inclined plane afforded by that situation than on a flat surface; it mounted rapidly to the top, though when it came to the edge, no attempt to fly was made, and it fell heavily to the ground. It rarely stirred at all during the day, but kept itself as much concealed as possible, and if it could not hide its body, would endeavour to conceal its head." After visiting Dungarvan in the summer of 1840, Mr. Davis wrote me to the following effect:—"It would seem that some of my statements respecting the first specimen are not correct [see Zoological Proceedings, as before quoted] as regards its capture. The species is never met with near the shore, but only far out, and is occasionally taken on the hook and line employed in hake-fishing. The fishermen sometimes keep them for weeks about their houses, and in some instances they have become tame; they never attempt to fly. A man had one a few days before I went there, but had killed it with dogs on a piece of water. It does not appear that the Manks shearwater is ever seen, nor could

* Mr. Selby remarks that his specimen "appears to be a bird of the year;" so probably is the bird under consideration; but the brief description of the female given by Temminck equally applies to it.

I ascertain that a shearwater was ever shot, but always taken with a hook. As before mentioned, they are commonly known by the name of *Hagdowns*."

Had I been aware, in accepting of Mr. Davis's kind offer to send his second specimen of this bird for my examination, that the former one was in England, and could be seen by my friend Mr. Yarrell, I should have left it to him to notice the subject; but having received the specimen and found corrections on my former notice necessary, they are here communicated. The same letter which announced that the bird had been despatched to Belfast, informed me that Mr. Yarrell had seen the former one, and was disposed to consider it *Puffinus major*, Fab.

So little is known respecting this species as an inhabitant of our seas, that I am induced to add the following. Mr. R. Ball, when dredging off Bundoran, on the west coast of Ireland (in company with Mr. E. Forbes and Mr. Hyndman), on the 16th of July, 1840, saw three petrels on wing near to him which he believed to be of this species. On my submitting Mr. Davis's specimen to Mr. Ball's inspection, he stated, that " the Bundoran birds exhibited some whiteness, which was confined to the ventral or rather anal portion, and which the specimen does not present; but such difference may be consequent on age." Mr. Ball continues: " they appear to me to be much more dusky than the Manks petrel, of which I have a specimen, and have seen several on wing when crossing the sea from Dublin to England. These were all, I think, smaller than the Bundoran birds, and the white part of their plumage was particularly conspicuous."

STERNA ARCTICA.

To Richard Taylor, Esq.

Sir,—In the Annals and Magazine of Natural History for the present month, the unusual circumstance is noticed of considerable numbers of *Sterna arctica*?, a bird essentially aquatic in its habits, having appeared at various places more or less remote from the sea, more particularly in the southern and western parts of England.

The account of the rarity of such an occurrence is accompanied by observations on the probability of the birds having been driven in from sea by the westerly gales which prevailed on the 7th and 8th of May, when " on their return to the northern regions after a winter sojourn in the south."

These last observations have induced me to trouble you with this communication, for the purpose of pointing out the improbability of such conjecture, as far as relates to their return to the " northern regions."

That the birds were driven inland by stress of weather admits of little doubt; but there is no evidence of their flight having been directed towards the polar regions, as suggested by your correspondent. On the contrary, there is very great doubt as to the birds in question being really the *Sterna arctica*, for all those specimens which were captured here and came under my observation belong to a different species (*S. Hirundo*), which species is a very common bird on our own coasts, as also on the southern and eastern shores of Ireland, where they are regular summer visitors, generally arriving about the 10th of May and retiring the latter end of October.

Along the coasts of Wexford and Waterford they are called "mackerel gulls," owing, I imagine, to the circumstance of their generally preceding the arrival of that fish, as well as the immense shoals of the *Centronotus Trachurus* (horse mackerel, Yarr. Brit. Fish. vol. i. p. 154), which spread themselves along the eastern shores of Ireland.

They (the birds) are probably attracted by the myriads of small fry which the horse-mackerel pursue with astonishing perseverance, the fry aforesaid constituting in common the food of both bird and fish. As the terns generally arrive on the coasts of the British islands about the 10th of May, is it not probable, from their appearance inland on the 8th of that month, that the westerly gales prevented them arriving at their accustomed quarters? hence their unusual appearance inland may be rationally accounted for.

The boldness of the terns' flight and eagerness in pursuit of their prey are striking features in their habits, while their incessant screaming when engaged in this necessary occupation cannot fail to attract the notice of the observant naturalist.

Such is the force with which the tern sometimes precipitates itself on its prey, that it is no unusual circumstance for the bird to disappear beneath the surface of the water, from which it is sure to emerge with its finny captive, for its aim is unerring. But as the habits of most of the aquatic tribe of birds are those of unmitigated rapine, the *Sterna stolida* (black noddy), which is also a summer visitor to St. George's Channel, sometimes steps in to rob its more timid congener of its anticipated repast.

The flight of the noddy is extremely rapid, and it is so exceedingly shy, that I never could get a shot at one, though watching many times for a "chance." As I have never observed this bird on the main shore, which it seldom or ever approaches, it probably retires, after feeding, to some insulated rock to repose itself, without fear of interruption. It appears a solitary bird, never assembling in flocks like the *S. Hirundo*, but singly seeks its food at some distance from land, though it occasionally pursues its prey into the estuaries of the larger Irish rivers, or along the outer shores of the coast.

When the *S. Hirundo* have done feeding, they assemble in flocks of twenty or thirty in number on some sandy shore adjacent to their fishing quarters, where they stand or sit with their heads all pointed in the same direction, until returning appetite again impels them to renewed exertions for a fresh supply of food.

The *Sterna minuta* (lesser tern) is equally abundant on the shores of the British islands. Its habits are exactly similar in every respect to those of the *S. Hirundo*, and they are mostly found occupying the same localities as the larger species, with whom they live in peaceful fraternity. I am, Sir, your obedient humble servant,

Bristol, June 4, 1842. THOS. AUSTIN.

[The conflicting accounts of the two species of Terns seems only another version of the old tale of the shield which was silver on one side and gold on the other; both observers are right, but each party seems to have become acquainted with only one side of the question. Mr. Austin writes as if he did not agree with Mr. Strickland—but both these Terns are summer visitors here—both were influenced by the same high winds, and both probably were obliged to steer for a time the same course.—Ed.]

On the Progress of the Silk-culture in the West Indies; and the advantage of the employment of Cold in the preservation of the Eggs of the Silk-worm.*

The eggs alluded to in the last report as obtained from Guadaloupe continued to hatch daily in small quantities, and at first appeared healthy, but soon showed signs of weakness, and few eventually came to maturity, and but a small number of cocoons were spun. Similar results attended the creole eggs of this island. At the latter end of October I visited Martinique, to ascertain the result of the use of an ice-house to preserve the eggs. Being favoured with an introduction to M. Vecoul, President of the Agricultural Society, &c., who takes a lively interest in the silk-culture, at his house I met M. Bouissett, who has for several years had to contend with similar difficulties to those I have had to contend with, and from him I ascertained that he had some time since arrived at the conclusion, that a degree of cold, approaching to freezing, was necessary for the eggs in order to obtain vigorous worms.

The colonial government of Martinique granted a sum of money sufficient to erect an ice-house on a large scale in the town of St. Pierre, at a cost of about 1000*l.* sterling; and under the supervision of M. Bouissett, chambers have been constructed in the interior of the building of various degrees of temperature for the reception of the silk-worm eggs, and he has found that the eggs wintered for three months commence hatching in about nine days, and in three days all are come forth as in the best-conducted establishments in Europe; and that the worms have proved uniformly healthy and vigorous, and in due time spinning excellent cocoons of great beauty, size and weight. This result is extremely satisfactory, as it removes at once all that has hitherto hindered success, and there is now every reason to think the silk-culture will prove a source of wealth to these colonies, as this has been the invariable result in every country in which it has hitherto been established. The fact that a degree of cold nearly approaching to the freezing point is essential to the egg in order to the production of a vigorous worm, does not appear to be known to the silk-culturists of Europe. It is very gratifying to me to be able to state, that I found the utmost willingness to impart information to me in Martinique, as I also did on similar occasions in Guadaloupe; and I have just heard from M. Bouissett, who informs me, that on accomplishing my proposed visit in the latter end of this

* Extracted from despatches addressed to Lord John Russell.

month, he will be prepared to supply me gratuitously with an assortment of eggs sufficient for my first crop, and will then be able to make arrangements for supplying me regularly in future with eggs that have been wintered in the ice-house. I have also secured the privilege of placing any eggs that may come to me from Europe in their ice-house if necessary. I may here observe, that the few eggs I brought with me from the ice-house, although they had been there for a short time only, and were in several respects under unfavourable circumstances, yet afforded very gratifying results. Should no unforeseen hindrance occur, it is expected that eight crops of cocoons will be obtained here this year. The mulberries are healthy and full of leaf. (Signed) T. Burke.

January 1, 1841.

Metcalfe Ville, July 27, 1841.

I have long been aware of the necessity of wintering silk-worm eggs; and in cases where we have been desirous of reproducing from the eggs of the same season in the United States, we have placed them on the ice. Our eggs are now in the ice-house in Kingston, from whence we shall withdraw them as we need them. I am happy to be able to say, that experience has more than confirmed my anticipations of entire success in raising silk for export from Jamaica. Our company is progressing steadily, and in due time (a few months) will export the first silk, to be followed by a crop per month, as the trees increase in strength.

(Signed) Samuel Whitmarsh.

FOSSIL INFUSORIA FROM THE CHALK OF SALISBURY PLAIN.

To Richard Taylor, Esq.

Sir,—Living as I do in the middle of the great chalk district of Salisbury Plain, Mr. Weaver's paper on the composition of chalk rocks and chalk marl, from the observations of Dr. Ehrenberg, has greatly interested me, and has led me to examine the chalk of this neighbourhood; and it occurred to me that, by taking advantage of the disintegration which chalk undergoes by exposure to moisture and frost, I should get perfect specimens of the various minute organic remains of which it appears to be composed. I have enclosed you some of the coarser particles of the chalk, obtained by washing the disintegrated chalk in the usual way in which the coarser particles of powders are separated from the finer.

This method answers most admirably, and when a small portion of the powder is mounted in Canada balsam, it forms a most beautiful object for the microscope. The larger forms may be as easily separated by the aid of a hand-glass as from the recent sea-sand containing analogous organic remains. It is probable, however, that the same idea has occurred to other observers, and in that case I trust you will forgive my ignorance: should any of your friends who are interested in these minute bodies wish for a supply, I shall be most happy to send them as much as they require from the various beds of this district; what I have enclosed is from the chalk technically called by our masons 'stone chalk,' of which all the inside and often the whole of the walls of our houses are built, excepting the quoins*. Hoping you will forgive the liberty I have taken in troubling you,

Believe me to be your obedient Servant,

Bulford House, Amesbury, Wilts. A. SOUTHBY.

TETRAO TETRIX.

To the Editors of the Annals of Natural History.

GENTLEMEN,—I have the pleasure of announcing to the ornithological readers of your Magazine the occurrence of a bird which is altogether new to this neighbourhood, *Tetrao tetrix*, Linn. A single example, a female, was shot on the 4th inst. in the Hebden Vale, about two miles from Hebden Bridge. On opening the stomach I found it to be filled with the flowers of *Geum urbanum*, *Rumex acetosa*, and a few of the capsules of the *Viola canina*. The specimen I have prepared, and placed it in my father's collection.

Heptonstall, June 8, 1842. THOMAS GIBSON.

SOCIÉTÉ GÉOLOGIQUE DE FRANCE.

We are able to inform our readers, that the great Annual Meeting of the French Geologists will take place this year on Sept. 4th, at Aix (dept. Bouches du Rhône), and we have no doubt will be attended by a vast number of foreigners, attracted both by the beauty and geological interest of the neighbourhood.

Investigation of the Anoplura, *or Insects of the Genus* Pediculus *of Linnæus.*

It will perhaps be in the recollection of our readers, that at the last meeting of the British Association a sum of £50 was placed in the hands of a committee of zoologists to forward the publication of Mr. Denny's proposed work on the British Species of Lice. This work has now appeared, and amply proves the propriety of the grant in question. Figures of about 210 species, highly magnified, beautifully coloured and drawn with Mr. Denny's well-known skill, are given in the volume which has just appeared. Of these species *nearly one half are new to science*, and nearly three-fourths to the British fauna. Our object, however, in mentioning the work in this place, is to express a hope that the present Meeting of the British Association will not close without renewing the grant, (especially as so small a sum has been allowed to the Zoological Section,) as it is known to most of the members that Mr. Denny possesses a great store of materials, derived chiefly from exotic animals, of whose parasites we necessarily know still less than of those of our own country.

J. O. W.

FOSSIL CRINOIDEA.

Our correspondent, T. Austin of Bristol, informs us that he intends publishing by subscription 'A Monograph of Fossil Crinoidea,' in

* The specimens have engaged the attention of the Microscopical Society (see p. 430). And we shall be very glad to avail ourselves of Dr. Southby's kind proposal, in order to forward some portion to Prof. Ehrenberg, who is now engaged in publishing a work on Fossil Infusoria from the various quarters of the globe.—EDIT.

which many new and important genera and species will be for the first time figured and described, and their geological range and distribution defined. The work, which is to appear in numbers, will we doubt not meet with the approbation of geologists.

Works just published.

The Botanical Looker-out among the Wild Flowers of England and Wales, forming a monthly Guide for the Collecting Botanist. By Edwin Lees, F.L.S., &c.

The Pictorial Catechism of Botany. By Anne Pratt.

On the Growth of Plants in Glazed Cases. By N. B. Ward, F.L.S.

Algæ maris Mediterranei et Adriatici. Auctore Jacobo G. Agardh.

Cycle of the Seasons of Britain. By L. Howard, F.R.S.

Lectures on Animal Physiology. By B. J. Lowe.

Systematic Zoology. Grammar and Synopsis of Natural History. By James Wade.

METEOROLOGICAL OBSERVATIONS FOR MAY 1842.

Chiswick.—May 1, 2. Clear and very dry. 3, 4. Very fine. 5. Cloudy: heavy rain. 6. Fine: showery. 7. Rain: stormy showers. 8. Cloudy: stormy. 10, 11. Very fine. 12. Drizzly. 13—15. Slight haze in the mornings: very fine: clear at night. 16, 17. Very fine: clear. 18, 19. Overcast. 20. Densely clouded. 21. Cloudy and fine. 22. Cloudy and fine: slight rain. 23. Cloudy. 24. Rain. 25. Rain: overcast. 26. Rain: cloudy: clear at night. 27. Cloudy and fine. 28. Very fine. 29, 30. Clear and very fine. 31. Very fine: cloudy.

Boston.—May 1, 2. Fine. 3. Cloudy. 4. Fine. 5, 6. Fine: rain P.M. 7. Cloudy: rain A.M. and P.M. 8. Windy. 9—11. Fine. 12. Rain. 13. Fine. 14. Foggy. 15, 16. Fine. 17—19. Cloudy. 20. Rain. 21, 22. Cloudy. 23. Fine. 24. Rain: rainy day. 25. Cloudy. 26. Rain: rain early A.M. 27. Cloudy. 28. Fine: rain early A.M. 29. Fine. 30. Cloudy. 31. Fine.

Sandwick Manse, Orkney.—May 1. Clear: fog. 2. Cloudy: clear. 3. Clear: cloudy. 4. Cloudy: damp. 5. Cloudy: rain. 6. Bright: cloudy. 7. Cloudy: thunder. 8. Showery. 9. Cloudy. 10. Rain: clear. 11, 12. Cloudy. 13—15. Clear. 16. Clear: fog. 17. Fog cloudy. 18. Cloudy. 19. Cloudy: drizzle. 20. Cloudy: shower. 21. Bright: shower. 22. Clear. 23. Clear: fog. 24. Clear: cloudy. 25. Cloudy: damp. 26. Bright: cloudy. 27. Bright: shower. 28. Bright: cloudy. 29. Cloudy: showery. 30. Bright: cloudy. 31. Bright.

Applegarth Manse, Dumfries-shire.—May 1, 2. Dry and withering. 3. Cloudy. 4. Fine. 5. Cloudy, with rain. 6. Showery. 7. Wet day. 8. Showers A.M.: cleared. 9. Fair, but cool. 10. Fair, but threatening. 11. Showery. 12—17. Fair and fine. 18. Fair and fine, but cloudy. 19. Fine rain P.M. 20. Rain and hail. 21. Fair and fine. 22. Showery. 23. Showery: growing weather. 24. Showery. 25. Fair and fine. 26. One shower: fine P.M. 27. Fair and fine. 28. Fair till noon: then rain. 29, 30. Showers. 31. Slight showers.

Sun shone out 29 days. Rain fell 12 days. Thunder 2 days. Hail 1 day.

Wind North-east 1 day. East 3 days. East-south-east 1 day. South-east 5 days. South-south-east 4½ days. South 5 days. South-west 4½ days. West-south-west 4 days. West 1½ day. North-west 1½ day.

Calm 7 days. Moderate 14 days. Brisk 2 days. Strong breeze 6 days. Boisterous 2 days.

Mean temperature of the month	52°·8
Mean temperature of May 1841	52 ·2
Mean temperature of spring-water	46 ·8
Mean temperature of spring-water, May 1841 ...	49 ·3

Meteorological Observations made at the Apartments of the Royal Society, London, *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; *by the* Rev. W. Dunbar, *at Applegarth Manse*, Dumfries-shire; *and by the* Rev. C. Clouston, *at Sandwick Manse*, Orkney.

Days of Month.	Barometer.								Thermometer.									
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		Orkney, Sandwick.		London: R.S.			Chiswick.		Boston 8½ a.m.	Dumf.-shire.		Orkney, Sandwick.	
1842. May.		Max.	Min.		9 a.m.	9 p.m.	9¼ a.m.	8¾ p.m.	Fahr. 9 a.m.	Self-reg. Mx.	Self-reg. Mn.	Max.	Min.		Max.	Min.	9¼ a.m.	8½ p.m.
1.	30·002	30·007	29·933	29·53	30·05	30·09	30·23	30·24	59·3	69·6	47·6	73	44	57	66	39	50	43
☾ 2.	30·084	30·022	29·962	29·59	30·10	30·00	30·16	30·01	57·3	67·7	47·8	66	30	57·5	66½	37	48	48½
3.	29·986	29·967	29·854	29·47	29·81	29·80	29·92	29·84	50·2	62·5	42·0	71	46	46·5	64	37	51	48½
4.	29·956	29·907	29·892	29·33	29·78	29·75	29·81	29·81	53·7	66·4	49·3	65	33	55	62	45	50	47
5.	29·904	29·886	29·530	29·24	29·59	29·21	29·45	29·20	56·8	62·0	47·6	63	46	58	56	45½	50	48½
6.	29·438	29·423	29·376	28·77	29·02	29·00	29·02	28·91	55·3	61·8	50·6	60	47	55	55	46	52	49
7.	29·340	29·322	29·197	28·73	28·87	28·77	28·81	28·79	51·7	62·3	49·0	63	46	51	51½	45	55	48
8.	29·416	29·706	29·382	28·80	29·06	29·47	29·00	29·30	54·2	62·0	48·4	63	41	55	55½	42½	45½	45
9.	29·948	30·084	29·892	29·40	29·80	29·97	29·79	29·97	51·3	61·6	46·4	60	32	50	55	37	45	44½
● 10.	30·218	30·172	30·068	29·69	30·02	29·90	30·04	29·98	52·0	60·5	41·8	64	35	53	60	34	51	47
11.	30·006	29·966	29·812	29·44	29·75	29·78	29·91	29·91	57·3	61·0	46·2	65	41	57	59½	46	50	47
12.	29·918	29·984	29·920	29·44	29·86	29·90	30·00	30·02	46·3	61·8	46·0	51	37	48·5	58½	43	50½	47
13.	30·082	30·078	30·033	29·15	29·92	30·01	30·07	30·01	54·7	57·0	47·6	70	36	53	60	43½	51½	48½
14.	30·200	30·230	30·138	29·67	30·08	30·14	30·16	30·24	53·2	61·2	48·4	72	38	51	65½	50	55	50½
15.	30·408	30·387	30·341	29·55	30·29	30·34	30·37	30·50	55·7	61·4	48·0	67	36	58·5	68	43	58	50
16.	30·436	30·390	30·307	29·87	30·38	30·31	30·53	30·50	57·8	64·3	48·7	68	42	58	72	45	55	50
☽ 17.	30·314	30·278	30·139	29·79	30·29	30·17	30·43	30·31	52·8	66·5	45·7	68	43	50·5	68½	49	50	48
18.	30·072	30·046	29·911	29·52	30·02	29·84	30·13	30·03	50·7	60·3	47·8	69	40	52	67½	41½	49	48½
19.	29·834	29·807	29·711	29·32	29·70	29·58	29·93	29·80	53·8	57·0	47·6	65	36	51·5	57	48	50	48
20.	29·706	29·658	29·646	29·05	29·45	29·37	29·68	29·55	57·0	70·3	47·0	63	49	46·5	60	46	49	49
21.	29·730	29·724	29·676	29·20	29·47	29·50	29·56	29·70	56·7	62·3	51·3	61	41	55	55½	43	51	49
22.	29·798	29·748	29·674	29·29	29·60	29·60	29·75	29·87	57·8	69·0	49·8	65	42	59	60	40	50½	48
23.	29·854	29·857	29·785	29·29	29·62	29·70	29·89	29·94	57·2	75·3	51·4	64	43	57·5	61½	48	51	50
○ 24.	29·882	29·838	29·790	29·33	29·79	29·76	30·04	30·05	53·3	64·6	52·7	65	40	54	59	48	52	49
25.	29·904	29·854	29·815	29·27	29·61	29·70	29·88	29·87	55·7	60·0	47·6	63	48	51	59½	47	55	49½
26.	29·806	29·823	29·767	29·22	29·70	29·69	29·90	29·86	56·2	61·6	51·2	66	47	55	62	43½	54½	50
27.	29·980	29·929	29·911	29·34	29·71	29·78	29·73	29·80	61·3	63·8	52·0	68	51	61	61½	47	53½	50
28.	30·050	30·066	29·988	29·38	29·81	29·88	29·75	29·77	57·5	68·4	54·0	70	41	56·5	60½	45½	52½	53
29.	30·181	30·124	29·991	29·48	29·86	29·72	29·73	29·60	61·8	78·3	51·2	71	46	62	60½	50	61	54
30.	30·010	30·050	29·955	29·23	29·70	29·88	29·58	29·75	62·3	69·6	53·7	73	46	63	58	48	55½	50½
31.	30·192	30·155	30·118	29·45	29·96	30·03	29·87	30·00	60·7	73·0	53·7	73	41	61	60	44½	53½	51
Mean.	29·958	29·952	29·857	30·01	29·44	29·44	29·812	29·841	55·5	64·9	48·8	65·97	41·51	51·8	62·4	44·1	51·88	48·69

Days of Month.	Wind.					Rain.					Dew-point.
1842. May.	London: R.S. 9 a.m.	Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	London: R.S. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Lond. R.S. 9 a.m.
1.	n.	c.	c.	ne.	se.	......	......	......	......	......	50
☾ 2.	ne.	ne.	c.	ese.	se.	......	......	......	......	......	50
3.	wnw.	nw.	n.	se.	se.	......	·02	......	......	......	43
4.	w.	n.	nw.	wsw.	w.	·069	......	......	......	......	49
5.	s.	s.	w.	wsw.	s.	......	·16	......	......	......	50
6.	s.	w.	sw.	wsw.	se.	·122	·12	·22	......	·15	52
7.	s.	sw.	sw.	se&sw	sw.	·213	·22	·05	0·90	......	51
8.	w var.	w.	w.	w&nw	nw.	·241	·20	·18	......	·14	50
9.	w.	n.	w.	nw.	nw.	·130	·10	......	......	·06	45
● 10.	w.	nw.	calm	s.	w.	·061	......	......	......	·20	45
11.	c.	s.	se.	sse.	se.	......	·26	......	......	......	47
12.	nw.	n.	n.	s.	se.	·130	·02	·09	......	......	47
13.	s.	nw.	calm	sw.	se.	·225	......	·16	......	......	48
14.	w.	w.	calm	s.	se.	·025	......	......	......	......	48
15.	c.	ne.	calm	sse.	w.	......	......	......	0·18	......	54
16.	n.	ne.	calm	s.	calm	......	......	......	......	......	54
☽ 17.	n.	ne.	calm	e.	n.	......	......	......	......	......	53
18.	n.	ne.	calm	sse.	se.	·022	......	......	......	......	50
19.	se.	sw.	calm	e.	c.	......	·04	......	......	......	48
20.	s var.	sw.	sw.	se.	c.	......	......	·15	......	·04	50
21.	se.	s.	sw.	se.	se.	......	......	·04	......	·06	49
22.	se.	s.	calm	se.	se.	·022	·01	·08	0·50	·17	51
23.	sse.	s.	w.	sc&sw	c.	......	·01	......	......	......	50
○ 24.	se.	sw.	calm	e.	c.	......	·20	·12	......	......	51
25.	s.	sw.	sw.	sse.	c.	·261	·23	·82	......	......	51
26.	s.	sw.	calm	sse.	se.	·119	·01	·40	......	......	52
27.	s.	s.	calm	wsw.	se.	·102	·13	·06	......	......	57
28.	nw.	w.	calm	sw.	se.	·066	......	·11	......	·06	54
29.	s.	s.	calm	s.	s.	·126	......	......	1·00	......	55
30.	ssw.	w.	s.	w.	sw.	......	......	......	......	·10	53
31.	s.	nw.	w.	sw.	s.	......	......	......	......	......	56
Mean.						Sum. 1·931	1·73	2·48	2·58	0·98	Mean. 50

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

No. 60. AUGUST 1842.

XLVI.—*On the rediscovery of* Halcyon smyrnensis (*Linn.*) *in Asia Minor*. By H. E. Strickland, M.A., F.G.S., &c.*

Albin, in his 'Natural History of Birds,' published about a century ago, describes a bird under the name of the "Smyrna Kingfisher," and gives a figure of it (vol. iii. pl. 27.) from a specimen preserved in spirit, which he states was shot by Consul Sherard "in a river of Smyrna." This species, to which Linnæus gave the name of *Alcedo smyrnensis*, has been retained ever since in our catalogues, though from the time of Sherard to the present day no further evidence has been adduced, as far as I am aware, of its occurrence on the coasts of the Mediterranean. The succeeding plate (vol. iii. pl. 28.) of Albin's work gives, under the name of "the Great Bengal Kingfisher," an indifferent representation of a well-known Indian bird which was afterwards more correctly depicted by Buffon in his 'Planches Enluminées,' No. 894. This bird, being evidently closely allied to Albin's "Smyrna Kingfisher," was classed as a variety of it by Gmelin and Latham, and stands as *Alcedo smyrnensis* γ. in their catalogues. Later writers on Indian ornithology agree in terming this bird (which appears to be common throughout India from Ceylon to Assam) *Halcyon smyrnensis*, thus implying a belief of its specific identity with the "Smyrna kingfisher" of Albin. But as Albin's figure presented certain differences from the Indian birds, and as no specimens from the Mediterranean shores were at hand for comparison, it was impossible to decide this point with certainty, and it seemed probable that the species from India might prove to be distinct, and might thus require a new appellation.

The differences in question were these: the adult Indian bird has the *lesser* wing-covers rufous, the *middle* ones black, and the *greater*, together with the quills, back and tail, bright

* Read at the British Association at Manchester, and communicated by the Author.

greenish blue, changing in certain lights to green. Younger specimens from India retain the rufous *lesser* covers, but have the *middle* covers blue-green, like the rest of the wing and upper parts. In Albin's "Smyrna Kingfisher," however, the *whole wing* is represented green, changing only to a bluish tinge on the middle covers, but without the rufous on the lesser covers. This discrepancy appeared to indicate a specific distinction, but was neutralized by the circumstance that Albin, or his colourist, has also given *green lesser covers* to the Bengal Kingfisher on plate 28, a mistake indeed which might easily arise, from the rufous ridge of the wing being concealed beneath the azure-green feathers of the upper back.

It was clear then that these doubts could only be solved by searching in Asia Minor for the original species described by Albin. During my residence at Smyrna in the winter of 1835–6, I failed in meeting with any traces of this bird, although two other species of *Alcedinidæ*, viz. *Alcedo Ispida*, Linn., and *Ceryle rudis* (Hasselquist) were not infrequent. The *Halcyon smyrnensis*, however, belonging as it does to an insectivorous genus which is rarely met with far beyond the tropics, could hardly be expected to occur so far north as Smyrna in the depth of winter. Failing in this attempt, I took occasion at a later period, when supplying that ardent and philosophic zoologist Mr. Edward Forbes with a list of ornithological desiderata to be sought for in the Levant, to call his particular attention to the long-lost "Smyrna Kingfisher," and I am happy to say that his researches have at last been crowned with success. In a letter from him, dated Macri, on the coast of Lycia, at the end of February last, he says, "One of the sailors has just shot a large kingfisher which I take to be the one wanted. Three or four have been seen, but not got at. The common Kingfisher is also very abundant, or something like it. The large bird was brought alive; its plumage is very beautiful. I have drawn it, and Graves is at this moment busy skinning it. We shall send the skin to you by an early opportunity." Through the kindness of Capt. Graves this specimen has since been forwarded to me, and on comparing it with a series of specimens from India, it turns out to be in every respect specifically identical with them. It is in the full adult plumage, possessing the rufous *lesser* and black *medial* covers which distinguish the perfect bird in India. We may therefore henceforth, without hesitation, retain the original specific name of *smyrnensis* for the specimens from India no less than for those of Asia Minor, and from the proximity of the latter country to Crete and the Morea, we may anticipate the future admission of this beautiful and interesting species into the fauna of Europe.

The specimen of the Smyrna kingfisher depicted by Albin must be regarded as an immature individual, and we must suppose that the uppermost series of wing-covers in his plate were either coloured green instead of rufous through an oversight of the artist, or that they indicate a still earlier stage of development than the Indian specimens which I have had opportunities of examining.

The description of the specimen from Macri is as follows: —Rich rufous brown on the head, cheeks, sides and back of neck, lesser wing-covers, under wing-covers, sides of breast, abdomen, and lower tail-covers; deep black on middle wing-covers, forming a large patch; greenish blue, changing in certain lights to verdigris-green, on upper back, scapulars, spurious wing, greater and primary wing-covers, secondaries, tertials and rectrices. On the rump and upper tail-covers this blue assumes a purer tint. Terminal half of primaries black, basal half greenish blue externally and white within, gradually increasing till the ninth primary is almost wholly white. Inner margins of secondaries and of rectrices blackish brown; chin, throat and middle of breast white; beak and legs vermilion-red. Total length $11\frac{1}{4}$ inches; beak to front $2\frac{1}{4}$, to gape $2\frac{3}{4}$, breadth 8 lines, height 8 lines; wing to end of primaries $4\frac{3}{4}$ inches, to end of tertials the same; middle rectrices 3 inches 7 lines, outer ditto 2 inches 11 lines; tarsus 7 lines; middle toe and claw $1\frac{1}{4}$ inch, hind ditto 7 lines.

XLVII.—*Notice of some Fungi collected by* C. Darwin, Esq., *in South America and the Islands of the Pacific.* By the Rev. M. J. Berkeley, M.A., F.L.S.

[With Three Plates.]

The following enumeration requires no especial prefatory observations. A portion of the fungi collected by Mr. Darwin has already been noticed in this Journal without any knowledge that there were more in the Museum at Cambridge. The present additional species were placed in my hands some time since by the kindness of Professor Henslow, but the publication has been delayed in consequence of the accidental loss of the notes and sketches which were prepared soon after their arrival. The delay has not however been without benefit, as I have since had the advantage of studying several very rich collections of exotic fungi, and have therefore been more confident in the determination of the species. I am under peculiar obligation to my friend Dr. Montagne, who has not only supplied me with specimens of the greater part of his published species, but has communicated many novelties of the greatest interest before publication.

1. *Agaricus salebrosus*, n. s. Sordidè flavus, pallidus; pileo subreniformi lobato subplicato subcarnoso, sulcis brevibus radiantibus notato, pellucido-striato; lamellis latis subdistantibus, acie subdentatâ; stipite nullo. Darw. No. 216.

On sticks, covered with bark. Rio Janeiro. May 1832.

One to two inches or more broad, of a pale dirty yellow. Pilei at first entirely resupinate, reniform, sometimes somewhat confluent; at length reflexed and free, more or less orbicular, smooth, more or less lobed and almost plicate, marked with short distinct radiating shallow furrows; margin thin, acute, pellucido-striate. Gills broad, rather distant, their edge slightly toothed. Stem none, but the portion of the pileus by which it is attached is thickened.

Allied to the species of the first section of Fries' division *Resupinati* in the tribe *Pleurotus*, in which it will range next to *Ag. porrigens*. The upper stratum of the pileus does not appear to be gelatinous.

Plate IX. fig. 1. *Ag. salebrosus*, nat. size.

2. *Lentinus villosus*, Fr. (non Klz. in 'Linn.'), Darw. No. 267.

On sticks. Rio Janeiro. May 1832.

3. *Schizophyllum commune*, Fr., Darw. No. 463.

On orange-trees. Rio Janeiro. May.

4. *Polyporus sanguineus*, Fr., Darw. No. 597.

Rio Janeiro. June.

5. *Polyporus igniarius*, Fr., Darw. No. 3285.

Var. *scaber*, Berk., Ann. of Nat. Hist., vol. iii. p. 324.

On a Mimosa. James Island (Gallopagos).

A large form of the variety described in an account of Fungi from Van Diemen's Land.

6. *Hexagona fasciata*, n. s. Pileo sessili tenui coriaceo rigido, reniformi, suprà concavo ligneo-fulvescente nitidiusculo demùm glaberrimo rugosiusculo, zonis crebris passìm profundioribus sulcato; hymenio ligneo-pallido; poris submagnis subhexagonis, acie lævi vel subdentatâ. Darw. No. 3391.

Tahiti. November.

Pileus 3 inches broad, $2\frac{1}{2}$ inches long, reniform, thin but coriaceous and rigid, subimbricated, very concave above, marked with many concentric grooves, most of which are shallow, and a few obscure radiating ribs scarcely visible except towards the margin, where they form small vaulted knobs, with corresponding depressions in the hymenium, smooth, very minutely rugose, of a tawny wood colour, with numerous darker zones. Hymenium and substance wood-coloured. Pores rather large, $\frac{1}{24}$th of an inch in diameter, obscurely hexagonal, minutely pubescent within; margin, even in those portions of the hymenium which are horizontal, but slightly toothed where the pores are at all oblique.

This very fine species, which has just the habit of *Stereum ostrea* as figured by Nees von Esenbeck, approaches somewhat in character to *Hexagona tenuis*, but there is not the slightest cinereous tinge, and the whole habit is different. The species however to which it is nearest is *Hexagona polygramma*, Montagne, of which I have an excellent specimen from the Neel-gherries. But though its colours are nearly the same, it is a much more even plant, without any of the little raised lines which characterize the Indian species. It is more frequently zoned and in a different way; it is thicker and rigid, not coriaceo-membranaceous; the pores too are much smaller. Individuals probably occur with a lateral stem.

Plate IX. fig. 2. *a*, *Hexagona fasciata*, nat. size; *b*, under-side of a young specimen.

7. *Laschia infundibuliformis*, n. s. Pileo infundibuliformi, sublobato, glabro, minutè striato; alveolis plùs minùs elongatis, ad basin stipitis obesi ex dissepimentis denticulatis hispiduli decurrentibus. Darw. No. 247.

On rotten wood in forest. Rio Janeiro. May 1832.

Whole plant gelatinous, flaccid, yellow-brown, very thin and delicate, half an inch broad, quite smooth, but minutely striate, infundibuliform, slightly lobed, at length split on one side. Stem a quarter of an inch high, confluent with the pileus. Hymenium favoso-alveolar; alveoli angular, more or less elongated, especially towards the stem, where they become linear and extend to its base; dissepiments obtuse, those of the stem minutely denticulate, so as to give it a slightly hispid appearance.

Plate IX. fig. 3. *a*, *Laschia infundibuliformis*, nat. size; *b*, ditto magnified; *c*, a section to show the form of the edge of the dissepiment.

8. *Cora pavonia*, Fr., Darw. No. 347.

Highest peak of Fernando Noronha.

9. *Radulum palmatum*, n. s. Carneo-rufum; subiculo effuso maculas irregularitèr ellipticas demùm lobatas efformante; processibus hymenii primò aculeiformibus, dein palmatis multifidis compressis. Darw. No. 463.

On orange-trees. Rio Janeiro. May.

Forming, by the confluence of several small, effused, more or less elliptic spots, lobed patches, which are from 1 to 2 inches long. Subiculum tomentose, from which after the manner of a lichen arise numerous erect, minutely tomentose processes 1 to 3 lines high, which are at first cylindrical and setiform, but soon become confluent, compressed, dilated and palmate. The whole plant is of a rufous flesh-colour, which probably in the fresh plant inclines to scarlet. This exceedingly pretty species, which is very different from any with which I am acquainted, has quite the habit of a lichen; indeed, it was in the same packet with *Borrera chrysophthalma* and other cortical lichens. It does not spring from beneath the bark.

PLATE X. fig. 1. *a*, *Radulum palmatum*, nat. size; *b*, processes of hymenium, magnified.

10. *Exidia Auricula Judæ*, Fr., Darw. No. 973.

On beech-trees. Port Famine. May 1833.

The specimens appear to be the same as the European species, but the down of the external surface is not so strongly marked.

11. *Peziza scutellata*, L., Darw. No. 1111.

On rotten wood in a forest. I. of Inchy, N. of Cape Tres Montes, 1834.

12. *Nidularia plicata*, Fr., Darw. No. 268.

On sticks in forest. Rio Janeiro. June 1832.

13. *Phallus campanulatus*, n. s. Capitulo libero campanulato ruguloso pervio; apice annuliformi; stipite suprà deorsùmque attenuato. Darw. No. 712.

On sand-dunes. Maldonado. June 1833.

Dirty white; head bell-shaped, more than an inch broad at the base, nearly $1\frac{1}{2}$ inch high, free below, with the border rather spreading, minutely wrinkled, ending above in a distinct, abrupt, ring-like border with a broad perforation in its centre, covered when fresh with a greenish black at length fluid mass, which has a scarcely offensive odour. Stem 4 inches high, $\frac{5}{8}$ths of an inch thick, attenuated above and below, deeply but minutely pitted, inserted by a very narrow base into the little cup-shaped inner volva. The outer volva was unfortunately so broken that its form could not be ascertained.

The species belongs to the same section with *Phallus aurantiacus*, Mont., and *Phallus impudicus*, but is distinguished by the ring-like apex and the rugulose, not reticulate, hymenium. Plumier, 'Filices,' 167. G, is most probably the same thing, but the peculiar form of the apex is not represented.

PLATE X. fig. 2. *a*, *Phallus campanulatus*, natural size, with its inner volva; *b*, the inner volva separated from the stem to show its mode of attachment.

14. *Clathrus crispus*, Turp.

Var. *β. obovatus*. Darw. No. 647.

On sand-dunes. Maldonado. Not common. May and June 1832.

"Salmon-coloured; brownish-green internally."

All the specimens, which, with one exception, are in a young state, are regularly obovate or pyriform, and in this point strikingly different from the plant of Turpin. In other respects the resemblance is so close that I am constrained to consider it a mere variety, especially as *Clathrus cancellatus*, from Micheli's and Brondeau's figures, appears to be occasionally obovate. It is quite scentless, whereas *C. cancellatus* is described as extremely fœtid. It appears to be the species figured by Plumier, 'Filices,' tab. 167. H.

No analysis of the genus appears to have been given since that of Micheli, which, as is usual with that admirable author, is wonderfully correct, considering the state of botany in his days. I am therefore happy to have an opportunity of being able to give figures from specimens preserved in spirits. If a vertical section be made in a young plant before the volva is burst, the receptacle is found to be attached at the base by a mere point; its substance, especially the lower part, is perforated with a few elongated cavities, and the centre filled with an opake jelly. For about two-thirds of its length the inner walls of the receptacle are studded with morchellæ-form knobs arranged round its apertures, hollow within, and consisting of a highly complicated sinuous mass like that of the hymenium of *Phallus*, which contains innumerable oblong sporidia. The receptacle is adorned, both externally and internally, with parallel striæ, which give it a very elegant appearance. In the old plant the portions of the hymenium are seen shrunk and withered, each seated at the point from which the ribs diverge from the border of the apertures. The number of apertures seems to be variable, but is always much greater than that of *Clathrus cancellatus*, which occurs in New Zealand as well as in the northern hemisphere.

Plate XI. fig. 1. *a*, *Clathrus crispus*, natural size before the bursting of the volva; *b*, ditto with the volva just burst; *c*, ditto further advanced; *d*, section of a young plant, showing the position of the knobs of the hymenium; *e*, section of a portion of the hymenium highly magnified to show its sinuous structure; *f*, sporidia; *g*, inner surface of a portion of an old plant to show the portions of the hymenium *in situ* at the juncture of the ribs and border of the aperture.

15. *Sphæria polymorpha*, Pers. Darw. No. 596.
On rotten trees in forest. Rio Janeiro. May.

16.* *Geaster saccatus*, Fr. Darw. No. 664. 1493.
Damp, rather shady places. Maldonado. June 1832.
Inner peridium, when fresh, dark brown, outer lighter.

17. *Bovista cervina*, n. s. Parva globosa peridio membranaceo pallido cervino, exteriori rigidiusculo; ore minuto subrotundo, capillitio, sporidiisque concoloribus. Darw. No. 754.
Driest part of plains. Rio Negro, Patagonia. 1833.
Subglobose, attached by a broad base to the earth, about $\frac{5}{8}$ths of an inch broad, fawn-coloured; inner peridium very thin and membranaceous, opening by a minute round orifice; outer more rigid, soon falling off, but a portion of it remains in general about the base. Sporidia globose, as far as I can see, not pedicellate, of a pale dingy umber, as well as the capillitium.

18. *Arcyria decipiens*, n. s. Gregaria, peridiis stipitatis

* I have lately ascertained, in young unopened specimens of *Geaster fimbriatus*, the curious fact that the inner peridium with its columella and hymenium are continued from the outer coat of the outer peridium through an aperture at the base of the inner coriaceous coat, which is of a completely different substance.

obovatis ochraceis, capillitio suprà libero obovato erecto sporidiisque concoloribus. Darw. No. 224.

On the rough bark of palms. Rio Janeiro. May 1832.

Growing in little gregarious patches about a line high. Stem about as long as the peridium, which is smooth, shining, of a yellow ochre, breaking away gradually above, but persistent at the base, and crateriform. Capillitium free above, slightly attached below, sometimes falling out entire from the peridium. Sporidia globose.

This plant has very much the habit of *Trichia clavata*, of which species I considered it a form till I examined the capillitium, which is that of an *Arcyria*, being reticulate, and not filled with spiral threads.

Plate X. fig. 3. *a*, plants of *Arcyria decipiens* magnified; *b*, capillitium, ditto; *c*, portion of capillitium with sporidia highly magnified.

XLVIII.—*Remarks on some points of Vegetable Structure.* By W. Hughes Willshire, M.D., M.B.S., Lecturer on Botany at Charing Cross Hospital, &c.

[With a Plate.]

In the last number of the 'Linnæa' appears a paper of Mohl's*, in which the origin of a secondary layer out of spiral fibres in a vessel is denied, as also that the punctations in dotted tubes depend for their presence upon the existence of this secondary internal layer. Yet in another paragraph of the same paper it is also stated, that the first approach towards the development of the punctations is seen in the existence of a delicate *fibrous net upon* the lateral walls of the vessels, especially of those which lie next to other vessels. Now from this latter statement it certainly appears, that the presence of *fibres* is admitted by Mohl though denied in another, and also from his averment that this fibrous net is seen *upon* the lateral walls—which we take to mean externally to the homogeneous membrane of which the vessel is at first composed; we assume that he here admits its formation to be secondary in regard to period of development, though its situation is outward. Though it is denied by Mohl that the fibres are spiral, from what we have just stated, however, we could draw no other conclusion than that the existence of a *secondarily formed fibrous layer* is admitted, did it not appear contradicted afterwards by his stating that no network or fibres exist *per se*, but are only appearances. The author says, "the meshes of the net answer to the after-present circles of the dot, consequently

* A translation of this valuable paper by the Rev. M. J. Berkeley appeared, together with the plates, in our last number.—Edit.

indicating the hollow or excavation which lies between the vessels, and the *apparent fibres* which include the meshes are *produced by the position of the walls of the vessels.*" From this it would appear then, that there is no distinct secondarily formed layer of fibrous network, but that the peculiar position of the walls of the vessel against adjacent lying structures gives rise to hollows or excavations, the circumferential edges of which constitute the fibres of the apparent net. If this proposition be really what is meant, the theory of the circle of the punctation (*der Hof des Tüpfels*), according to Mohl, is nothing further than a depressing of the primary homogeneous membrane in certain places. It is true, that the writer admits of the existence of a secondary layer, and also of fibres *running between* the punctations in certain descriptions of vessels, but this layer is not, he says, composed of spiral fibres grown together, nor have these fibres anything to do with the formation of the circle of punctation. How mere local position can give rise to such symmetry, peculiarity of form and spiral appearance which the dots and circles of punctated ducts really possess, it is to us difficult to imagine, as also what truly should be deduced from Mohl's own statement upon the subject. We would beg to offer a few remarks connected with this matter as suggested by our own observations as influenced by the recent investigations of Dr. Barry on the presence of primordial fibre. Dr. Barry has demonstrated the existence of primordial filament or fibre in bodies of animal organization, and we shall endeavour to draw an analogy between some of his views with phænomena known to exist in the vegetable kingdom. The point from which we shall start is, that in that fluid of animals which plays the part of a mediate agent in nutrition, and offers to the plastic powers of the ultimate cells a generative structural material, it has been shown corpuscular bodies exist possessing a peculiar filament or fibre, and which, through the kindness of Dr. Barry, I had an opportunity of seeing at the College of Surgeons. This gentleman remarks, that it is well known that discoid bodies circulate in plants, and it remains to be shown whether they have not filaments, and whether the spiral filamentous development is *primary* (Ann. N. Hist. vol. viii. p. 503). The juice circulating in the lactiferous tissue of vegetables contains corpuscles and variously shaped bodies, of which *Ficus, Vinca, Chelidonium*, &c., will afford illustrations. In certain species of *Euphorbia*, however (Meyen, 'Pflanzen Physiologie,' vol. ii. p. 394 *et seq.*), exist strangely and differently shaped objects circulating in the milk juice, and in which dark stripes or lines may be observed (Pl. XII. fig. *a.*): these I hold to be analogous to the phænomena shown to exist in animal blood. These objects were formerly looked upon from their peculiarity of shape as crystals; but Hartig (Erdman's and Schweiggerseidel's Journal, 1835) stated they were formed of amylum; and Meyen (*ut anteà*) regarded the stripes or lines as caused by tearings or lacerations of the inner portion of the substance of the amylaceous body by a gradual extension of its layers.

Whatever may be the peculiar forms however of these bodies, and admitting their identity of reaction as regards iodine with that of starchy material, we conceive that, so far from regarding them as not the absolute essentials of the lactiferous fluid, and as not analogous to those of the blood, the present state of our knowledge allows us to consider them as actually the same, and as forming mediate generative structural matter for vegetable tissue, since it has been shown by Mohl (Valentin's Repert., 1841) that colour varying from brown to blue may be produced in all vegetable membranes under certain conditions by iodine; and by Payen (Valentin's Repert. and Comptes Rendus) that the substance which forms the elementary structure of all plants is the same in all species, that this primary substance is *cellulosa,* that it alone forms the walls of earliest formed tissue, that it can be converted into dextrine by the action of sulphuric acid, and that it has with *amidon* a similarity of composition. To look therefore upon these bodies as mere crystals or as pieces of starch, we think now unwarranted, and they should be considered as primordial bodies of *cellulosa*; the dark lines or stripes being *probably* filaments or fibres, and the whole being analogous to the corpuscle of the blood with its filament or fibre, and which serves to produce new tissue. We confess, in our present state of knowledge with respect to vegetable anatomy, we cannot lay down as a rule, that fibre or filament is always the primary form of evolution; and we consider that, without assuming that for which we have no ocular proof, we must yet rest satisfied with believing that much tissue is not derivable from fibre. Yet that it often is, and primarily so, may be allowed; and every vegetable physiologist will have met with abundance of proof, that what, under less careful investigation, or merely ordinary circumstances, has appeared primary homogeneous membrane, has, with more care and delicate investigation, been resolvable into fibre or filament, primary and elementary. Although in many plants the parietes of lactiferous tissue are homogeneous, showing no trace of fibre, yet in *Euphorbia magnispina* they are resolvable into spiral filaments, which we are not inclined to believe are of secondary origin in these ducts, but of primary. Further, though there is abundance of evidence of secondary formation being thus derived in most plants and but little of primary, yet in others the circumstances of the case are such as to lead us to believe in the origin of the general tissues being derived from primary spiral filaments. In a new species of *Stelis* brought by Meyen from the island of Luçon scarcely any membrane is to be found not so resolvable, and surely this or much of it must be primary. In the description of this plant the physiologist just mentioned states that all the parenchymatous cells lying beneath the epidermis are composed of tissue formed by spirally wound bands, and possess no otherwise primary homogeneous enveloping membrane. In some of the larger cells where pressure is exerted, as at their terminations, the membrane appears structureless or homogeneous like ordinary membrane, but all the rest of them is distinctly formed of spiral filaments (Pl. XII. fig. *b*.). Now, from all portions and structures of this plant being so composed, save the cells of the epidermis, it would appear to be a pushing of a doctrine to maintain that the spiral fibre and filament are here but of secondary origin; and even the cells of the epidermis, we are inclined to believe, are derived from the same element, since the parchment-like cells of the aërial roots presented spiral lines, though the filaments were so firmly grown together that they could not be separated as a great part of the others could.

From the universality here evinced, we think we may not be in error in believing that Schleiden's theory, that the formation of filament does not take place independently of membrane, but occurs in the interior of cells whose membrane was originally homogeneous, meets with a great exception. The spiral lines observed by Dr. Brown on the hairs of *Tradescantia* form, we think, another. We cannot go the length of Corda, who states that the shortly articulated spiral vessels of *Nepenthes distillatoria* are devoid of an enveloping homogeneous membrane.

In that description of tissue known to vegetable anatomists by the name of fibro-cellular, there is a variety found occurring in portions of the generative apparatus of some plants in which the fibre appears totally independent of membrane in its fully developed state, and has hence been called fibre without membrane. From the investigations of some continental physiologists, however, we are prevented from accepting these instances as examples of primary fibrous development, and as yet must regard them as examples of secondary formation only. In one remarkable case, however, in which fibre occurs, in the seeds of *Collomia*, which was first published by Dr. Lindley, though Horkel is said to have demonstrated it to his class some years before, we think a true illustration of their primary development is afforded, and in which the spiral direction is at the same time very plain. It is true that some writers have stated their belief, that these spiral filaments are invested by a primary membrane, and hence that they are only secondary in appearance; but all that we conceive is, that they are surrounded by a sort of mucus, probably cytoblastemic. In the many examples found in *Orchideæ* of fibro-membranous tissue, the fibre can only be considered as forming the secondary layer. It appears to us rather difficult to say whether the branched filaments which connect together the granules of pollen in many plants are to be regarded as primary or not. In the earlier periods of antheroid evolution none are to be seen, it being only after the dissolution of the original cells in which the granules were formed that they appear.

In many of the lower orders of plants the formation of primary fibre is evident; the mesothallus of many lichens and the filaments of certain fungi illustrate the point; but in these orders great care, we conceive, must be used in drawing our conclusions, since much of fibrous and spiroid tissue—the latter in particular—is in them decidedly of secondary development. The spiroid fibres of the cells of *Sphagnum*, and the same structure which we are led to believe may be hereafter observed in *Dicranum glaucum* and *Octoblepharum albidum*, as well as the spiral filaments of *Trichia* and *Jungermannia*, are of course all secondary.

Turpin, in his reduction of vegetable forms to elementary types, assumed two conditions as the lowest; the one called *Protospheria simplex*, in which the development was spheroidal and cellular; the other *Protonemata simplex*, in which the evolution was filamentous and thread-like. These states of development have been assumed as primary and springing from a mere structureless, gelatinous phycomater or matrix, and also that the mere evolution of either of these forms—a simple cell or thread—constituted the lowest conditions of an entire vegetable organism. This theory in some points, however, is to us too vague to offer a support to the theory of primary filamentous development, since we conceive that the *Protonemata* is here secondary upon the *Protospheria*. There is only one argument in its favour, and that is, in its agreement with a law of physiology, namely, that as we get lower down in the scale of vegetable bodies, the *complications* of the elementary powers of which the higher orders are made up become fewer and fewer, until at last we get so low that scarcely any *complications* exist at all, the mere exemplification of the element as it were constituting the whole individual; but yet we think that the *Protonemata* of Turpin is not so low as this, and that we cannot stop from reducing them, however low they may be, into a *complication* of a lower form—the *Protospheria,* and in which it may truly be said scarcely anything but the exemplification of the element can be seen.

Though we believe then, that on an examination of our knowledge with respect to vegetable anatomy, much will be found in support of Dr. Barry's theory, yet much will remain, and which certainly comprises more facts than exist in favour of that theory, which entitles us to maintain that tissue exists not derived from primary filament, and that the latter is in a great mass of cases a secondary formation only. While, therefore, we would modify some statements made in the observations on the structure of *Tilia,* at p. 85, by substituting for "all tissue" "much tissue," and admitting that some membrane is composed of primordial filaments, we cannot attach less importance to the doctrine of a secondary fibrous layer there maintained.

The next point to which we shall allude is in reference to the formation of the punctation on dotted vessels. With deference to Mohl, whose views however we may have not properly made out, from the foreign language in which they are propounded, we beg leave most decidedly to differ, and believe that the origin of the punctations is immediately dependent upon a fibrous layer; and from an analogy alluded to by Dr. Barry, and a suggestion of his with regard to the teeth of a spiral filament being concerned in their production, we hold that the matter may be properly explained: on the other hand, we must remain in the opinion of Schleiden, in opposition to that of Dr. Barry, whom we consider to look upon these fibres as primary, that this fibrous layer is of secondary origin; that it is formed within a previous homogeneous membrane which alone is primary.

In all vessels in which true punctations are found, whether the central dot is surrounded by a circle or not, or whether the circle alone exists, the first approach to their formation is the production of a secondary layer of fibres upon the inner surface of the apparently primary homogeneous membrane. This layer consists of filaments, which not only have a spiral direction with respect to the duct in which they are formed, but they are bent upon themselves as it were, forming sinuous curves (Pl. XII. fig. *c.* (*a*)). In many cases the position of these filaments with respect to each other is such, that the directions of the curves are opposed to each other (as at fig. *c.* (*b*)), and in all very densely punctated vessels such appears to be the case: on the other hand, the bendings of the filament may all preserve the same direction, save in a very few spots, the curves fitting into each other; no intervals being formed between them, but one continuous layer resulting from their growth and approximation, except in the few places just alluded to (Pl. XII. fig. *d.*): such appears to be the case in vessels whose punctations are few and scattered. Now it is in those spaces which result from the opposition of the smaller curves (fig. *c.* (*b*)) that the punctations are formed, nothing there existing but a layer of external membrane, which becomes depressed in the form of a hollow or excavation towards the centre of the tube, the edge of the depression being the opposed curves (fig. *c. d.* and *e.*). This answers to the larger surrounding circle of the dot, *der Hof des Tüpfels* of the Germans.

According to the size of the curves so will be that of the circle of punctation, and according to the shorter or more elongated spiral direction of the sinuous fibres along the primary layer, so will be the position of the circles with respect to each other. Thus in the tubes of many *Coniferæ* the punctations are large, and placed in a single row down those walls of the vessel which are in approximation to others, whilst those parietes in juxtaposition with true cells have small circles only, and often distant from each other (fig. *e.*). In these cases the spiral direction of the fibre is very elongated, and opposition of curves, the latter being large, ensues in a limited manner and apparently overruled by the nature of the adjacent organs, which fully establishes one part of Mohl's theory, namely, that contiguous structure influences the formation of the punctations. In the *Coniferæ*, from many of the curves being similar in direction, there is much fibre consolidated into apparent homogeneous substance (fig. *e*, one extremity is drawn homogeneous from the consolidation of the fibres, which is the natural appearance of the whole tube, save where the punctations exist; the position of these indicate the direction and curves of the fibres, though not actually apparent). With respect to the dot seen in the circle of depression, Mohl's view appears to us to be correct, that it is a canal traversing the walls of the vessel, thickened by superimposed matter from the interior of the vessel to the bottom of the excavation: that the external point of this canal is not pervious, is also probable from the appearance it presents (fig. *g.*).

We must differ from Mohl in looking upon many of those instances which he adduces as examples of the *dot* without the circle or hollow, as instances of small hollows or depressions without the dot: in these cases, it seems to us, the great mass of spiral fibres has curves agreeing in direction with each other, and hence much of the secondary layer is not resolvable into distinct fibres. At certain places, however, slight variations in the curves take place; they become opposed, and a small depression of the outer membrane results, or the few opposed curves may be large, and hence a greater hollow will ensue; but in these vessels very little matter is added to the internal layer, perhaps none, and hence no dot or canal is apparent in them (Pl. XII. fig. *d*.).

The spiral and sinuous direction of the fibres of the secondary layer is very easily recognizable, at least when punctated vessels are carefully examined; but the attention of the observer should be strongly directed to it, as the brighter appearance of the punctations themselves, from the light only passing through a less thickened layer of membrane, draws more powerful consideration to them. It may also be well observed when a vessel is cut, or when it breaks itself at the side (as at fig. *f*.).

The section of a completely formed punctation is seen at Pl. XII. fig. *g*; the dotted line indicates the primary membrane, the broader dark line beneath it the fibre.

It will be seen that we thus differ from Mohl in believing that a secondarily formed fibrous layer, consisting of filaments bent upon themselves, is mainly instrumental in the formation of punctations, and agree with him in the circumstance of the depression being caused by a sinking-in of the primary membrane, but which latter condition never could exist without the previous existence of the fibres alluded to. We also consider the fibres or filaments not to be of primary development, and not as serving in this particular as a support to Dr. Barry, in what we have thought to have been his views. (Figs. *a*. and *b*. are from Meyen.)

XLIX.—*A Catalogue of Shells from the Crag.* By S. V. Wood, Esq., F.G.S.

[With a Plate.]

[Continued from vol. vi. p. 253.]

To the Editors of the Annals of Natural History.

Gentlemen,

It has been my object with the present as well as the preceding portion of this Catalogue to adhere as closely as possible to the classification of Lamarck; my only deviations from the system of that eminent naturalist are those rendered necessary by the additions that have been made to the science of Malacology, and the establishment of new genera by other writers. I have also myself thought it requisite to propose a few for some forms in my own cabinet. Mr. Lyell and Capt. Alexander have kindly furnished me with the list of shells from the mammaliferous crag*, while those from the red and coralline are what my own cabinet contains, every species of which I have myself collected.

With respect to the utility of this Catalogue as one means of arriving at the relative ages of the three deposits to which it has reference, it should be borne in mind that some amount of error may arise from the imperfect state or altered condition of many fossil species; some modifications in the several proportions of extinct to recent species may also arise from future researches both in recent and fossil conchology, a source of error mentioned by Mr. Charlesworth. And in applying the percentage test to these tertiary beds, allowance should be made for the absence from the red and mammaliferous crag of certain species found in the coralline and also inhabiting our own seas, amounting to nearly ten per cent., many of them minute and fragile. Mr. Lyell, in his paper upon the relative ages of the Crag of Norfolk and Suffolk, 'Mag. of Nat. Hist.,' 1839, p. 322, says, "If they" (the recent species just referred to) "should hereafter be detected in beds strictly contemporary with the red crag, it by no means follows that they would alter the proportion of thirty per cent., because with them we might expect to bring to light a great number of extinct species which would probably agree with the extinct species of the coralline crag, whilst others would be peculiar to the red crag." Now on this point I must beg to dissent from Mr. Lyell, as I consider a part, at least, of these recent species should be allowed for in our estimates, since we know they must have existed through the intermediate period; and though in our researches for these absent species we should in all probability bring to light a number of extinct forms, so at the same time we might expect to discover with them a number of forms identical with those now living in our own seas but not known in the coralline crag, and that we have as much reason to expect in our new discoveries that the extinct species should not much exceed the proportionate number of recent not found in the older bed, as that those absentees should be the only recent species that we may hereafter discover. We have not however yet arrived at that know-

* Dr. Buckland states in his Anniversary Address to the Geological Society for 1840, p. 236, that Mr. Lyell proposes the term "Norwich Crag" for the newest of the three crag deposits, but I have employed throughout this catalogue Mr. Charlesworth's name "Mammaliferous Crag," which he gave to this formation in the year 1836, and which has consequently the right of priority. (See Proc. of Brit. Assoc. for 1836.)

ledge of the contents of these beds which would enable us to determine with precision the number of species each formation possesses. I give my Catalogue more to show the riches of our tertiary deposits than with the expectation that any generalizations can be established where so many sources of error are likely to interfere with our calculations, hoping that a better acquaintance with recent British Testacea will enable me at a future period to correct some of the errors it may probably be found to contain. Many of the identifications in this Catalogue have of necessity been based upon figures and descriptions, but a comparison with the specimens themselves is in all cases essential to correct determination.

With respect to the temperature of the sea during the formation of these deposits, various and conflicting opinions have been given. The coralline crag, it has been asserted, presents us with indications of a tropical nature: a conclusion which has been drawn from the profusion of Polyparia that this formation contains. In regard to the evidence given by the presence of Testacea, it has been imagined on the one hand, that such genera as *Glycimeris*, *Trichotropis*, *Astarte* and *Cyprina*, and the large development of these latter forms, give reason to conclude the climate was at least as cold as what we experience at the present day; but it may be remembered that *Astarte* and *Cyprina* are both found in the London clay associated with shells whose analogous forms are only now living in tropical climates, and that the *Glycimeris* has been found upon the coast of Massachusetts; on the other hand, the *Pyrulæ* are all denizens of the Oriental seas, and the only species of *Pholadomya* yet known was procured near one of the West India Islands; these favour the assumption that the sea of the crag period was of a warmer temperature. Several of the species of the coralline crag have been found living in the Mediterranean, and as far as we know at present restricted to that part of the world. It is strange to find associated in the same formation such apparently incongruous types as *Pyrula* and *Pholadomya*, *Glycimeris* and *Astarte*, the one representing the tropical form, while the other is generally found in the North; but if we only give a little extension to the geographical range of each of these types, allowing what are generally considered to be northern genera to reach as far to the southward as we would give the same indulgence to those that appear exclusively of a tropical character, it would approximate the latitude and probably the temperature of that great inland sea or that of the coast of Portugal, to which I would assign the temperature of the coralline crag. I would further remark in support of the above opinion, that there are in the coralline crag a few genera, which, if not possessing decidedly tropical characters, have not hitherto been found in the North, viz. *Pholadomya*, *Chama* and *Lingula*, *Cancellaria*, *Cassidaria*, *Columbella*?, *Terebra*, *Pleurotoma*, *Pyrula* and *Mitra*.

I must again repeat, that the names for the new species are merely provisional, and the synonyma introduced are those only that I have considered requisite for the true understanding of the species.

Class ANNULATA.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
1. Spirorbis granulatus (Serpula granulata, *Mont. Test. Brit.* p. 500).	Sutton.	....	....	Britain.
2. — heterostrophus (Serpula heterostropha, *Mont. Test. Brit.* p. 503).	Sutton.	....	....	Britain.
3. — carinatus (Serpula carinata, *Mont. Test. Brit.* p. 502).	Sutton.	Sutton.	....	Britain.
4. — sinistrorsus (Serpula sinistrorsa, *Mont. Test. Brit.* p. 504).	Sutton.	Sutton.	....	Britain.
1. Vermilia triquetra (Serpula triquetra, *Mont. Test. Brit.* p. 511).	Sutton.	Sutton.	....	Britain.
2. — vermicularis (Serpula vermicularis, *Mont. Test. Brit.* p. 509).	Sutton.	Sutton.	....	Britain.
3. — supra-plana, n. s.	Sutton.	Sutton.		
4. — tricuspidata (Serpula tricuspidata, *Sow. in Tankerville Catalogue*, 1825, *Appendix*, p. 1. Serpula serrulata, *Flem. Edinb. Ency.* vii. p. 67. pl. 204. f. 8).	Sutton.	....	....	Britain.
1. Filograna.	Sutton.	....	Bramerton.	Britain.

My specimens are all attached laterally the entire length.

1. Serpula ? recta, *Walker* (*Test. Min.* rar. f. 11).	Sutton.	....	....	Britain.
1. Cyclogyra multiplex.	Sutton.			

I have given this a name provisionally, and placed it in its present position with considerable doubt. The volutions are numerous and completely discoidal, partly enveloping the preceding whorl; they are not tubular, neither do they possess the regularity of a convoluted mollusc. A similar shell has been figured by D'Orbigny as *Operculina*, but the removal of one side of several volutions shows the interior without partitions. Diameter $\frac{1}{7}$th of an inch. Pl. V. f. 5.

Class PTEROPODA.

Ord. Thecosomata.

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*

1. Cleodora infundibulum, n. s.

Sutton.			

Spec. Char. Elongate, trumpet-shaped, smooth, bicarinate, open at both ends.

This shell is now opake, and has an opening at the smaller end, which may be perhaps accidental. Only four specimens. Length quarter of an inch; greatest diameter one-tenth. Pl. V. f. 13.

1. Ditrupa subulata, *Berkeley* (*Zool. Journal*, vol. v. p. 427. pl. 19. f. 2. Dentalium subulatum, *Deshayes, Monograph de Dent.* pl. 2. f. 29).

Sutton.	Sutton.		

The crag specimens rarely exceed half an inch in length.

2. — polita, n. s.

Sutton.			

Shell slightly arcuated, thin, smooth, subcylindrical; anterior opening plain, posterior cleft, bilateral, with unequal terminations. Pl. V. f. 14.

The body of the crag shell is not inflated or enlarged like that of *D. gadus*, but has the posterior opening laterally cleft, somewhat resembling that of *D. coarctata, Dentalium coarctatum*, Deshayes, 'Monog. de Dent,' pl. 4. f. 18. (which is however distinct from *gadus*), but the dorsal part of the posterior end of this fossil is produced beyond the edge beneath and rounded, the ventral edge is shorter and truncated, an enamel-like polish covers the exterior, and was probably when inhabited subhyaline, but is now opake. Length half an inch nearly.

1. Cæcum trachea? *Flem.* (*Edinb. Encyclcp.* vol. vii. p. 67. Dentalium trachea, *Mont. Test. Brit.* p. 497. t. 14. f. 10. Odontidium rugulosum? *Phil. En. Moll. Siciliæ*, p. 102. t. 6. f. 20).

Sutton.	....	....	Britain.

The recent British shell is regularly annulated and smooth, the annuli in my single crag specimen are more irregular and rugose.

2. — mammillum, n. s.

Sutton.			

3. — glabrum? (Dentalium glabrum, *Mont. Test. Brit.* p. 479).

Sutton.	....	....	Britain.

Class GASTEROPODA.

Ord. Gymnobranchiata.

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*

1. Chiton fascicularis, *Sow., Jun.* (*Conch. Illust. Brit. Chitones*, f. 87 *a*).

Sutton.	....	....	Britain.

2. — strigillatus, n. s.

Sutton.			

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
3. Chiton tenui-sculptus, n. s.	Sutton.			
4. — arcuarius, n. s.	Sutton.			
5. — angulosus, n. s.	Sutton.			

I have considered these as *Nov. Spec.* with doubt, having been unable to procure more than four British species to compare with, and all the hitherto published figures and descriptions are inadequate for that purpose. In order to obtain a correct determination in the fossil Chitons (where seldom more than detached valves are met with), their degree of convexity must be ascertained, their altitude and relative dimensions of length and breadth, the amount also of angularity in the central valves, and the shape and magnitude of the sustentacula, or processes at the posterior part of each, which vary in all the species I have examined.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
1. Lottia virginea, *Gray* (var. *α*. Patella virginea, *Müller, Z. D. Prod.* 237. var. *β*. Patella conica, *Jeffries*. Patella equalis, *Min. Con.* t. 139).	Sutton.	Sutton.	....	Britain.
2. — ? parvula (Patella parvula, *Woodward, Geol. of Norf.* t. 3. f. 1).			Bramerton.	
1. Patella vulgata, *Linn.*		Sutton.	....	Britain.

Only one imperfect specimen; it differs from the common character of the recent shell in having the rays slightly imbricated.

Ord. Pleurobranchiata.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
1. Bulla catenata, *mihi* (Scaphander catenatus, *Leach, Moll.* p. 55. Bullæa angustata, *Phil. Enum. Moll. Sic.* p. 121. t. 7. f. 17. Bulla dilatata, *Wood, Illust. Mag. Nat. Hist.* pl. 7).	Sutton.	....	....	Britain.
2. — quadrata, *Wood* (*Illust. Mag. Nat. Hist.* 1839, p. 460. pl. 7. f. 1).	Sutton.			
3. — sculpta, *mihi* (B. catenata, *Wood, Illust. Mag. Nat. Hist.* pl. 7. f. 2).	Sutton.			
4. — lignaria, *Auct.* (*Illust.* pl. 7. f. 4).	Sutton.	Sutton.	....	Britain.
5. — ventrosa, *Wood* (*Illust.* pl. 7. f. 5).	Sutton.			
6. — cylindracea, *Wood* (*Illust.* pl. 7. f. 8. Bulla convoluta, *Min. Con.* t. 464. Bulla cylindracea, *Mont. Test. Brit.* pl. 7. f. 2).	Sutton.	Sutton.	....	Britain.
7. — truncata, *Mont.* (Bulla subtruncata, *Wood, Illust.* pl. 7. f. 9).	Sutton.	....	....	Britain.

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*

8. Bulla Conulus, *Desh.* (*Coq. foss. des Env. de Paris,* tom. ii. pl. 5. f. 34—36).

Sutton.			

9. — concinna, *Wood* (*Illust.* pl. 7. f. 7).

Sutton.			

10. — acuminata? *Brug.* (B. acuminata, *Phil. En. Moll. Sic.* t. 7. f. 18. B. acuminata, *Grat. Not. sur les Bull.* pl. 3. f. 43, 44; not Bulla acuminata, *Min. Con.*).

Sutton.	....	....	Mediterranean.

This differs from the figures given at the above references in being less slender, and also in being striated more especially at the base, visible in perfect specimens: I am unacquainted with the recent shell.

11. — Lajonkaireana, *Bast.* (*Mém. Géol. de Bord.* pl. 1. f. 25. Bulla olivula, *Wood, Illust. Mag. Nat. Hist.* pl. 7. f. 11. Bulla terebellata, *Dubois, de Mont. Foss. de la Wolhyn.* pl. 1. f. 8–10).

Sutton.	....	....	Coast of France

This identification is made from the above references: I have not seen the recent shell.

12. — obtusa (Bulla obtusa, *Mont. Test. Brit.* p. 223. pl. 7. f. 3. Bulla minuta, *Woodward, Geol. of Norf.* t. 3. f. 3).

		Bramerton.	Britain.

13. — nana, mihi.

Sutton.			

Spec. Char. Shell smooth; volutions four, slightly convex; suture deep; apex obtuse; outer lip arcuated, inner slightly replicate; umbilicus moderate. Axis half a line. Pl. V. f. 1.

The spire is more elevated and the volutions more rounded than in *B. hyalina,* to which it approaches nearest.

Many species of this genus are, in the recent state, beautifully transparent; probably it was so with some of these: they are now opake.

Ord. Pneumonobranchiata.

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*

1. Helix hispida, *Gray* (*Edit. of Turt. Man.* p. 154. pl. 4. f. 41).

		Bulcham.	Britain.

2. — pulchella, *Gray* (*Edit. of Turt. Man.* p. 154. pl. 5. f. 40).

	Bawdsey.	....	Britain.

Only one specimen found in loose crag; it has the ferruginous tinge common to the shells of that bed, but for the present must be considered doubtful.

1. Succinea oblonga, *Gray* (*Edit. of Turt. Man.* p. 154. pl. 6. f. 39).

		Bulcham.	Britain.

Capt. Alexander's cabinet.

1. Conovulus pyramidalis (Auricula pyramidalis, *Sow. Min. Con.* t. 379).

	Sutton.	Thorpe, near Aldbro.'	

2. Conovulus myosotis (Auricula myosotis, *Drap.* pl. 3. f. 16, 17).

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
	Sutton.	Bramerton.	France.

Only three specimens from the red crag: Capt. Alexander has found it in the mammaliferous crag near Southwold.

1. Lymnæus palustris, *Gray* (*Edit. of Turt. Man.* p. 239. t. 7. f. 107).

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
		Bulcham.	Britain.

2. — pereger, *Gray* (*Edit. of Turt. Man.* p. 233. t. 7. f. 101).

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
		Bulcham.	Britain.

1. Planorbis corneus, *Gray* (*Edit. of Turt. Man.* p. 258. pl. 8. f. 95).

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
		Bulcham.	Britain.

2. — vortex, *Gray* (*Edit. of Turt. Man.* p. 258. pl. 8. f. 91).

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
		Bulcham.	Britain.

3. — marginatus, *Gray* (*Edit. of Turt. Man.* p. 258. pl. 8. f. 88).

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
	Butley.	....	Britain.

This is the only genuine freshwater shell that I have seen from either the red or cor. crag. I have but one specimen, procured from undisturbed crag five feet below the bottom of the incumbent sand.

Pl. V. f. 12. is an enlarged representation of a very minute sinistral shell, not more than $\frac{1}{4}$th part of a line in diameter, somewhat resembling in outline *Planorbis corneus*, but too small to be the fry, I think, of that species; moreover it has the appearance of a spire more elevated and a deeper umbilicus than in any species of that genus that I am acquainted with, and is probably a marine shell. Three other specimens of about the same size were in my cabinet six years ago, but are now unfortunately lost.

1. Infundibulum rotundum (Patella rotunda, *List.* Patella Sinensis, *Mont. Test. Brit.* p. 489. t. 13. f. 4. Infundibulum rectum, *Min. Con.* t. 97. Infundibulum clypeum, *Woodward, Geol. of Norf.* t. 3. f. 2).

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
	Sutton.	Sutton.	Bramerton.	Britain.
var. β. depressa.				
	Sutton.	Sutton.		
var. γ. spinosa*.				
		Walton Naze.		
2. — subsquamosum, n. s.				
	Ramsholt.			

[To be continued.]

L.—*Catalogue of the Marine Zoophytes of the neighbourhood of Aberdeen.* By John Macgillivray, Esq.

The increasing importance attached by naturalists to the class of Zoophytes may seem to justify any attempt, however humble, tending to elucidate their local distribution. I feel, therefore, encouraged to submit to the readers of this Journal

* One row of imbricated spines.

a few notes upon the Zoophytes of a portion of the Aberdeenshire coast; the same which, nearly a century ago, furnished Ellis with that portion of the materials for his great work on Corallines, which he derived from the contributions of his friend Dr. Skene.

With few exceptions, the names here used are those employed by Dr. Johnston in his 'History of British Zoophytes;' and I cannot allow the present opportunity to pass without offering my humble testimony to the great merits of that work; possessing too a double interest in the eyes of those who, like myself, have had their attention first directed by its means to a class of objects yielding in interest to no other throughout the whole range of the animal kingdom. The arrangement followed throughout is also that of the work alluded to above. Occasional assistance has been afforded in the determination of the species by Dr. Fleming's 'History of British Animals,' as well as by the published researches of Mr. Hassall, recorded in the sixth volume of this periodical.

Coryne squamata. On *Halidrys siliquosa*; also on a dead valve of *Cyprina Islandica* from deep water.

Echinocorium clavigerum, Hassall; *Alcyonidium echinatum*, Flem., Johnst. Of frequent occurrence on *Buccinum undatum*, *Fusus antiquus* and *F. corneus*, brought up by the fishing-lines.

Tubularia indivisa. Shells and stones from deep water; common.

T. Larynx. Both the varieties mentioned by Johnston are abundant on this part of the Aberdeenshire coast.

T. ramea. Don-Mouth; a single specimen.

Thoa halicina. Deep water; not rare, but generally of small size.

T. muricata. This very rare and remarkable species was sent to Ellis by Dr. Skene, who appears to have been its discoverer. I procured a single specimen an inch and a half in height, with numerous vesicles, in one of the fishing-boats, attached to a dead valve of *Pecten Islandicus*.

Sertularia rugosa. On *Flustra foliacea*; occasional.

S. rosacea. My Aberdeenshire specimens do not exceed an inch and a half in height; indeed are generally much less, always of a delicate white colour, pellucid, and with the free portion of the cells much longer than they are represented in Dr. Johnston's figure. The branches too, though generally alternate, are not unfrequently opposite. Very plentiful on corallines, shells and ascidiæ.

S. pumila. On *Fucus serratus* and *F. nodosus*; also once on *Tubularia Larynx*; common.

S. pinnata. Small-sized specimens are not unfrequent, growing upon *S. Abietina*.

S. nigra. Found many years ago upon some part of our coast by the celebrated Robert Brown, "Botanicorum facile princeps." Fragments of this very distinct species have several times occurred upon the beach at Don-Mouth, and a little to the north of Aberdeen pier.

Sertularia Tamarisca. Don-Mouth; attached to a fragment of *Cyprina Islandica.*

S. abietina. Extremely abundant.

S. Filicula. Plentifully thrown upon the beach at Don-Mouth, also between that and the harbour.

S. operculata. Sometimes the cells have one of the lateral teeth abortive or wanting; in the latter case the remaining tooth is often as long as the mucronated tip, which thus appears bifid. On a small specimen before me presenting the above arrangement, a solitary, somewhat obovate, compressed, truncated, and operculated vesicle has its lateral margin so sinuated as to present three distinct notches. Forming large tufts upon the stem of *Laminaria digitata*; abundant.

S. argentea. Presenting great differences in texture and habit as well as in the form of the cells and vesicles. Thrown plentifully upon the beach.

S. cupressina. The only specimen which I have seen, and which is almost entirely encrusted with *Alcyonidium parasiticum,* exhibits great differences in the form of the cells: the aperture is sometimes patulous, occasionally with two distinct teeth—the typical form; at other times the orifices are contracted, the cells being somewhat acutely pointed, thus exhibiting one of the characters of *S. argentea*; both modes of formation existing upon the same branch. Don-Mouth.

Thuiaria Thuia. Branched specimens are by no means rare. Thrown upon the beach in great abundance; also brought up by the fishing-lines, attached to stones and shells; of the latter, especially dead valves of *Pecten Islandicus.*

Antennularia antennina. The branched variety, described and figured by Mr. Hassall*, who conjectures its identity with the *A. ramosa* of Lamark, is here still more common than the normal (undivided or sparingly branched) state of *A. antennina.* My specimens agree with Mr. Hassall's one in arising from a *single* trunk which divides into numerous branches, which again subdivide; nor in them have I been able to detect any of "the small tubular cells placed between the larger ones," which are never absent upon the unbranched polypidom. The absence of these cells, together with the peculiar *habit,* seem to justify Mr. Hassall in considering *his A. ramosa* as a good species. At the same time it would appear that there is *another* (slightly) branched state† of *A. antennina,* which is unquestionably a mere accidental variation, being provided with "the small tubular cells" above alluded to, as I have ascertained by the examination of several specimens. Deep water; abundant.

Plumularia falcata. Often much branched, and attaining a large size. Extremely abundant.

P. pinnata. My specimens are horn-coloured; they agree with Dr. Johnston's description in every other respect. Upon various corallines from deep water; not rare.

* Ann. and Mag. of Nat. Hist. vi. p. 168. pl. v.

† Johnst. Hist. of Brit. Zooph. pl. 15. fig. 2.

Plumularia setacea. Don-Mouth; a single tuft growing upon *Modiola barbata.*

P. Catherina. Often brought up by the fishing-lines from deep water.

P. myriophyllum. Deep water; a single specimen.

Laomedea dichotoma. Generally attached to *Buccinum undatum*, *Fusus antiquus* and *F. corneus*; brought up abundantly by the fishing-lines.

L. geniculata. On *Fucus nodosus* and *Laminaria digitata*; plentiful.

L. gelatinosa. Don-Mouth; a single specimen.

Campanularia volubilis. Don-Mouth; met with only once.

C. integra. Stem a single tube, filiform, creeping; cells on long slender annular pedicles, campaniform, with the rim entire; vesicles ——— ?.—J. M^cG.

This species, which I believe to be new, differs from the preceding in having cells with the rim *entire*, and not serrulated, as in *C. volubilis.* With *C. Syringa*, the only other British species of the genus which has a single tube for a stem, it can never be confounded; the "denser corneous texture, cylindrical tubular cells, and short pedicles" of *C. Syringa* are perfectly distinctive. Don-Mouth; parasitical on *Tubularia indivisa*; has occurred only once.

C. Syringa. Don-Mouth; on *Plumularia falcata*; apparently rare.

C. dumosa. Both varieties are here abundant; of that mentioned first in Dr. Johnston's work, I have a specimen covering a surface of six inches square.

Alcyonium digitatum. The red variety, supposed to be identical with the *A. rubrum* of Müller, I have frequently met with here. Mr. Hassall * regards this as a distinct species, apparently on the sole ground of not having "been able to detect any gradations of colour between it and the common kind, as might be expected were it a mere variety." Mr. Hassall further states, that, "having obtained both growing upon the same shell, each possessing its own peculiar colour," he considers this circumstance "a strong fact in favour of its 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." This argument, however, I am afraid, is hardly tenable; to be consistent, Mr. Hassall ought to separate as so many distinct species those *Sertulariæ* which are occasionally found of a bright pink colour, and make two species out of *Laomedea geniculata*, of which Dr. Johnston has "often observed coloured and colourless specimens growing upon the same stone †, both being subjected to the same influences." At the same time Mr. Hassall has shown that the coloured variety is *not* "*A. digitatum* in its primary crustaceous condition;" the correctness of which view I have since verified by finding red specimens of considerable size coriaceous, but not crustaceous. On stones and shells from deep water; abundant.

Actinia gemmacea. The variety δ. of Dr. Johnston's work, or that characterized by having the body quite smooth, is brought up from

* Ann. and Mag. Nat. Hist. vii. p. 285. † Brit. Zooph. p. 152.

deep water in great abundance by the fishing-lines, the baits employed being greedily swallowed by the *Actiniæ*. Individuals of a uniform bright scarlet colour are not unfrequently met with, but in general the specimens I have seen are only irregularly blotched with that colour upon a ground of dirty yellow.

Actinia Dianthus. This "Actiniarum pulcherrima" I have met with only twice, adhering to dead valves of *Cyprina Islandica*, a favourite attachment of the preceding species.

Crisia eburnea. On various corallines; apparently not very common.

C. luxata. Although one of the characteristics of this species is the black colour of the internodes, these are no darker than the rest of the polypidom in a specimen before me, in which I have in vain looked for other distinctions. A common parasite upon *Flustra foliacea* and many other corallines.

C. ternata. One of Dr. Skene's discoveries, which does not seem to have occurred since, except to Dr. Fleming, who well characterized it from his Zetland specimens. Cells elongated, gradually increasing in breadth towards the top, for the most part with a lateral projection ending above in a slightly acute angle; aperture terminal, large and oval, level with the surface, and furnished above with from two to four short spines. Vesicles cylindrical, inversely conical, arising from the tops of the cells, very sparingly produced. Numerous very long tubular bodies arising from the cells, give the whole polypidom a very characteristic appearance. The joints are amber-coloured, the remainder being white and pellucid. I have seen no true opercula upon this species, although the persistent polype-sac might be mistaken for such.

Notamia loriculata. Very abundant.

Tubulipora Patina. Usually attached to *Plumularia falcata* and *Sertularia Abietina*; plentiful.

T. serpens. Extremely abundant upon corallines; few specimens of *Plumularia falcata* are without this parasite.

Discopora hispida? About two lines in diameter, calcareous, white, subcircular, revoluted at the margin, which is free, the crust being adherent at the centre only. The surface is closely studded with vertical tubular cells of various lengths, which do not appear to be arranged in any definite order; some are level with the surface, while others project in a slightly inclined manner to a height of twice their diameter. The longer cells are coalescent throughout, the shorter at the base only. Such of the cells as are prominent are obliquely truncated, with the apex bifid, or presenting two sharp spines. Often there is but a single spine, sometimes an additional smaller one arising lower down. The polypidom bears a considerable resemblance to *Tubulipora Patina*, with which it is generically associated by Dr. Fleming: while I say this, I of course *assume* the specific identity of my specimen with *Discopora hispida*, of which I am by no means certain. It may be observed that Dr. Fleming gives as one of the characters of the genus *Discopora*, "crust adhering in the middle;" while the author of the 'History of British Zoophytes' mentions that the crust is "adherent throughout" in *his* genus of the same name. On *Sertularia abietina*; a single specimen.

Cellepora pumicosa. Extremely abundant.

C. ramulosa. It is not difficult to trace the gradation by which this and the preceding pass mutually into each other. Fragments are plentifully cast upon the beach, and fine specimens are occasionally brought up from deep water by the fishing-lines.

C. Skenei. Deep water; a single specimen.

C. lævis. A specimen now before me agrees well with Dr. Fleming's description of the only one met with by him; it is half an inch in height, and rather more in breadth. But why give as part of the specific character "pores with simple mouths," when a few lines further on we find it stated, that towards the extremities of the branches the orifices are furnished with "a blunt process at the proximal margin"? Although the majority of these processes are more or less obtuse, yet many are acutely pointed; and were it not for the deservedly high scientific character of its discoverer, I would not have the slightest hesitation in referring *Cellepora lævis* to *C. ramulosa*, one of the least ambiguous modifications of which I believe it to be.

Lepralia coccinea. On stones from deep water; plentiful.

L. ciliata. With the preceding; also on shells, and on *Cellepora ramulosa*.

L. quadridentata, Johnst. MS.; Hassall, Ann. and Mag. Nat. Hist. vi. p. 171. pl. vi. f. 5. On a dead valve of *Cyprina Islandica* from deep water.

L. trispinosa. On a root of *Laminaria digitata*.

L. insignis, Hassall, Ann. Nat. Hist. vii. p. 368. pl. ix. f. 5. I have a species of *Lepralia* which agrees well with Mr. Hassall's description (his figure I have not seen) of *L. insignis*, with this slight exception, probably an accidental one, that the spines surrounding the aperture of the cells vary in number from four to six. The strong process rising out of each cell is very characteristic. On a fragment of limestone from deep water.

L. reticulata. Crust reticulated; cells tubulous, narrower towards the base, with a perforation in the upper wall; aperture slightly contracted, and furnished above with a blunt tooth.—J. M^cG.

The crust is very thin, spreading irregularly, and of a snow-white colour. The cells are slightly prominent, tubular, increasing slightly in breadth towards the distal extremity; in the upper wall of each cell, close to the mouth, is situated a somewhat triangular opening communicating with the interior, and sometimes crossed by a small transverse spiculum. The round, scarcely contracted aperture of each cell is furnished above with a short blunt tooth which projects downwards, being apparently connected with the triangular opening in the upper wall of each cell. This opening varies much in size, but is always present; it is separated from the mouth by a short interval, which is often broken down and a deep notch formed. Some of the cells are furnished with globular pearly opercula. The interval between the cells is beautifully reticulated, a double row of apertures existing between each two parallel cells. Only a single specimen of this very distinct species has occurred to me, attached to a fragment of limestone from deep water. Not having been able to find it described, I have ventured to give it a specific name taken from one of its most prominent characters.

Membranipora pilosa. On various fuci and corallines; common.

Flustra foliacea. This varies much in its mode of division. Extremely abundant.

F. truncata. Equally common with the preceding.

F. carbasea. Generally but not always attached to shells; very common here, where it was discovered about a century ago by Dr. Skene, who sent it to Ellis.

F. membranacea. Covering the frond of *Laminaria digitata* and *Fucus nodosus*, especially the former; abundant.

Cellularia scruposa. On corallines, shells, &c.; plentiful.

C. reptans. Not quite so abundant as the preceding, but still common.

Farcimia sinuosa, Hassall, Ann. and Mag. Nat. Hist. vi. p. 172. pl. 6. By a careful examination of a very fine specimen selected from an extensive series, I have found a great variation in the form of the cells. These are generally "rounded above and excavated below for the reception of the head of the succeeding cell," as they are described by Mr. Hassall, but between this form and a perfect rhomboid there exists an obvious gradation. Rhomboidal cells are found chiefly upon the terminal articulations, but occur also throughout the polypidom along with the much more numerous spathulate cells. In Mr. Hassall's specimens the aperture was invariably "situated in the upper third of each cell;" in mine, however, the aperture is occasionally "exactly central;" it often commences at the middle of the cell, although still more frequently at a little above this. Not having seen an undoubted specimen of *F. salicornia*, or one having *all* the cells rhomboidal, and *all* their apertures "exactly central," it would be presumption in me to offer any opinion regarding the specific distinctness of the *F. sinuosa* of Mr. Hassall, to whom we are indebted for the correction of several errors which had crept into zoophytology, as well as for the discovery of many new and interesting species. Brought up by the fishing-lines from a depth of between forty and sixty fathoms, a bank covered by this depth of water being situated about ten miles off the land; not uncommon.

Alcyonidium gelatinosum. Don-Mouth.

A. hirsutum. Shore north of the harbour; like the preceding. I met with it only once.

A. parasiticum. Upon *Sertularia argentea* and many other corallines, once upon *Crassina Damnoniensis*, and frequently upon stones; very common.

Cliona celata. A small *Annelide* inhabits perforations, the orifices of which are very similar to those in which the *Cliona* is found; with respect to the latter, however, I could not have been mistaken, having repeatedly oberved the living zoophyte projecting about a line beyond the orifices in the shell which it inhabited. Found in perforations in the dead valves of *Cyprina Islandica* and *Pecten Islandicus*; not uncommon.

The zoophytes enumerated in the preceding catalogue were either collected during a three days' examination of the detritus thrown upon the beach at Don-Mouth after a storm in October 1841, or are the result of a diligent and almost daily search during the first fortnight of February 1842, among the objects brought up from deep water by the lines of the Footdee fishermen. To the sixty-four species enumerated above, in all probability many more remain to be added, but, being about to leave the neighbourhood of the Aberdeeenshire coast, I must leave this pleasing task to future observers.

Old Aberdeen, February 23, 1842.

LI.—*The Physical Agents of Temperature, Humidity, Light, and Soil, considered as developing Climate, and in connexion with Geographic Botany.* By Richard Brinsley Hinds, Esq., Surgeon R.N.

[Continued from p. 333.]

III. Light.

Light and heat are so intimately connected and so generally accompany each other, that the laws of one are very nearly those of the other. Both are of the utmost importance to vegetation, and it is not easy to allow a superior influence to either, each in its turn, when coming under consideration, appearing to claim priority. Light is pre-eminently active in the functions depending on the alternation of day and night, in fixing the more solid constituents, and in bestowing richness of colour and secretion.

Sir Isaac Newton, by means of the prism, separated solar light into seven distinct rays, which from their properties he called colorific. These were red, orange, yellow, green, blue, indigo and violet; and they were found to possess different degrees of refrangibility, it being greatest in the violet and least in the red. A method was now developed for explaining the numerous shades of colour in substances; black was ascribed to the absorption of all the rays, white to their reflection, and every variety of tint or colour was due to the partial reflection of certain rays and the absorption of all the others. More recently it has been proved by Sir David Brewster that these seven colours are resolvable into three primary rays, red, yellow and blue; orange being formed by a mixture of red and yellow, green by yellow and blue, indigo and violet by red and blue, the latter receiving a slight portion of yellow. The varied colours of flowers, fruits, and of vegetable substances generally are dependent on a peculiar and inscrutable property of their tissues, enabling them to reflect certain rays or portions of rays, the depth and richness depending on the quantity of their exposure to heat and light.

Though colour is one of the most prominent effects of light, it materially influences some of the vital functions of plants. Under it alone takes place the decomposition of carbonic acid, whereby solid carbon is bestowed on the plant, and oxygen yielded to the atmosphere. When deprived of light the tissues are extremely lax, the whole plant assumes an unhealthy longitudinal development, apparently searching for what is so highly necessary to its economy; the proper secretions are not at all, or most sparingly, eliminated, losing the customary sapid, acrid, aromatic or other properties. Its effects on many of the leaves and flowers of warm climates are remarkable, both only expanding under its influence, and closing or folding up as this declines or is removed. Pinnate leaves are more particularly affected in this manner, and they greatly prevail in low latitudes: many flowers are liable to this, *Compositæ* present numerous instances; the *Oxalideæ* and *Mesembryanthema* of Southern Africa require the full glare of the sun before they will expand their flowers, often opening only for a short period, and when a cloudy day occurs they will not unfold at all. The scarlet pimpernel (*Anagallis arvensis*) of our fields has received the appellation of the shepherd's weather-glass, from the sensitiveness it betrays on the approach of a cloud threatening rain, and the term appears to have been applied with much correctness. Those flowers with a contorted æstivation are eminently affected by its presence or absence.

Like temperature, the intensity of light diminishes from the equator to the poles, but not so rapidly, rather corresponding with the radiation of the sun's rays; thus in high latitudes, the light is proportionately greater for the temperature than in low, and a similar circumstance happens in alpine situations, as was observed long since by Saussure. The protracted period in northern climates at one time of the presence of light, and at another of its absence, might be supposed to affect proportionately the vegetation; a flora may be expected running its course within a short period, displaying considerable vigour of growth, and after having perfected the seeds, leaving future existence entirely with them. In a somewhat lower latitude careful preparation is made to meet that portion of the year when the temperature is rigorous and light greatly removed;

the trees shed their leaves, leaving no tender organs exposed, vitality is well shut up and preserved in the solid parts, and the perennial plants leave their roots buried within the slow conducting materials of the earth.

Light is not so essential to colours but that they are sometimes produced without it, and all which in botanical acceptation are received as such, are known to be developed without its influence; green, which is not regarded botanically as a colour, is the most rarely formed under such circumstances; but instances are to be met with, and I shall cite the rich green of the seeds imbedded in the pulp of the fruit of the *Jacquinia aurantiaca.* Many sea-weeds, growing at depths accessible only to very subdued light, are supplied with much richness of colour, good pinks and greens being the most common. Plants will sometimes grow where they are not in the least degree exposed to light, and even in such cases they will form a small portion of chromule; their general appearance is here so changed and distorted that they are not easily recognized, the organs being irregularly developed, and losing their customary shape and outline. In a natural state the simpler organized plants are more usually found in situations feebly admitting light, as mosses, lichens, and the *Algæ gloiocladeæ.*

The good effects of light on the vegetable kingdom are displayed in a variety of ways connected with its growth; it increases the stature and development of forest-trees, causing them to spread more, giving a greater solidity to their structure, and strength and durability to their woods. In those countries where the brilliancy of the light is not obstructed by atmospheric causes, the flowers excel in the lustre of their colours, and vegetation partakes strongly of fragrance: Lower California, though destitute of trees and almost of shrubs, has a variety of plants of the most lively colours, and both the flowers and foliage generally abound in aromatic properties. The absence here of the larger vegetation admits freely the sun's rays; the dew-point of the atmosphere is greatly below the temperature, there being but little suspended moisture, the skies cloudless, and the soil too arid to admit of much evaporation. The vegetation, though consisting entirely of lowly plants, is exceedingly interesting from the engaging colours, peculiar structure of many of the flowers, and the individuality of the flora generally.

In one state of vegetation alone is light prejudicial; during germination carbonic acid is given off by the seed and oxygen absorbed: this is a state of things favoured by darkness, the reverse occurring in growing plants when exposed to the heat and light of the sun. Ingenhouz was the first to observe this prejudicial effect of light, and the circumstance was soon confirmed by Sennebier.

IV. Soil.

There are several circumstances which favour the conclusion that soil is of secondary importance in its influence on the vegetable kingdom. 1. In those climates where the heat and moisture of the atmosphere are in excess, and vegetation puts on its gayest forms, it is not unusual to see the roots of the loftiest trees of the forest exposed in the beds of mountain torrents, where they have been left bare by the sudden rush of water in the rainy season. Often trees of the greatest vigour shoot upwards from the fissures of hard rocks, the roots penetrating the crevices, and to every appearance without the means of communication with anything like soil. 2. A considerable number of plants live on the surfaces of others, without drawing the least portion of nourishment from them. These are the truly epiphytic kinds, and include numerous species of *Orchidaceæ*, *Aroideæ*, *Bromelia*, *Tillandsia* ; with many ferns, mosses, lichens and fungi. Their dependence seems placed chiefly in the atmosphere for the means of existence ; though it is no doubt true, that when large trees become a good deal covered with many of these plants, a quantity of refuse vegetable matter collects round the points of attachment, and is made available by the plants themselves. The manner in which the bases of the leaves in *Bromelia* and *Tillandsia* sheath over each other so as to form a cup, enables them to retain a quantity of water for a long time, and the falling leaves, portions of broken branches, flowers and fruits that have been shed, all tumbling in and mixing together, form a very turbid but nutritive mixture. Few, I imagine, will not sympathize with Dampier, when in a similar situation, who informs us, that, when wandering in the woods and parched with thirst, he was frequently in the habit of opening a channel with his knife in the lower part of these plants, and thus obtaining a good supply of water. Frequently dead beetles, drowned ants, and many other insects are floating on the surface, all which may make a very serviceable beverage for the vegetable kingdom, but one little likely to be palatable to man. 3. That plants generally are not conspicuous for their attachment to particular soils, is manifest from the number which will thrive in the uniform circumstances of a botanic garden ; here species which have been assembled from a variety of situations are placed side by side, and grow so well, that there is every inducement to believe the nature of the soil is with them of very trifling importance. Some plants undoubtedly have predilections for particular soils, but these are exceptions to the mass of vegetation, and in some of these cases it is the property of retaining moisture or collecting heat which directs the bias of the plant, more than any inherent peculiarity of the soil. 4. Some water plants float on the surface without any communication with the bottom, as the *Lemna* and many Cellulares; the marine algæ, though attached, are without the least semblance of a soil to draw from, and some are of such enormous length, that it would in all probability take a long time for any nutrient matter to find its way from the root to the opposite extremity; whilst the *Sargassum vulgare*, if not without a root, is at least well able to survive a separation.

A natural soil is a very heterogeneous substance; its base might be expected to proceed from the disintegration of the predominant rock in its vicinity, and such it usually is; many foreign materials are soon mixed with it, substances drifted by the wind, the decaying parts of vegetation, the droppings of animals, in some cases not an unimportant integrant, even occasionally the dead remains of animals themselves; but in a state of nature these latter are soon invaded by a host of beings which ere long remove every vestige of their prey. All these substances are included in the twofold division of inorganic and organic; the former being derived from the mineral world, the latter from plants and animals.

The organic portion, or mould, is that constituent of the soil which is the actual food of plants, and whilst the inorganic part acts as a mechanical agent in retaining or diffusing moisture, this is destined, after being rendered soluble by the action of the atmosphere, to furnish nourishment to vegetation. As mould results chiefly from vegetable decomposition, many varieties may be distinguished according to the kind of plants furnishing it. One, well known, is found on our heaths, or in situations where the *Ericæ* have been growing, and is particularly suited for the rearing of other members of their family. The mould formed by the decay of the *Eucalyptus* of New Holland would seem to have such a prejudicial effect on the soil as to exclude other vegetation, and assemblages of tree-ferns have apparently the same effect. The black soil at the bottom of pools and ditches of stagnant water owes its richness to the large quantity of vegetable remains in a state of rapid decomposition and rendered soluble for future nutrition.

The different mineral productions which form the mass of our globe, regarded as to their efficiency in creating soils, have been divided by Professor Jameson into eight classes or varieties, and whilst we borrow his ideas on this subject it will be convenient to reverse his arrangement, by commencing with those which are found most conducive to their formation.

The *first* class contains those substances which separate with facility into an earthy mass; as marl, slate-clay, basaltic and volcanic tuffa. The two latter are capable of producing a very fertile soil; on the declivities of Mount Ætna the vegetation is luxuriant, and also in the vicinity of Vesuvius.

To the *second* class belong conglomerate rocks of greywacke, old red sandstone, and sandstones of various kinds, easily separable by mechanical forces and convertible into gravelly, sandy, or earthy soils.

Third class. Slaty rocks, by their natural structure easily divided and reduced to a mass, which, mixed with water, forms a paste.

In the *fourth* class are those rocks having a crystalline or granular texture; their cohesion not being considerable, they are easily reduced. Granite and gneiss belong here, rocks which often form a good soil, as the materials forming them are loose in their aggregation and retain a proper allowance of moisture.

Fifth class. Basalt; not very favourable to vegetation. The flora of a basalt country is usually meagre.

Sixth class. Chalk and gypsum, though without much cohesion, are not likely to produce a good soil, nor do they readily retain moisture.

The *seventh* class comprises compact limestone; even when much comminuted this will not develope any good qualities, owing to the abundance of calcareous matter. A mixture with aluminous earth in some measure counteracts this excess.

In the *eighth* class are assembled those substances, which, by exposure to the atmosphere for long periods, undergo, if any, very trivial changes. They consist of vitreous lava, pure quartz, compact quartz, flinty slate, and porphyry with a siliceous base. No soil properly so called is formed by them, and the only vegetation likely to be met with in their neighbourhood are lichens, which attach themselves to the surface.

These are some of the principal rocks which lend their constituent parts towards the generation of Soil. In nature the number, by every possible admixture, becomes multiplied to infinity; but whatever may be the mineralogical condition of its structure, vegetation will not thrive in a soil having its sole origin in this source, which an experiment by Giobert admirably illustrates. The four earths, silica, alumina, lime and magnesia, were mixed together in such proportions as were considered to constitute a fertile soil; the compound was well watered and planted with several vegetables; they however would not thrive till the water was changed for the drainings of a dunghill. Plants have been placed in a variety of substances, as sulphur, pounded glass, &c., and carefully moistened with distilled water; in this state they have existed for some time, but it is beyond all experience to suppose, that, in such a condition, they should perfect the several functions required of them by nature. It is only by a proper supply of organized matter in the soil that vegetation can proceed with vigour; some portion of this is supplied by animals, but by far the greater and more important is yielded by plants, which is thus returning to the form and uses from which it had previously issued.

Every year brings in the alternation of its seasons changes in the vegetable kingdom; as soon as spring has set in new life is given to every herb and shrub, the buds unfold, developing flowers and leaves; the former soon fade and fall, in time the fruit follows, and towards the end of summer the rising winds drive the leaves in clouds from the trees. Heavy rains now succeed, and the broken branches, portions of shed bark and other vegetable remains, the refuse of the autumn, are soon saturated with moisture and hasten to decomposition. In countries with excessively moist climates the quantity of fallen vegetation is immense; large trees, the noblest members of the forest, sinking under the effects of a continually moist atmosphere, literally lie in tiers, and give a footing, though often a treacherous one, for hundreds of yards without it being necessary to touch the soil. A portion of this decaying matter is dissolved by the rain-water, and penetrating the earth carries nutriment to the roots against the demands of the ensuing spring. What remains gradually mixes with the mineral constituents of the soil, and more slowly becomes subservient to the same end.

[To be continued.]

LII.—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. 10. *Revisio Tiliarum.* Auctore Eduardo Spach. (Ann. des Sc. Nat. vol. ii. *n. s.* p. 381.) [So far as respects our British species.]

TILIA, Linn.

Arbores, comâ subrotundâ vel ovali, densissimâ. Cortex interior flexilis, tenax. Lignum læve. Ramuli sæpè ab autumno ad ver purpurascentes vel sanguinei. Gemmæ axillares, squamosæ. Pubescentia sparsa vel stellato-tomentosa.

Folia alterna, disticha, petiolata, simplicia, indivisa (nonnunquam angulosa, in varietatibus quibusdam pinnatifida vel palmata), serrata, acuminata, plerumque subrotunda, inæquilateralia, basi obliquè cordata truncatave et palmato- 4–7-nervia, subtùs ad venarum axillas barbata; petioli teretes, basi et apice incrassati, sæpè graciles ac laminâ subæquilongi. Stipulæ geminæ, caducæ. Folia cotyledonea palmatifida.

Flores umbellati vel corymbosi, vel sæpius trichotomè cymosi, odorati; pedunculi ad petiolorum latus exterius solitarii, graciles, penduli, supernè deflexi, infernè costæ bracteæ chartaceæ reticulatæ lingulatæ adnati*; pedicelli ebracteolati, stricti, apice dilatati, infernè glandulis verruciformibus sparsis instructi.

Sepala 5, libera, reflexo-patentia, decidua, concava, obsoletè trinervia, sericea, vel tomentosa, intùs basi subbarbata et foveolâ melliferâ instructa, æstivatione valvatâ.

Receptaculum pentagonum, brevissimum, ferè planum, nectario tenuissimo obtectum.

Petala 5, hypogyna, libera, sepalis alterna, subspathulata, concava, albida, vel lutescentia, tenuè venosa, vesiculis multis diaphanis (oleo essentiali repletis) adspersa †, sub anthesi erecto-conniventia, demùm elongata, distantia, subpatentia.

Stamina 25—80, hypogyna, pluriseriata, decidua. Filamenta libera, vel basi irregulariter polyadelpha, filiformia, albida, sæpè apice bifurca, æstivatione recta, subimbricata, ante anthesin flexuosa, demùm divergentia. Antheræ luteæ, thecis 2 rimâ longitudinali dehiscentibus, medifixis, discretis, plùs minùsve divergentibus.

Staminodia (petala interiora) 5 (in quibusdam speciebus nulla) petalis anteposita et subconformia at minora, filamentorum basi adnata, æstivatione staminibus interiore.

Pistillum: ovarium sericeum vel tomentosum, subglobosum, 5-loculare: loculis biovulatis. Ovula superposita, angulo centrali appendentia. Stylus indivisus, teres, erectus, basi articulatus, post anthesin accrescens plus minusque exsertus, demùm deciduus. Stigmata 5, brevia, dentiformia, triquetra, sub anthesi arcte conniventia, demùm erecto-divergentia vel patentia ‡.

Pericarpium: nux lignosa (in specie unicâ chartacea), subpisiformis, 5-costata (costis nonnunquam demùm evanidis), evalvis, abortu unilocularis, 1- vel rarò 2-sperma.

Semen placentæ demùm parietali hilo lineari mediante adnatum, obovoideum, basi attenuatum. Epispermium crustaceum, rufescens. Chalaza apicilaris, mammiformis. Perispermium corneum, oleosum. Embryo rectus, medianus, longitudine perispermii, recens viridis:

* Pedunculi, quum manibus distenduntur, strepitu rumpunt peculiari.

† His procul dubio tribuendum florum odor fragrantissimus eorumque virtutes stimulantes; bracteæ pedunculi sepalaque autem mucilagine copiosâ scatent.

‡ Characteres specierum e stigmatorum directione desumti fallacissimos esse, pro certo habemus.

radicula oblongo-clavata, elongata, infera, per germinationem e nucis basi circumscissa excrescens; cotyledones foliaceæ, subcordatæ, flexuosæ, pennato- 5-lobatæ: lobis inæqualibus, subconvolutis.

§. Staminodia nulla. Stamina 25–45, petalis longiora, stylum etiam post anthesin superantia; filamenta vix apice bifurca, basi nunc libera, nunc pentadelpha: phalangibus 5–8-andris, petalis antepositis, cum filamentis 1–3 liberis alternantibus. Nux aut chartacea, fragilis, costis filiformibus, aut lignosa, costis prominulis.

Species omnes Europæ incolæ.

A. *Folia* (*præter barbulas paginæ inferioris*) *petiolis ramulisque glabra.*

a. *Nux obliqua, chartacea, fragilis: costis filiformibus, tomento floccoso nonnunquam absconditis.*

TILIA SYLVESTRIS, Desfont.—T. foliis e basi obliquè cordata v. dimidiato-cordata, v. truncata, v. rotundata orbicularibus v. subrotundis, v. transversè ellipticis, v. ovatis, v. ovato-ellipticis, cuspidato-acuminatis, inæqualiter serratis, suprà obscurè viridibus, sublucidis, subtùs glaucis, barbatis; petiolis foliorum superiorum laminâ subæquilongis v. dimidio usque brevioribus; pedunculis 2–9-floris (plerumque 7-floris); nuce obovatâ v. ovato-globosâ, umbonatâ.—*Tilia sylvestris*, Desfont. Cat. Hort. Par.—*T. parvifolia*, Ehrh.—Borkh.—Eng. Bot. t. 1705. Schk. Handb. t. 141. Hayn. Arzn. iii. 46. Guimp. et Hayn. Deutsch. Holz. t. 106.—*T. microphylla*, Vent. Diss. t. 1. fig. 1.—*T. europæa*, γ. Linn.—*T. ulmifolia*, Scopol.—*T. europæa borealis*, Wahlenb.

Præ cæteris varietatibus sequentes insigniores, characteribus in singulis individuis satis constantibus, transitu tamen uniuscujusque in alteram facile recognoscendo.

Var. α. *ovalifolia sive minor.*—Foliis minoribus ($\frac{1}{2}$–2 pollices longis, 10–15 lineas latis), e basi truncatâ v. rotundatâ valdèque obliquâ subovatis: ramulorum floriferorum summis vix petiolo longioribus sive isto paulo brevioribus.—[Hospitatur in Horto Parisiensi ubi *Tiliá sylvestri rotundifoliá* mense ferè præcocius, medio Junio nempè florescit.]

Var. β. *cordifolia sive major* (*Tilia parvifolia*, Guimp. et Hayn. *l. c.*). —Foliis majoribus (3 pollices circiter longis, $2\frac{1}{2}$ pollices latis), cordatis v. cordato-ovatis, basi plus minusve obliquis: ramulorum floriferorum summis plerumque petiolo longioribus.

Var. γ. *rotundifolia* (*Tilia microphylla*, Vent. *l. c.*).—Foliis 1–3 pollices latis, latitudine plerumque brevioribus, subæquilateralibus, e basi cordatâ subrotundis: serraturis sæpissime latis rotundatis; petiolis foliorum summorum laminâ nunc subæquilongis, nunc dimidio brevioribus. [Formæ huc spectantes in Galliâ cæteris vulgatiores videntur.]

Arbor altitudinem 80-pedalem diametrumque 6-pedalem attingens. Cortex truncorum vetustorum rimosus, e fusco nigricans, juniorum et ramorum lævigatus, olivaceus. Ramuli annotini viridescentes, vel lutescentes, vel rubelli. Rami patuli, comam conico-pyramidalem efformantes. Gemmæ ovatæ, obtusæ, incurvæ, rufescentes. Foliorum lamina 1–3 pollices longa, nunc longitudine æquilata, nunc angustior, basi 5- v. 7-nervis, membranacea, subtùs in axillis nervorum lanâ floccosâ rufescente vel lutescente barbata; serraturæ triangulares vel rotundatæ, plus minusve approximatæ, vel distantes, inæquales vel subæquales, mucrone brevi, cartilagineo, albido, nonnunquam apice calloso mucronatæ; petiolus gracilis, 6–24 lineas longus (foliorum infimorum semper lamina brevior). Pedunculi plerumque folio paulo longiores (semper petiolo longiores); bractea lanceolata, v. lanceolato-oblonga, apice rotundata v. attenuata, flores superans pedicellisve superata, nunc usque ad basin pedunculi decurrentes, vel ab eâ plus minusve remota; pedicelli umbellati, v. corymbosi, v. trichotomè cymosi, pedunculi parte liberâ nunc longiores, nunc breviores. Sepala vix ultra 2 lineas longa, oblongo- v. ovato-lanceolata, obtusiuscula, subtùs glabra v. pulverulenta, supra sericeo-tomentosa. Petala $2\frac{1}{2}$–3 lineas longa, lanceolato- v. oblongo-spathulata, obtusa, albida, apice obsoletè crenulata. Stamina 25–30, libera (an semper ?), petalis demùm dimidio longiora. Ovarium sericeo-tomentosum. Stylus glaber, post anthesin staminibus vix superatus. Nux pisi minoris volumine, tenuis, fragilis, tomento rufescente, floccoso, demùm deciduo induta, immatura turbinata v. pyriformis.

Habitat in Europâ ferè totâ, præsertim borealiori, necnon in montibus Uralensibus ac Caucasicis, inque Siberiâ Australiori (v. v. c. et sp.).

b. *Nux coriacea, subæquilateralia: costis prominulis.*

TILIA INTERMEDIA, DeC.—T. foliis e basi subæqualiter v. obliquè cordata v. dimidiato-cordata, v. truncata, v. rotundata subrotundis, v. ovato-subrotundis, v. ovatis, cuspidato-acuminatis, inæqualiter serratis, supra lætè viridibus, subtùs pallidioribus (vix glaucis): summorum petiolo lamina dimidio—duplo breviore. Pedunculis 2–7-floris; nuce subturbinatâ vel obliquè obovatâ, umbonatâ, velutinâ.—*Tilia intermedia*, DeC. Prodr.—*T. europæa*, Smith, Eng. Bot. t. 610. Svensk, Bot. t. 40. Flor. Dan. t. 553.—*T. vulgaris*, Hayn. Arzn. iii. tab. 47. Guimp. et Hayn. Deutsch. Holz. t. 107.—*T. Tecksiana*, C. Bauh.

Arbor 40–60 pedalis ultraque. Cortex vetustior nigricans, rimosus. Rami divergentes, suberecti, comam pyramidalem vel conicopyramidalem efformantes. Ramuli annotini olivacei vel lutescentes. Gemmæ ovatæ, subcompressæ, lævigatæ, olivaceæ vel purpurascentes. Foliorum lamina 2–$3\frac{1}{2}$ pollices longa, 18–45 lineas lata (folia surculorum sterilium usque ad $4\frac{1}{2}$ pollices lata totidemque longa), membranacea, basi 5- v. 7-nervis, supra lævigata, subtùs in venarum axillis lana floccosa dilutè fulva v. lutea, v. castanea barbata; serraturæ triangulares, v. rotundatæ, plus minusve inæquales, mucrone brevi cartilagineo sæpè apice sphacelato acuminatæ; petiolus 6–20 lineas longus, gracilis. Pedunculi foliis ferè æquilongi, vel paulo breviores, plerumque 4–7-flori; pedicelli parte liberâ pedunculi subæquilongi, vel paulo breviores, umbellati, vel corymbosi, vel dichotome sive trichotome cymosi; bractea lanceolata, v. lanceolato-oblonga, subobtusa, plerumque usque ad basin pedunculi decurrens. Sepala ovato- v. oblongo-lanceolata, obtusiuscula, suprà glabra, subtùs marginibusque tomentosa, 2½ lineas longa. Petala 3 lineas longa, lanceolato- v. oblongo-spathulata, obtusa, apice obsoletè crenulata, pallidè straminea. Stamina 30–35, basi irregulariter pentadelpha (secundùm cl. Hayne libera). Ovarium sericeo-tomentosum. Stylus glaber, post anthesin staminibus subæqualis. Stigmata obtusa, margine denticulata, post anthesin nunc arrecta, nunc patula. Nux 3–4 lineas alta, diametro 2½–3-lineari, sublignosa, pentagona, tomento floccoso lutescente induta, demùm glabrescens. Semen obovoideum, castaneo-fulvum.

Habitat in Europâ mediâ et boreali; specimina Gallica spontanea haud vidimus; hospitatur autem in hortis ac arboretis, e. g. circa Parisios in ambulacris sylvæ *Bois de Boulogne* dictæ.

B. *Nux lignosa: costis valdè prominulis. Ramuli juniores, petioli ac foliorum pagina inferior plus minusve hirti.*

TILIA MOLLIS, Spach.—T. foliis e basi cordata, v. dimidiato-cordata, v. rotundata, v. truncata orbicularibus, v. subrotundis, v. ovato-subrotundis, v. ovatis; cuspidato-acuminatis, inæqualiter serratis v. crenato-dentatis, subæquilateralibus v. obliquis, utrinque puberulis, subtùs ad nervos venasque hirtis: summorum petiolis laminâ subæquilongis vel triplo usque brevioribus; pedunculis 3–7-floris; nuce turbinatâ, v. pyriformi, v. obovatâ, v. ovatâ, v. ellipsoideâ, umbonatâ, v. acuminatâ, velutinâ, v. incano-puberulâ.—*Tilia mollis*, Spach,*—*T. platyphylla*, Scopol. Carn.—Vent. Diss. t. 1. f. 2. Duham. ed. nov. 1. t. 50.—*T. cordata*, Mill. Dict.—*T. cordifolia*, Bess. Gal.—*T. europæa*, Desfont. Cat. Hort. Par. Hook. Fl. Lond. t. 190. E. Bot. Suppl. t. 2520.—*T. pauciflora*, Hayn. Arzn. iii. t. 48. Guimp. et Hayn. Deutsch. Holz. t. 108.—*T. corallina*, Ait. Hort. Kew.—*T. rubra*, DeC. Prodr.—*T. corinthiaca*, Bosc. Nouv. Cours d'Agricult.

Præ cæteris ferè innumeris varietatibus forsanque hybridis hujus speciei sequentes facilius agnoscendæ:—

Var. α. *vulgaris* (*T. platyphyllos*, Vent. *l. c.* Duham. *l. c.*—*T. pauciflora*, Hayn. Guimp. et Hayn. *l. c.*).—Foliorum superiorum lamina petiolo 2–3-plo longiore; pedunculis 2–3-floris; pedicellis bracteam subsessilem basi rotundatam superantibus; nucibus velutinis vel incanis, turbinatis, plerumque æquilateralibus.—Forma videtur in sylvis vulgatissima. (V. v. c.)

Var. β. *pluriflora*.—Foliorum superiorum laminâ petiolo vix dimidio longiore, basi plerumque truncatâ, obliquissimâ; pedunculis 5–7-floris; pedicellis divaricatis, bracteam lanceolato-ligulatam a pedunculi basi distantem vix superantibus vel subæquantibus; nucibus turbinatis, sæpè obliquis, velutinis.—Transitum sistit a præcedente in sequentem. (V. v. c.)

Var. γ. *longepetiolata*.—Foliorum superiorum laminâ petiolo subæquilongâ vel paulo breviore, basi inæqualiter truncatâ; pedunculis 5–7-floris; pedicellis divaricatis, bracteâ lanceolato-ligulari a basi

* De synonymis antiquioribus nullum accepimus, quia omnia formas nonnisi variabiles speciei designant.

pedunculi distante superatis; nucibus turbinatis, velutinis, sæpè obliquis. (V. v. c.)

Var. δ. *bracteosa.*—Foliorum superiorum laminâ petiolo subæquilongâ vel dimidio longiore, ovatâ v. cordatâ; pedunculis 3–5-floris; pedicellis divaricatis, bracteâ lanceolato-ligulari a basi pedunculi distante longe superatis; nucibus obovatis, subacuminatis, incanis, sæpè obliquis. (V. v. c.)

Var. ε. *leptolepis.*—Foliorum superiorum laminâ petiolo paulo longiore, subovatâ, basi obliquè truncatâ v. rotundatâ; pedunculis paucifloris; pedicellis bracteam angustè lanceolatam subsuperantibus; nucibus ellipsoideis, subacutis. (V. v. c.)

Var. ζ. *brevipes.*—Foliorum superiorum laminâ petiolo 2–3-plo longiore, subrotundâ, basi subæqualiter cordatâ; pedunculis 3–5-floris, brevibus; pedicellis bracteâ lanceolato-oblongâ longe superatis; nucibus subglobosis, vel ovatis, v. ellipsoideis, obtusissimis, incanis, æquilateralibus. (V. v. c.)

Var. η. *corallina.* (*T. corallina,* Ait.—*T. europæa,* Hook. *l. c.*—*T. rubra,* DeC.)—Foliorum superiorum laminâ petiolo longiore; pedunculis 3–7-floris; pedicellis bracteam oblongo-ligularem, latissimam, plerumque sessilem subæquantibus vel paulo superantibus; nucibus globosis vel ovatis, umbonatis (raro acuminatis), tomentoso-velutinis*.—Ramuli annotini nunc per totum annum, nunc hyeme tantum sanguinei, etiam in præcocitatis varietatibus haud raro occurrunt.

Varietates α. et η. species forsan duas sistunt distinctas, permultis hybridis hortensibus intricatæ.

Arbor 60–100-pedalis, diametro 2–3-pedali. Cortex vetustus griseo-fuscus, rimosus. Rami cinerei, verrucosi, arrecti. Coma ovalis vel subpyramidalis. Ramuli annotini olivacei, vel lutei, vel virides, vel sanguinei, v. violacei, punctati. Ramuli juniores pilis patentibus hirti. Gemmæ ovatæ, obtusæ, fuscescentes. Foliorum lamina 1–4 pollices longa (surculorum sterilium folia nonnunquam semipedalia), nunc totidem lata, nunc longitudine angustior, supra subrugosa, lætè vel obscurè viridis, subtùs pallidè virens sæpeque lucida, basi 5- v. 7-nervis, serraturæ vel crenulæ plus minusve approximatæ, mucrone brevi albido subcartilagineo apice sphacelato acuminatæ; petiolus $\frac{1}{2}$–3 pollices longus, hirsutus v. velutinus, simul ac axillæ, costa, nervi venæque paginæ inferioris pilis mollibus patulis hirti v. hirsuti. Bracteæ foliorum longitudine, vel paulo breviores aut longiores, 3–8 lineas latæ, liguliformes, v. lanceolatæ, v. lanceolato-oblongæ, obtusæ vel acutæ. Pedicelli divaricati plus minusve arrecti, nunc pedunculi parte liberâ longiores, nunc breviores, plerumque bracteâ paulo superati, umbellati v. corymbosi, v. subtrichotome cymosi. Sepala ovato-lanceolata, obtusiuscula, dorso glabrescentia, facie marginibusque sericea, $2\frac{1}{2}$–3 lineas longa, pallide lutea. Petala 3–4 lineas longa,

* Nuces juniores quasi ecostatæ videntur (talesque tribuuntur ab illustr. DeCandolle *Tiliæ* suæ *rubræ*), tunc costæ, demùm prominentissimæ, tomento denso velantur.

straminea, spathulato- v. obovato-oblonga, obtusa, integerrima, vel apicem versus obsolete crenulata. Stamina 30–45 : filamenta libera v. pentadelpha, ovarium sericeum vel tomentosum. Stylus glaber vel basi barbatus, post anthesin 2 lineas longus. Stigmata obtusa, demùm sæpè patentia. Nux 2–4 lineas alta, diametro $\frac{1}{2}$–3-lineari; costæ plus minusve prominentes, sæpissime crassæ. Semen ovatum v. obovatum, fusco-castaneum.

Habitat in Europâ, præsertim mediâ et australiori. Parisiis florescit medio Junio : individua tamen reperiuntur singula jam initio Junii vel tantum initio Julii florida.

LIII.—*General Features of Chusan, with remarks on the Flora and Fauna of that Island.* By Theodore Cantor, M.D., Bengal Medical Service, &c.

[Continued from p. 370.]

Animals observed at Chusan.

1. MAMMALIA.

Cheiroptera.

**Vespertilio irretitus*†. V. auriculis capite brevioribus, rotundatis; trago lanceolato ; rostro brevi, obtuso, nigro ; labiis mentoque crinibus longioribus sparsim tectis ; vellere dorsi capitisque molli, brevi, griseo-brunnescenti, abdominis pulvericolore ; membro virili maximo ; caudâ corpus longitudine æquante, e membranâ interfemorali, subtùs sparsim hirsutâ, paululum exsertâ.

Ears rounded, shorter than the head ; tragus lanceolate ; muzzle short, obtuse, black, the lips and chin with scattered, lengthy, bristly hairs ; fur of the back and head short, soft brownish gray, that of the abdomen dust-coloured ; male genital organ highly developed ; tail as long as the body, slightly protruding from the interfemoral membrane, the abdominal surface of which is thinly covered with short hair.

Dentition :—Incis. $\frac{2-2}{3 \cdot 3}$; canin. $\frac{1-1}{1-1}$; molar. $\frac{4 \cdot 4}{5 \cdot 5}$.

Dimensions.	inch.	lin.
Length of the head	$\frac{1}{2}$	0
—— body	$1\frac{1}{2}$	1
—— tail	1	1
—— ear	0	$2\frac{1}{2}$
Breadth of the ear	0	2
Length of the tragus	0	1
Extent of the wings	8	0

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* Animals marked with an asterisk have been sketched at Chusan in 1840 by Dr. Cantor, who has supplied the names unless otherwise observed.

† *Irretire*, from its being frequently arrested in the strong web of two large spiders, *Epeïra bilineata* and *heraldica* (vide infra), which circumstance has given rise to the common erroneous belief that those and similar spiders feed upon bats.

Canina.
Canis sinensis, Auct.
Felina.
Felis domesticus, Auct.
**Felis* ——— ?
Edentata.
Manis pentadactyla, Linn.
Pachydermata.
Sus (var. sinensis Auctor.).
**Equus caballus*, Auct.
—— *asinus*.
Ruminantia.
**Capra*.
**Bos taurus*, Auct.

2. AVES†.

Passerinæ.
Dentirostres.
Lanius erythronotus, Vigors.
Dicrurus balicassius, Vieillot.
Turdus merula, Auct.
Philedon ——— ?
Sylvia hippolaïs, Temminck.
Fissirostres.
Hirundo erythropygia, Sykes.
Conirostres.
Pyrgita montana, Auct.
Pastor cristatellus, Temm.
Pica vulgaris, Auct.
Syndactyles.
Alcedo bengalensis, Gmelin.
Grallæ.
Cultirostres.
Ardea ——— ?

3. REPTILIA.

Chelonia.

**Trionyx tuberculatus*. T. testâ triste olivaceâ, ocellis nigris tuberculisque crebris tectâ; infrà albo-viridescens; laminis osseis quatuor.

Dark olive; carapace with ocellated black spots and numerous tubercles; beneath greenish white; four callosities.

**Emys muticus*. E. testâ fuscâ; fasciâ lætè flavâ pone oculos notatus; sterno scutis duodecim composito, fusco-maculatis.

The shell brown; behind the eyes a bright yellow band. Sternum composed of twelve plates, with brown spots.

Sauria.

**Hemidactylus nanus*. H. supernè cinereus, strigis sagittalibus nigris 5—6; caudâ annulis 6—7 ejusdem coloris cinctâ. Infrà margaritaceus.

Gray above, with five to six black arrow-shaped marks, and six to seven rings of the same colour on the tail. Beneath pearl-coloured.

**Tiliqua rufo-guttata*. T. supernè ænea, lineis serratis nigris quatuor ornata; lateribus pallide flavis, rubro permaculatis; abdomine pallide flavo.

Bronze-coloured above, with four black zigzag lines; the sides pale yellow, with numerous red spots. Beneath pale yellow.

Ophidia.

a. Venomous.

**Naja atra*. N. supernè atro-iridescens, lineis duplicibus transversalibus flavis cincta; abdomine in nonnullis margaritaceo, in aliis schistoso.

Iridescent black, with a number of distant transversal double lines

† Identified by Edward Blyth, Esq.

of a yellow colour. The abdominal surface in some of a pearl, in others of a slaty colour.

b. Innocuous.

**Lycodon rufo-zonatus.* L. supernè brunneus fasciis pluribus transversalibus rubris ornatus; superficie abdominali margaritaceâ, caudali nigro-maculatâ. 193 + 72.

Brown, with numerous transversal crimson bands; the abdominal surface pearl-coloured, spotted with black on the tail.

**Coluber dhumnades.* C. supernè niger, fasciâ flavâ mediâ, similibus duabus utrinque anticè inclusus; abdomine schistoso. 189+98, 199+92.

Black, with a longitudinal yellow band in the middle and two on either side, terminating with the anterior half of the back; the abdominal surface of a bluish black colour.

**Coluber mandarinus.* C. supernè lætè scarlatinus, rhombulis flavis, oris nigris albo-marginatis, crebro ornatus, guttis nigris irregularibus albo-marginatis utrinque inclusus; scutis abdominalibus margaritaceis, alternè nigris. 222 + 63.

Bright scarlet above, with numerous yellow lozenges, surrounded with broad black brims, relieved with white edges; on either side a number of small irregular black marks edged with white; the abdominal surface pearl-coloured, chequered with black.

**Tropidonotus rufodorsatus.* T. (scutis lævibus tectus) suprà brunneo-cinereus, fasciis quatuor nigris anticè interruptis seriebusque tribus summis rubro-marginatis; subtùs lætè flavus alternè niger. 178 + 52.

(Covered with *smooth* scales.) Brownish gray above, with four longitudinal black, on the anterior part interrupted, bands, and the three upper rows of scales on the back edged with red; beneath gamboge chequered with black.

Python Schneideri, Merrem.

Batrachia.

**Rana temporaria*, var. R. supernè brunneo-viridis; superficie internâ femorum parcè nigro-maculatâ; infrà pallidè flava.

Brownish green above, with a few dark spots on the inner surface of the thigh; pale yellow beneath.

**Rana esculenta*, var. R. supernè brunneo-viridis, lineis tribus pallidè flavis, æquidistantibus, fasciisque pluribus irregularibus nigris ornata; abdomine flavo albescenti.

Brownish green above, with three parallel faint yellow lines, and a number of irregular black transversal bands. The abdominal surface whitish yellow.

**Hyla arborea*, var. H. supernè aureo-viridis, lineâ laterali nigrâ utrinque inclusa; subtùs albo-flavescens.

Golden green above, with a brownish black lateral line; beneath yellowish white.

**Bufo gargarizans.* B. supernè brunneo-canescens, tuberculis conicis magnis, nigro-acuminatis tectus; lateribus violaceo-canescentibus; abdomine albescenti nigro-maculato.

Grayish brown above, with numerous large conical tubercles with black points; the sides grayish lilac; the abdominal surface buff, speckled with black.

4. PISCES.

Acanthopterygii.

Pharynginæ labyrinthiformes.

Anabas scandens, Cuv.

**Macropodus ocellatus*. M. brunneus, lateribus violaceis, postoperculo nigro ocellato; alâ dorsali analique longissimâ ejusdem ferè magnitudinis, rufâ, ærugine marginatâ necnon punctatâ, radiorum mollium apicibus nigris; alâ caudali latè lanceolatâ, scarlatinâ ærugine maculatâ.

D. 17 + 8; C. 12; A. 20 + 12; V. 1 + 5; P. 11; Br. 4.

Habitat. Streamlets and canals.

Brownish, with lilac sides, and a black ocellated spot on the gill-cover; the dorsal and anal fins very elongated, nearly of equal size, of a reddish colour edged and spotted with verdigris; their soft rays with black points; the caudal fins broad, lanceolate, of scarlet colour with verdigris spots.

**Ophicephalus argus*. O. dorso lateribusque viridi-brunnescentibus, abdomine albo-rufescenti, ocellis crebris nigris lateralibus, supra lineam lateralem albo-marginatis; pinnis flavis, nigro-maculatis.

D. 49; C. 14; A. 33; V. 1 + 5; P. 16; Br. 5.

Habitat. Streamlets, estuaries.

Brownish green back and sides, reddish white abdomen. Numerous black ocellated spots edged with white above the lateral line; fins yellow, spotted with black.

Mugilidæ.

Mugil cephalotus, Cuv.

Habitat. Estuaries and sea.

Gobioides.

**Periophthalmus modestus*. P. brunneus, cinereo marmoratus; abdomine albo-cærulescenti, alis pallidè flavis; dorsali anteriori fasciis nigris duabus ornatâ; radiis alarum nigro-punctatis.

D. 15 + 1·12; C. 13; A. 1 + 11; V. 1 + 5; P. 11; Br. 2.

Habitat. Along the coasts and banks of canals.

Brownish marbled with gray, minutely spotted with black. Abdomen bluish white. Fins faint yellow. The first dorsal with two black bands, the second with a black band and the rays with black spots. The caudal, ventral and pectoral with similar spots.

**Eleotris flammans*. E. supernè violaceo-brunneus; alâ dorsali anteriori fasciis tribus undulatis violaceis, flammeo-marginatâ; posteriore fasciis undulatis quatuor nigris, radiis alarum aurantiacis, apicibus nonnullis flammeis, aliis nigris; alâ caudali violaceo-canescenti, fasciis tribus cæruleis, radiorum flavorum apicibus flavis; alâ anali aurantiacâ, fasciis quinque nigris undulatis, radiorum brunneorum apicibus nigris; alis ventralibus pectoralibusque pallidè violaceis, radiorum flavorum apicibus nigris.

D. 6 + 1·10; C. 15; A. 1 + 9; V. 1 + 5; P. 18; Br. 6.

Habitat. Canals, estuaries.

Dark lilac brown above; the dorsal fins with orange spines and rays, the anterior with three waved lilac bands and with flame-coloured margin; the second with four waved black bands; the extremities of the rays partly black, partly flame-coloured. The caudal grayish lilac, with three blackish blue arched bands; rays yellow, with black extremities. Anal orange-coloured, with five waved black bands; brown rays with black extremities; the pectorals with five arched black dotted lines.

Malacopterygii.

Cyprinidæ.

**Cyprinus gibelioides.* C. suprà viridi-nigrescens, scutis lateralibus majoribus argenteo-viridibus, viridi-nigrescenti marginatis, squamis infra lineam lateralem argenteis obliteratis; pinnarum radiis flavis, apicibus nigris.

D. 2 + 18; C. 19; A. 2 + 5; V. 9; P. 15; Br. 3.

Habitat. Streamlets, canals, estuaries.

Dark green above. The large scales on the sides silvery green, edged with dark green; below the lateral line the scales are silvery, indistinct; the rays of the fins yellow with black extremities.

Cyprinus auratus, Linn.

Leuciscus (*Cyprinus*) *daniconius*, Hamilton. Hab. Streamlets, canals.

**Cobitis anguillicaudata.* C. supra lineam lateralem, flava, olivaceo-maculata, infrà cinerea nigro-maculata; abdomine flavo; pinnarum radiis flavis, nigro-punctatis, apicibus rubris; pinnâ caudali longissimâ, cirrhis decem.

D. 9; C. 9; A. 7; V. 6; P. 10; Br. 3.

Habitat. Ponds, streamlets, canals.

Yellow, with olive-brown clouded spots above the lateral line; below the latter gray, minutely spotted with black. Abdomen yellow. The fin rays yellow, spotted with black, and with red extremities. The caudal fin much elongated. Cirrhi 10.

Esocidæ.

**Hemiramphus intermedius.* H. supernè lætè viridis, lateribus argenteis, abdomine albo, alis pallidè flavis.

D. 14; C. 15; A. 16; V. 6; P. 11; Br. 10?

Habitat. Sea, estuaries, canals.

Light green above, with silvery sides; abdomen white. Fins faint yellow.

Siluridæ.

**Silurus punctatus.* S. supernè nitidè olivaceo-viridescens sive brunnescens, seriebus duabus punctorum nigrorum infra lineam lateralem; abdomine albo-flavescenti; alis dorsalibus, caudalibus analibusque nigris; ventralibus albo-flavescentibus; pectoralibus latè nigro-marginatis. Cirrhi $\frac{2}{2}$.

D. 5; C. 15; A. 80; P. 1 + 5; V. 14; Br. 5.

Habitat. Fresh and brackish water.

Shining olive-green or brown, with two rows of black minute dots below the lateral line. The abdominal surface yellowish white. The dorsal, caudal and anal fins black; ventrals yellowish white; pectorals the same colour, with a broad black brim.

Apodal Malacopterygii.

Muraenidæ.

**Anguilla latirostris*, Yarrell.

Habitat. Fresh and brackish water.

**Synbranchus grammicus*. S. suprà flavo-rufescens, infra lineam lateralem albo-flavescens, toto corpore lineis nigris inscripto.

Habitat. Streamlets, canals, estuaries.

Reddish yellow above the lateral line; beneath buff, with numerous black inscription-like lines all over the body.

5. MOLLUSCA.

(*Described by W. H. Benson, Esq., Bengal Civil Service.*)

Gasteropoda.

Pulmonifera. Terrestria.

Incilaria †, nov. gen. Corpus elongatum, posticè attenuatum, repens, undique velo marginatum. Tentacula quatuor, superioribus oculiferis, inferioribus integris. Foramen commune in latere dextro, non procul ab extremitate anticâ veli situm.

**Incilaria bilineata*. Corpore livido, velo punctis maculisque fuscis conspersis ornato, lineis duabus lateralibus, nigrescentibus, unicâ obscuriore medianâ strigatâ. Long. ad poll. $1\frac{1}{2}$.

Habitat. The earth, under roots, on trees and plants.

**Helix ravida*. Testâ subglobosâ, umbilicatâ, epidermide olivaceâ, anfractibus sex transversè subplicatis, ultimo ventricoso, suturis impressis, umbilico mediocri; aperturâ suborbiculari elongatiusculâ, labio reflexo, tenui explanato, labro acuto. Axis 1·3, diam. 1·33.

Habitat. Trees, stones, rocks, earth.

**Helix tapeina*, Journ. Asiatic Society, vol. v. p. 352. No. 7.

Habitat. N.E. frontier of Bengal. Rare at Chusan.

**Helix naninoides*. Testâ solidiusculâ, subdiscoideâ, supernè radiatim tenuiter striatâ, infra striis lævigatis, distantibus; spirâ depresso-conoideâ, apice obtusato, planulato; aperturâ transversè lunatâ, labro obtuso, crasso, infrà subreflexo.

Habitat. Singapore; scarce at Chusan.

**Clausilia pluviatilis*. Testâ fusiformi pallidè olivaceâ; spirâ attenuatâ, crystallinâ, apice papillari; anfractibus 14, medianis ventricosioribus, omnibus leviter transversè striatis; peristomate valdè

† From *incile, a gutter*, with reference to the gutter-like channel which divides the mantle from the foot.

reflexo planato, ad labii basin plicâ obliquâ solidâ, sulcoque concurrente munito. Axis 1·1 poll.

Habitat. In the earth.

**Clausilia aculus.* Testâ subulatâ nitidâ, epidermide fuscescenti, anfractibus 10 aut 11, oblique leviter striatis; aperturâ dentibus duobus vel tribus munitâ, peristomate reflexo. Axis longior 0·65, minor 0·5 poll.

Habitat. In the earth, on mossy stones, walls and trees.

**Achatina erecta.* Testâ albidâ solidiusculâ subulato-turritâ, epidermide fœdâ, scabrâ; anfractibus octo, planulatis, suturis impressis; apice obtuso.

Habitat. Same localities, and in company with *Clausilia aculus.* Common at Macao, where however *C. aculus* is not found.

AQUATICA.

**Planorbis papyraceus.* Testâ compressâ, olivaceo-corneâ, subpolitâ, minutissimè radiato-striatâ; anfractu ultimo latiori, suprà infràque æqualiter convexo; peripheriâ carinatâ, spirâ basique ambabus depressis, umbilicatis, umbilico inferiori arctiori; labro superiori valdè prominente, semicirculari, inferiori recedente, recto. Diam. 0·4 poll.

Habitat. Canals, ponds, attached to *Chara.*

**Planorbis hemisphærula.* Testâ nitidâ, olivaceo-corneâ, suprà convexâ, apice planulatâ, infrà excavatâ, umbilico coarctato, peripheriâ obtusâ, nullo modo carinatâ. Diam. 0·25 poll.

Habitat. Same localities as *P. papyraceus* on *Chara* and *Lemna.*

Planorbis compressus, Hutton.

Habitat. Same localities as the preceding. Inhabits also Bengal.

**Lymnæa plicatula.* Testâ elongato-ovatâ, corneâ, scabriusculâ; anfractu ultimo transversè plicatulâ, suturis impressis; spirâ mediocri, apice acuto plerumque ferrugineo; aperturâ infrà patulante, basi evasâ.

Habitat. Ponds.

**Lymnæa minor.* Testâ ovato-acutâ, corneâ, politâ; spirâ vix dimidium testæ efformante, apice obtusiusculo; anfractibus quatuor, suturis leviter impressis; aperturâ ovatâ, plicâ columellæ obsoletâ.

Habitat. Same locality as the latter.

TECTIBRANCHIATA.

**Bullæa caurina.* Testâ ovato-oblongâ, albâ, tenuissimâ, papyraceâ, transversè eleganter minutissimèque striatulâ; aperturâ auriformi suprà angustatâ, infrà patulante; labro apicem superante; spirâ nullâ.

Habitat. Said to inhabit canals.

PECTINIBRANCHIATA.

**Paludina quadrata.* Testâ elongato-conoideâ, crassâ, epidermide viridi-olivaceâ, anfractibus sex planulatis, leviter transversè plicatis, longitudinaliter liratis; liris subquinis; aperturâ mediocri, intùs albidâ violaceâ; umbilico arcto, peritremate nigrescente.

Habitat. Canals and ponds.

**Paludina lecythoides.* Testâ ovato-acutâ, olivaceâ, anfractibus sex aut septem rotundatis, transversè subplicatis; suturis excavatis; aperturâ oblongâ, peritremate subreflexo, nigro; apice acuto; umbilico ætate evanescente.

Habitat. Ditches and ponds.

**Paludina* (*Bithynia,* Gray) *longicornis.* Testâ ovato-conoideâ, corneâ, politâ, spirâ aperturam longitudine vix superante; anfractibus quatuor, ultimo convexo, suturis minimè depressis; aperturâ subrotundâ, suprà angulatâ; peristomate subreflexo, nigrescente; labio crassissimo; operculo testaceo, umbilico evanido; apice obtuso.

Habitat. In canals, attached to aquatic plants, stones, piles.

**Paludina* (*Bithynia*) *striatula.* Testâ ovato-acutâ, corneâ, politâ; spirâ elongatâ; anfractibus quinque convexiusculis, liris pluribus, interdum inconspicuis, circumdatis; suturis depressiusculis; apice obtusato; peristomate reflexo nigrescenti, undato; umbilico evanido; operculo calcareo.

Habitat. Same localities as the latter.

Laguncula, nov. gen. Testâ turbinatâ, subglobosâ, aperturâ majori, integrâ, oblongâ; peristomate interrupto; labio subreflexo; umbilico profundo tortuoso.

**Laguncula pulchella.* Testâ albido-glaucâ, ovato-globosâ; anfractibus convexis, lineis longitudinalibus elevatiusculis aliisque obliquis decussatis instructis; suturis impressis; aperturâ intùs fasciâ latâ pallidè castaneâ ornatâ columellâque intus concolore.

Habitat. Said to inhabit canals.

**Melania cancellata.* Testâ elongato-turritâ, olivaceâ, solidiusculâ, anfractibus novem convexiusculis, omnibus costulis frequentibus, ultimoque fasciis tribus elevatis basalibus munitis; costulis liris plurimis cancellatis; suturis mediocriter excavatis; apice eroso. Axis 1·0 poll. v. paulò plus.

Habitat. Canals.

**Melania* (*Hemisinus*? Swainson) *crebricostis.* Testâ elongato-turritâ, olivaceâ, tenui, anfractibus plurimis leviter convexis; costis frequentissimis albidis, lævigatis, munitis, ultimo costulis evanidis, balteo submediano, rugisque plurimis basalibus circumdato; suturis impressis; columellâ subrectâ; basi leviter canaliculato-effusâ; labro tenui, lævi, subreflexo, apice decollato. Axis testæ decollatæ 1·05 poll.

Habitat. Found with the preceding, but scarce.

Batillaria†, nov. gen. Testâ turritâ, insculptâ, rudi; anfractibus plurimis; aperturâ oblongâ, infrà angustiore, basi truncatâ, evasâ; labro sinuato, suprà emarginato, infrà provecto, labio suprà callo munito; columellâ planatâ, basi incrassatâ, obliquè truncatâ, canalem vix efformante; operculo corneo, tenui, spirali, multiverticillato.

Batillaria zonalis (syn. *Cerithium zonale,* Lamarck, L'Océan des Antilles; *C. zonale,* Gray, China, Griff. Cuv. xii. pl. 14.). Testâ elongato-turritâ, scabrâ, albidâ, fasciis fuscis ornatâ; anfractibus tredecim,

† *Batilla, a shovel,* from the lengthened form of the shell, and the conformation of the base of the aperture.

mediocriter convexis, costulis liris longitudinalibus decussatis, suprà subnodulosis; aperturâ intùs fasciis fuscis strigatâ; columellâ albâ. Axis 1·4 poll.

Habitat. The coast.

ACEPHALA.

Testacea.

**Arca galactodes.* Testâ subrhomboideâ, tumidâ, subæquilaterali, anticè subangulatâ, posticè rotundatâ, multiradiatâ; radiis exilissimis auctûs rugas decussantibus; cardine mediocri terminis exterioribus angulatis; natibus lævibus remotiusculis, incurvatis; margine lævi; epidermide fuscâ. Lat. 0·75, long. 0·5 poll.

Habitat. Said to inhabit canals.

**Mytilus niger.* Testâ oblongâ, trigonâ; cardine unidentato; natibus subincurvatis, decorticatis, sub epidermide albis, marginibus purpurascentibus; intùs margaritaceo-splendidâ, margine purpureo. Long. 3·4 poll, lat. 1·7.

Habitat. Said to inhabit canals.

**Dreissena purpurascens.* Testâ oblongâ subquadratâ, radiato-plicatâ, sub epidermide albo purpureoque ornatâ; intus margaritaceâ; epidermide brunneâ; apice subincurvato, compressiusculo. Long. 1·5, lat. 0·8 poll.

Habitat. Said to inhabit canals.

**Modiola Senhousia.* Testâ transversè oblongâ, subalatâ, gibbâ, læviusculâ; anticè angustatâ, posticè dilatatâ, intùs iridescente; epidermide olivaceâ, obscurè radiatâ; alâ natibusque strigis flexuosis spadiceis ornatis; basi leviter emarginatâ. Long. 1·2, lat. 0·6 poll.

Habitat. Coasts of Chusan and Canton Province.

**Anodon gibbum.* Testâ fragili, ovatâ, tumidâ, anticè rotundatâ, posticè subalatâ, extremitate posticâ subangulatâ; natibus concentricis rugosis, rugis parallelis, subdistantibus, areâ posticâ radiis tribus approximatis, leviter elevatis, rugosulis munitâ, margaritâ interius albidâ versus apicem aurantio-tabescente, versus marginem purpureo viridique splendidè margaritaceâ; margine fusco; epidermide olivaceâ, obscurè radiatâ. Long. 2·0, lat. 3·2 poll.

Habitat. Canals.

**Unio* (*Theliderma*, Swainson) *Leaii*, Gray. Testâ crassâ, subovatâ, compressâ, umbonibus dentibusque cardinalibus extremitati anticæ angustiori approximatis; valvæ sinistræ dente cardinali interiori margineque cardinali penè parallelis, illâ versus dentem lateralem mediocriter productum spectante; valvæ dextræ dente cardinali unico crenato; valvis intùs minimè profundis; margaritâ iridescente, pallidè salmonis colore tinctâ; natibus minimè prominentibus; rugis seriebus duabus e lineâ umbonali divaricatis, posterioribus simplicibus, anterioribus, basalibusque nodulosis, testam exteriorem munientibus; epidermide flavo-olivaceâ. Long. 2, lat. 3 poll.

Habitat. Said to inhabit fresh water at Chusan, and also Canton River.

**Unio* (*Theliderma*) *divergens.* Testâ crassâ, angulato-ovatâ, subalatâ, tumidiusculâ, facie externâ tuberculato-plicatâ, rugis seriebus duabus e lineâ umbonali divaricantibus, posterioribus simplicioribus, anterioribus basalibusque plerumque nodulosis; natibus mediocriter prominentibus; epidermide nigrescente, striis subimbricatis. Valvæ sinistræ dente cardinali interiori versus angulum marginis posterioris basalisque spectante, ad latus exterius laminis pluribus munito, dente exteriori penè obsoleto, brevi, a basi interioris divaricato; dente laterali brevi crasso. Long. 2·65, lat. 3·5 poll.

**Corbicula fuscata.* Testâ cordatâ subinæquilaterali, fusco-virente, tumidiusculâ, politâ, intùs et ad nates violaceâ, extrinsecùs sulcis crebris circumdatâ, rugis intersitis subimbricatis; margine interiori plerumque nigrescente; natibus decorticatis. Lat. 1·3, long. 1·15 poll.

Habitat. Canals.

Venus sinensis, Auct. Testâ orbiculatâ, convexâ, albidâ, marginibus violaceis, denticulatis, extrinsecùs radiis violaceis plicisque concentricis exilissimis ornatâ; disco plerumque ferrugineo, dente cardinali postico bifido, sæpè bilobato, laminæ cardinalis extremitate posticâ concavâ. Long. 1·7, lat. 1·65 poll.

Habitat. Said to inhabit canals.

**Sanguinolaria iridescens.* Testâ subellipticâ, compressâ, albidâ, iridescente, versus apicem incarnatâ, exilissimè transversè striatâ, striis obsoletis radiatim decussatâ; latere postico subrostrato, subangulato, antico longiore, rotundato.

Habitat. Said to inhabit canals.

**Novaculina constricta.* Testâ albâ, tenui, transversè oblongâ, læviusculâ, extremitatibus rotundatis, radio mediano subconstrictâ, epidermide olivaceo-flavescente, posticè quasi capillis intertextis adhærentibus vestitâ. Lat. 2·45, long. 0·75 poll.

Syn. *Solen constrictus*, Lamarck.

6. ANNELIDES.

Hirudinidæ.

**Bdella lineata.* B. supernè brunneo-viridescens, lineâ dorsali mediâ aurantiacâ, infrà griseo-flavescens.

Greenish brown above, with an orange-coloured dorsal line; beneath yellowish gray.

——— ? ——— ?

7. CRUSTACEA.

Decapoda Brachyura.

**Carcinus olivaceus.* C. suprà olivaceo-viridescens; infrà albus; parte anteriore marginis interni femoris spinâ armatâ.

Greenish olive above; beneath white, with a single spine on the anterior part of the internal margin of the femur.

**Sesarma tetragona.* S. supernè viridis, infrà griseo-viridescens; brachiis manibusque rubris.

Carapace green; sternum and legs greenish gray; arms and claws red.

Sesarma quadrata, M. Edwards.

Decapoda Macrura.

**Palæmon ornatus*, Olivier. P. lætè griseo-viridescens; suprà nigro-maculatus.

Light greenish gray; carapace minutely dotted with black.

Stomapoda Unipeltata.

Squilla mantis, Fabricius.

Entomostraca Pœcilopoda.

Xyphosura.

Limulus ——— ?

8. ARACHNIDA.

Araneidæ.

**Attus chlorommatus*. A. villosus brunneus, oculis anterioribus mediis læte viridibus; cephalo-thoracis maculâ oculiferâ latâ nigrescente, fasciam albam mediam hastæformem circumdante, abdomine fasciâ lanceolatâ albâ ornato. Long. poll. dimid.

Hairy, brownish; the anterior centre pair of eyes light green; the broad oculiferous spot blackish, surrounding a white spear-shaped mark; the abdomen with a white lanceolate streak in the centre.

**Thomisus albinus*. T. cephalothorace albo-virescenti, cristâ oculiferâ triangulari, aurantiaco-marginatâ, oculis ambobus anterioribus rubris; palpis maxillaribus pedibusque albo-virescentibus; abdominis albidi trapezoidis superficie superiore punctis quinque marginibusque violaceis, angulis ambobus posterioribus castaneis. Long. ad lin. tres.

Cephalothorax greenish white, with a triangular raised oculiferous crest with orange-coloured margins; anterior pair of eyes crimson; maxillary palpi and feet greenish white; abdomen whitish, in the form of a trapezium; the upper surface edged with lilac and with five lilac points, the two posterior angles chestnut-brown.

**Thomisus bicoloratus*. T. cephalothorace, palpis pedibusque hirsutis, gramineis, abdomine albo-virescente, lineâ longitudinali mediâ duabusque transversalibus nigris, punctisque quinque nigrescentibus ornato. Long. ad lin. duas.

The hairy cephalothorax, palpi and feet grass-green; abdomen greenish white, with a longitudinal black line in the middle, divided by two short distant transversal lines and with five dark points.

**Hypoplatea fasciata*. H. schistosa, cephalothorace nigro radiato, abdomine brunneo indistinctè fasciato, lineâ apicali nigrâ emarginatâ terminato, femoribus tibiisque nigro-fasciatis. Long. lin. sex.

Slate-coloured; cephalothorax with black radiated lines; abdomen indistinctly marked with brown, posteriorly terminated by a black notched line; femora and tibia black-banded.

**Latrodectus* (?) *limacida*†. L. flavescenti-griseus, cephalothoracis maculâ oculiferâ majore arcuatâ nigrâ, thorace rhombulis duobus brunneis, anticè divergentibus, ornato; abdomine fasciis brunneis

† From the circumstance of its having been observed to seize the slug, *Incilaria bilineata*.

transversalibus quatuor diviso; femoribus tibiisque nigro-fasciatis; pedibus brunneis. Long. poll. 1.

Yellowish gray, with a large black arched oculiferous spot; on the thorax two anteriorly diverging brown lozenges; the abdomen with four brown transversal bands; the legs black-banded; the feet brown.

**Uloborus curvicaudus.* U. cephalothorace, palpis maxillaribus pedibusque hirtis, flavo-brunnescentibus; abdominis cylindrici, albo-flavescentis, indistinctè nigro-marmorati extremitate posteriore acuminatâ recurvâ. Long. lin. 5.

Cephalothorax and the hairy palpi and feet brownish yellow; abdomen cylindrical, yellowish white, indistinctly marbled with black; the posterior pointed extremity bent upwards.

**Tetragnatha ænea.* T. cephalothorace palpisque maxillaribus hirsutis, flavo brunnescentibus; femoribus tibiisque viridibus, tarsis nigris, hirsutis; abdomine conico æneo, maculis nigris duabus basalibus, lineisque nigris septem, quarum tres summæ lineâ basali anticè junctæ, ornato. Long. ad poll. dimid.

Cephalothorax and the hairy palpi brownish yellow; the hairy femora and tibiæ green; feet black; abdomen conical, green, bronze-coloured, with two black spots near the base, longitudinally striped with seven black lines, the three upper ones of which are united at the base by a black transversal line.

**Epeïra bilineata.* E. cephalothorace femoribus pedibusque ambobus anterioribus brunneo-nigrescentibus; abdomine subfusco-canescenti, lineolis duabus undulatis nigris, posticè convergentibus, infra quas punctis summis sex; palpis maxillaribus tibiisque ambabus anterioribus subfuscis, femoribus tibiisque ambabus posterioribus subfuscis bifasciatis. Long. poll. 1·1.

Cephalothorax, thighs and feet of the two anterior pair brownish black; abdomen light grayish brown, with two waved, black, posteriorly converging lines, within which are six distant points; the maxillary palpi and tibiæ of the two anterior pair light brown, with two black bands on the joints.

**Epeïra heraldica.* E. maculis oculiferis cephalothoracis, cano-hirsuti, nigris; abdomine brunneo-flavescente nigro-punctato, fasciis tribus, quarum anteriore coronæformi, albo-flavescentibus transversè ornato; punctis sex summis; pedibus nigris hirsutis femoribus tibiisque ambabus anterioribus albo-fasciatis. Long. poll. $1\frac{1}{2}$.

Cephalothorax gray, hirsute; oculiferous spots black; abdomen yellowish brown dotted with black, with six points above and with three transversal whitish yellow bars; feet black, hirsute; the two anterior pair of femora and tibiæ with white bands.

Epeïra fasciata, Walckenaer.

Holetra.

**Phalangium spiniferum.* P. supra brunneum, protuberantiâ oculiferâ triangulo flavo inclusâ, dorso flavo marginato, spinâ forti summâ armato; subtùs flavo-albescens. Long. lin. 2.

Brown above; the oculiferous protuberance enclosed within a yellow triangle; the margins of the back spotted with yellow; the upper part of the back surmounted by a strong spine; whitish yellow beneath.

9. INSECTA.

Myriapoda Chilognatha.

Iuloidæ.

**Polydesmus bicolor.* P. nitidè niger, lineis dorsalibus transversalibus rubris 19, mucroneque segmenti penultimi rubro. Long. ad poll. 2.

Shining black, with nineteen red transversal lines, and the point on the penultimate segment red.

Scutigeridæ.

**Scutigera rufipes.* S. pallidè schistosa, segmentis dorsalibus carinatis novem, abdominalibus sedecim; tarsis rufis. Long. poll. dimid.

Pale slate-coloured, with nine keeled dorsal, sixteen abdominal segments; tarsi red.

Scolopendra morsitans, Auct.

10. ANIMALCULA.

Volvocina.
- *Gyges granulum, *Ehrenberg.*
- *Sphærosira volvox, *Ehr.*

Closterina.
- *Closterium trabecula, *Ehr.*
- * ——— turgidum, *Ehr.*
- *——— ? falcatum.

Astasiæa.
- *Euglena longicauda, *Ehr.*

Dinobryina.
- *Epipyxis utriculus, *Ehr.*

Arcellina.
- *Arcella aculeata, *Ehr.*

Bacillaria.
- *Desmidium Schwartzii, *Ehr.*
- *——— hexaceros, *Ehr.*
- *Xanthidium coronatum.
- *——— hirsutum, *Ehr.*
- *Arthrodesmus quadricaudatus, *Ehr.*
- *Micrasterias hexagona.
- *Euastrum margaritiferum, *Eh.*
- *——— Jovis.
- *——— integerrimum, *Ehr.*
- *Navicula fulva, *Ehr.*
- *——— gracilis, *Ehr.*
- *Navicula sigma, *Ehr.*
- *——— curvula, *Ehr.*
- *——— S romanum.
- *——— turgida, *Ehr.*
- *Bacillaria vulgaris, *Ehr.*
- *Cocconema gibbum, *Ehr.*
- *——— cymbiforme, *Ehr.*
- *Gomphonema truncatum, *Eh.*
- *Cocconeïs pediculus, *Ehr.*
- *Gaillonella nummuloides, *Eh.*
- *——— distans, *Ehr.*

Vorticellina.
- *Vorticella patellina, *Ehr.*

Enchelia.
- *Leucophrys patula, *Ehr.*

Colepina.
- *Coleps hirtus, *Ehr.*

Trachelina.
- *Trachelius vorax, *Ehr.*
- *——— anas, *Ehr.*
- *——— lamella, *Ehr.*

Euchlanidota.
- *Lepadella emarginata, *Ehr.*

Brachionæa.
- *Brachinus urceolaris, *Ehr.*

Dubia.

LIV.—*On some new Insects from Western Africa.* By the Rev. F. W. Hope; *with remarks on the Goliath Beetles,* by Mr. Savage.

Sp. 1. *Lucanus Savagei,* ♂. Long. lin. 22; lat. lin. $5\frac{3}{4}$. Atro-castaneus, thorace elytrisque ferrugineo-brunneis, mandibulis valdè exsertis multidentatis concoloribus, femoribus tibiisque piceis tarsisque nigris.

This insect is allied to *L. Downesii,* which was received from Fernando Po: it is named in honour of the Rev. Mr. Savage, an American Missionary in Africa, a zealous and able individual, who has contributed greatly to our stock of information respecting the entomology of Western Africa.

Sp. 2. *Lucanus picipennis,* Hope. Long. lin. 18; lat. lin. $5\frac{3}{4}$. Niger, capite thoraceque punctulatis, mandibulis duobus semel sumptis haud æqualis, internè dentatis, apicibus acutis. Elytra atro-castanea, corpore infrà atro, pedibus antennisque concoloribus, tribus ultimis articulis fusco-pilosis.

This species was captured at Sierra Leone and Cape Palmas; the female appears to be unknown.

Sp. 3. *Lucanus ungulatus,* ♂, Hope. Long. lin. 15; lat. lin. $4\frac{3}{4}$. Atro-castaneus, thorace elytrisque ferrugineo-brunneis, mandibulis exsertis, ferè ad basin et ad apicem unidentatis, longitudine thoraci cum capite æqualibus. Corpus infrà concolor femoribus lætè rubris, geniculis tarsisque nigris.

This insect is also from Cape Palmas.

Sp. 4. *Gymnopleurus hilaris,* Hope. Long. lin. 7; lat. lin. 5. Lætè viridis et auratus, clypeo thoraceque subtilissimè punctulatis. Elytra ferè glabra, aliquot lineis impressis insignita. Corpus infrà concolor, tarsis exceptis, nigris.

I received this insect from Mr. Strachan of Sierra Leone.

Sp. 5. *Gymnopleurus lætus,* Hope. Long. lin. 8; lat. lin. 6. Corpus suprà cupreo-æneum, clypeo thoraceque punctulatis, fossulâ utrinque fortiter impressâ. Elytra ferè glabra lineisque impressis insignita. Totum corpus infrà nigrum et nitidum.

This species is from the vicinity of Cape Palmas.

Sp. 6. *Heliocopris Dianæ,* Hope. Long. lin. $14\frac{1}{2}$; lat. lin. 8. Niger, clypeo integro, caput anticè rugis transversis insignitum, posticè lunato cornu armatum. Thorax anticè excavatus cornu robusto e medio antrorsum extenso, lateribus lineis obliquè elevatis utrinque insignitis. Elytra ferè glabra aliquot lineis impressis. Corpus infrà nigrum, antennis palpisque piceis.

This unique species is from Cape Palmas.

Sp. 7. *Diplognatha admixta.* Long. lin. 9; lat. lin. 5. Affinis *Cetoniæ Hebrææ,* Oliv., at major. Olivaceo-viridis, thorace elytrisque flavo variegatis. Clypeus ferè quadratus, medio subbidentatus. Thorax olivaceus maculisque cretaceis aspersus. Elytra flavo-olivacea coloribus mixtis. Corpus infrà concolor segmentis abdominis utrinque maculis cretaceis aspersis, pedibus brunneo-piceis.

Hab. in Africâ Æquinoctiali.

Sp. 8. *Cetonia cincticollis*, Hope. Long. lin. $5\frac{1}{4}$; lat. lin. $2\frac{1}{4}$. Viridis, capite oblongo-quadrato, anticè emarginato virescenti. Thorax viridis margine omni flavo, binis luteis maculis in medio positis. Elytra viridia albis punctis sparsa, humeris scutelloque flavescentibus. Corpus infrà opalino-viride, femoribus tibiisque concoloribus tarsisque nigris.

Hab. In the vicinity of Cape Palmas.

Sp. 9. *Popillia sulcipennis*, Hope. Long. lin. $5\frac{1}{2}$; lat. lin. 3. Viridis, capite subemarginato et punctato. Thorax lateribus flavis disco crebrissimè punctulato. Scutellum viridi-opalinum. Elytra viridi-æneа sulcata sulcis interpunctatis. Podex cupreo-æneus utrinque albo-maculatus. Corpus infrà viridi-æneum, sterno cupreo, posticis segmentis abdominis, pedibusque albidis capillis obsitum.

Sp. 10. *Popillia luteipennis*. Long. lin. $5\frac{1}{2}$; lat. lin. $2\frac{1}{2}$. Affinis *Popilliæ Oleæ*, Newman, at non metallica. Viridi-succinea, capite clypeo nigricanti. Thorax luteus lateribus parùm elevatis, maculis binis virescentibus ferè mediis, punctoque concolori minori insignitus. Scutellum viride glabrum. Elytra striato-punctata succinea, viridique colore aspersa, lateribus saturatioribus. Podex utrinque albo-maculatus. Corpus cupreo-æneum, lateribus abdominis utrinque et pectore flavis capillis obsitum. Femora flava, tibiis tarsisque cupreis.

Hab. In Africâ Æquinoctiali.

Sp. 11. *Popillia cyanoptera*. Long. lin. 6; lat. lin. 3. Viridis, caput cum thorace viride et punctatum. Scutellum pallidius. Elytra striato-punctata, cyanea. Podice puncto utrinque albo-maculato. Corpus infrà viridi-æneum nitidum lateribus abdominis utrinque albo-pilosis. Pedes bini anteriores picei, quatuor femoribus posticis viridibus, tibiis tarsisque cupreo-æneis.

Hab. In Africâ Æquinoctiali.

Sp. 12. *Lepidiota Savagei*, Hope. Long. lin. $12\frac{1}{2}$; lat. lin. 5. Affinis *Mel. Commersoni*, at multo minor. Brunnea, suprà cinerea, subtùs albo-squamosa. Clypeo reflexo parùm subemarginato. Thorax elytraque brunnea cinereoque squamosa. Scutellum concolor. Corpus pedesque fusca alboque squamosa.

This is the first instance I believe of *Lepidiota* being taken on the continent of Africa, although it has occurred at the island of Madagascar. *Mel. Sommeri* of the French cabinets belongs to another genus.

Sp. 13. *Euchlora circumcincta*. Long. lin. 9; lat. lin. 5. Viridis, clypeo integro. Thorace flavo-marginato fossulâ impressâ utrinque positâ. Scutellum posticè cupreum. Elytra marginibus externè flavis, podice flavescenti. Corpus infrà flavo-piceum femoribus pallidioribus, tibiis tarsisque cupreo-æneis.

This is the first instance of the occurrence of *Euchlora* in Africa;

it accords well with some of the Asiatic species, and in form approaches *Euchlora aureola* of Hope.

In concluding the species of new Lamellicorns, I add an extract of a letter lately received from Mr. Savage of Cape Palmas, respecting the Goliath Beetles. "As to *Goliathus Cacicus* these regions abound with them, and after a year's watching I have obtained the flower and know botanically the tree from which they derive their food. It is a syngenesious plant belonging to Jussieu's *Compositæ, Corymbiferæ.* As a genus it appears to be undescribed, though I have not as minutely examined it as I intend to do when I have more leisure. As soon as able I shall describe and send it through you to the Linnæan Society. The *Cacicus* inhabits no other tree, as it is said. The *Mecynorhina torquata* inhabits two kinds of tree, one a magnificent *Mimosa*, a Goliath of its kind; I have not yet obtained the blossom; it is now in seed, which I have. The *G. Drurii* is not found in the locality of Cape Palmas; it has been taken at Bussa, near Montserrado, and the specimen I now send is from Cape Coast. I lately saw Professor Klug's *regius,* which is no more nor less than the female of *Drurii.* Of this I am as certain as that the *princeps* of Hope is the female of *Cacicus.* The Gold Coast would seem to be the locality of *Drurii,* and the Grain Coast that of the *Cacicus* and *torquatus.*"

BIBLIOGRAPHICAL NOTICES.

A History of British Sponges and Lithophytes. By George Johnston, M.D. Lizars, Edinburgh; Highley, London: 1842.

There is no branch of natural history which has been so much neglected as that of the sponge tribe. Situate as it were in the debateable ground between the animal and the vegetable kingdoms, naturalists appear to have considered themselves justified in looking upon the sponges as scarcely worthy of notice, and it was not until Dr. Grant published, in the Edinburgh Philosophical Journal, the account of his valuable investigations of the anatomy and physiology of some of the British species, that they were determined with any degree of certainty to be members of the animal kingdom. We were then, for the first time, made acquainted with the true purposes and modes of action of the incurrent and excurrent canals which permeate their substance in every direction, and of the manner in which some of the species are propagated by the ejection of ciliated gemmules or ova from their large oscula. Dr. Grant also described several new British species, and these, in addition to what had been previously described by Montagu and others, formed the groundwork for the arrangement and brief descriptions presented to us by Dr. Fleming in his 'History of British Animals.' The whole of our information regarding these singular creatures has hitherto been dispersed, in the form of detached papers, in the various scientific periodicals, and the present instance is the first in which their descriptions have been collected together and published in a full and explicit manner.

The author commences his work by a general view of the structure, physiology and geographical distribution of sponges in general, and proceeds at some length to review the labours of his predecessors on this subject, from the times of Aristotle and Pliny to the present period. In this part of his subject we have the various and conflicting opinions of both ancient and modern naturalists, regarding their animal or vegetable nature, examined and compared in a temperate, clear and satisfactory manner; and he concludes this able digest of the labours of his predecessors with quoting the observation of Professor Owen, "that if a line could be drawn between the animal and vegetable kingdoms, the sponges would be placed upon the vegetable side of the line." But, our authcr observes, "We shall possibly however arrive at an opposite conclusion, if, proceeding in our inquiry, we follow the siliceous species insensibly gliding on the one hand into the fibro-corneous sponge, filled with its mucilaginous fleshy slime, and on the other into the fleshy Tethya, in whose oscula the first signs of an obscure irritability show themselves. Sponges therefore appear to be true Zoophytes; and it imparts additional interest to their study to consider them, as they probably are, the first matrix and cradle of organic life, and exhibiting before us the lowest organizations compatible with its existence."

In the chapter on "the discoverers of the British species," we have a clear and concise account of the progress of their discovery, by which it appears that forty species were described by Dr. Fleming in his 'History of British Animals.' Our author however describes fifty-six, being an increase of sixteen new species since the publication of Dr. Fleming's work.

The systematic arrangement adopted is that of Dr. Fleming, with some alterations and additions, and these have been carefully and judiciously made. The author has again separated Spongilla from Halichondria, and by this alteration, and by the adoption of new genera, has increased the number from four, as described by Dr. Fleming, to nine.

The species have been describ.d with much care, and additional specific characters have been introduced where it has been found necessary; and the author has given a list of the synonyms to each, so full and complete, as to render this portion of the work exceedingly valuable. There are also extensive lists of habitats; and the latest information on the anatomy, physiology and habits of the various species treated of, and of the sponge tribe in general, has been zealously collected and introduced up to the very latest period.

The second part of the work, 'The British Lithophytes,' may be considered in the light of a supplement to his 'History of the British Zoophytes,' although the author by no means seems to consider them as such. In the introduction to the subject he says, "The corallines are marine productions, which grow in profusion on rocks, shells, and, more rarely, on sea-weeds, to which they are rooted by means of a spreading calcareous crust; and they rise up to the height of a few inches, at most, in lichenoid or conferva-like tufts, dividing and subdividing from the base into numerous branches and branchlets, having the same structure and appearance as the primary shoots. They are remarkably distinguished from other Algæ by being covered with a calcareous crust, which is jointed at short and regular intervals, and conceals a central axis of a decidedly vegetable nature." In this conclusion we cannot agree to the full extent with the author. Ellis, in his 'History of British Corallines,' and other authors of long standing and high merit, have all concurred in considering these curious bodies as Zoophytes, and this decision has been adopted by almost every botanist up to the present period. The subject of their true nature, in the scale of organized beings, is one of exceeding interest, and one which is admirably calculated to afford employment to the high powers and improved microscopes of the present day; and until they have undergone a careful examination by such means, we may be content to consider their present situation to be in the neutral ground, between the animal and vegetable kingdoms.

In this part of the work the author describes four species of Nullipora and one of Corallina more than we have had enumerated by preceding writers; and we find, as in the first part of the work, the species fully and carefully described, with copious lists of synonyms. In conclusion, the author has furnished a Latin 'Synopsis Spongiarum et Lithophytorum,' which is calculated to be of much service to the student.

The work is illustrated by twenty-five copper-plates, containing numerous figures, and twenty-three wood-cuts incorporated with the letter-press.

This volume, like its predecessor, 'The History of the British Zoophytes,' by the same talented author, is admirably calculated for a sea-side companion, and we can promise its readers that they will reap a rich harvest of pleasure and instruction through its means, in the study of the curious organisms of which it treats. The author has rendered a valuable service to science by its production, and we trust that this excellent addition to the natural history of our country will meet with the patronage it so well merits, and that the volume will find a place in the library of every naturalist in the kingdom. V.

Plantæ Novæ vel minus notæ, opusculis diversis olim descriptæ, generibus quibusdam speciebusque novis adjectis iterum recognitæ. Auctore Philippo Parlatore, M.D., Univers. Panormitanæ Professore, &c. 8vo, pp. 88. Paris, 1842. Gide.

By the kindness of its esteemed author we have just received this valuable tract, which contains the descriptive portions of several memoirs scattered in the journals of Italy, and now collected into one book for the purpose of being distributed amongst his botanical friends. Three new genera are described, viz. Maillea, to receive the *Phalaris crypsoides* of D'Urville and Kunth; Avellina, founded upon the *Bromus Michelii* of Savi, which has been considered as a *Festuca* by Kunth and Bertoloni, a *Kœleria* by DeCandolle, an *Avena* by Gussone, *Trisetum* by Trinius and Tenore, and a *Vulpia* by Reichenbach; and Serrafalcus, intended to include the *Bromi secalini* of Bertoloni and Koch, the *B. genuini* and *B. festucacei* of those authors being retained as the genus *Bromus*. As it is a point of considerable interest to English botanists, it may be as well to point out the difference between the proposed new genus and *Bromus*, namely, *Bromus*, lower glume 1-nerved, upper 3—5-nerved; florets lanceolate, compressed; spikelets broader upwards;—*Serrafalcus* (Parl.), lower glume 3—5-nerved, upper 7—9-nerved; florets oblong, turgid; spikelets narrower upwards. As these characters are founded upon differences of considerable value in this natural order, and the group thus formed is a very natural one, it is probable that the genus ought to be adopted, in which case the following British *Bromi* will become species of *Serrafalcus*, viz. *mollis* (including *racemosus*), *commutatus*, *secalinus*, *velutinus* (probably a variety of the preceding), *arvensis* (a very doubtful native), and *squarrosus*. It would take far more space than we can afford to record all the new species here described, and we will only take the liberty in conclusion of expressing a hope, that other botanists who publish their observations in journals which rarely pass the boundaries of the countries in which they are published, will follow the excellent example that has now been set by Prof. Parlatore.

Journals of two Expeditions of Discovery in North-west and Western Australia. By George Grey, Esq., Governor of South Australia. 2 vols. 8vo. London, 1841.

We wish to call the attention of our zoological readers to the Appendix to this highly interesting work, which contains the following articles:—

C. Contributions towards the geographical distribution of the *Mammalia* of Australia, with notes on some recently discovered species; by J. E. Gray, F.R.S., &c.

This contains, 1st, a valuable table of all the species discovered on the Australian continent or its adjacent islands, pointing out their respective localities, and containing 96 species; 2ndly, a description of 12 new species.

D. A List of the *Birds* of the Western Coast; by John Gould, F.L.S.

E. A Catalogue of the *Reptiles* and *Amphibia* hitherto described as inhabiting Australia, with a description of some new species from Western Australia, and some remarks on their geographical distribution; by J. E. Gray, F.R.S., &c.

This contains, 1st, a list of 107 species, with their localities; 2nd, observations on the more obscure and hitherto unknown genera and species, with figures of the following, viz. *Ronia catenulata*, *Aprasia pulchella*, *Delma Fraseri*, *Moloch horridus*, *Elaps Gouldii*, *E. coronatus*, *Calamaria Diadema*, *Liatris Burtonii*, *Soridia lineata*, *Hy-*

draspis australis, Chelodina oblonga, Hyla biocellata, H. Adelaidensis, Breviceps Heliogabali (called *B. Gouldii* in the text), *Helioporus albo-guttatus*.

F. Notes on some *Insects* from King George's Sound, collected and presented to the British Museum by Capt. G. Grey, by A. White, Esq.

This contains, 1st, a notice of previous publications on Australian Insects; 2nd, a list with detailed observations upon the *Coleoptera, Orthoptera, Hymenoptera, Neuroptera, Hemiptera* and *Lepidoptera*, and 11 beautiful woodcuts of new or interesting species.

In addition to this Appendix, the whole of chapter 7 of vol. ii. is occupied with Capt. Grey's own observations on natural history, and is illustrated by several figures.

*Wiegmann's Archiv für Naturgeschichte**. Parts II.—V. for 1841. Berlin, 1841–42.

In our former notice of this excellent journal (vol. viii. p. 47) we promised to bring its contents regularly under review; from our long silence it may have seemed that we had neglected it; this has however been occasioned by the delay and irregularity in the publication of the work, owing to the long illness and lamented decease of its late editor. Within the last few weeks three parts have been issued, two of them for last year, and the first part for the present; probably by this time Part VI., completing the volume for 1841, as well as Parts II. and III. for 1842, will have been published, though they have not yet reached us. We are now able, on the authority of our friend Prof. Erichson, to assure the subscribers to the work in this country, that it will henceforward make its appearance regularly. The contents of the four parts before us are as follows:—

On the genera and species of Comatulæ, by J. Müller, p. 139—148. This paper was read before the Royal Academy of Sciences of Berlin on May 13, 1841. The author refers to a paper previously communicated, in which he had divided the non-petiolated Crinoidea into three families;—*Articulata* with the genera *Comatula*, Lam., and *Comaster*, Agass.; *Costata* with shaly ribbed calyx and pinnulæ opposite, differing from the pinnulæ of all other Crinoidea, gen. *Saccocoma*, Agass.; and *Tessellata*, gen. *Marsupites*; and he then proceeds to the description of his new genus *Actinometra* founded on the *Comatula solaris*, Mus. Vienn., one of the most gigantic forms of recent *Comatulæ*; it has no trace of grooves proceeding to the centre of the disc, the ventral side of which is occupied by a tube. The arms are furnished with grooves, which terminate however equidistant, in a circular groove encircling the margin of the disc. In all the rest it resembles the *Comatulæ*. Its specific name is *imperialis*. Size 2 feet. Of true *Comatulæ* the author admits only 24 recent species, among which are 12 with 10 arms.

Genus *Alecto*, Leach, *Comatula*, Lam.

* Species with 10 arms, or simple division of the rays.

Alecto carinata, Leach (Comatula carinata, *Lam.*, *Griffith*, *An.*

* Conducted by Prof. W. F. Erichson.

Kingd. Zoophytes, pl. 8.).—*Al. europæa*, Leach (Com. mediterannea, *Lam.*, *Heusinger Zeitschrift f. Physik*, iii. tab. 10, 11.).—*Al. Adeonæ*, Müll. (Com. Adonæ, *Lam.*, *Blainv. Actinol.*, tab. xxvi.).—*Al. solaris*, Müll. (Com. solaris, *Lam.*).—*Al. brachiolata*, Müll. (Com. brachiolata, *Lam.*).—*Al. Milleri*, Müll. (Com. fimbriata, *Mill.*) has never again been observed.

The following new species with 10 arms are then described :—*Alecto phalangium*, from Nice ; *Al. Eschrichtii*, from Greenland ; *Al. echinoptera*, locality ? ; *Al. rosea*, locality unknown ; *Al. tessellata*, India ; and *Al. polyarthra*.

** Species with greater division of rays.

Alecto rotalaria (Com. rotalaria, *Lam.*), with 20—22 arms ; *Al. fimbriata* (Com. fimbriata, *Lam.*), with 20 arms ; *Al. multifida* (Com. multiradiata, *Lam.*), with 44 arms ; *Al. Savignii* (*Déscription d'Egypte, Echinodermes*, pl. 1. f. 1.), with 20 arms ; and as new : *Al. palmata* (? Caput medusæ cinereum, *Linck*, tab. 22, No. 33.), about 35 arms, India ; *Al. parvicirra*, 27 arms, locality ? ; *Al. timorensis*, 36—40 arms, from Timor ; *Al. japonica*, 27 arms, Japan ; *Al. flagellata*, 38 arms, locality ? ; *Al. Novæ Guineæ*, 56 arms ; *Al. elongata*, 20 arms, New Guinea ; *Al. Bennetti*, above 70 arms, locality ?.

The madreporal plate is wanting in the *Comatulæ*, and seems to be generally absent in the Crinoidea. Prof. Müller considers the madreporal plate on *Comatula Adeonæ* figured and described by Delle Chiaje to be the *Epizoon* of the *Comatulæ* first noticed by Thompson—a discoid animal with fringed margin. It has anteriorly a snout proceeding from the ventral side, a ramified intestinal canal, and 10 rudiments of feet provided with three long hooks on the ventral side, *Cyclocirra Thompsoni*, Müll. It is frequently met with affixed to the disc and arms of *Alecto europæa*. It differs very considerably from the parasitic worms by its rapid motion without any contraction of the body, and is therefore more related to the Crustacea, among which however there is no form similar to it. In some measure it appears allied to *Arctison*, which have not the least relationship to the Rotatoria.

I have frequently had occasion, says the author, to examine *Comatulæ* in a live state, and have found the fact to be confirmed, that the cirrhi of the central head are without all motion, as was evident from the anatomy. The arms have a lively motion during swimming, five of the ten arms move alternately at the same time, so that one between each two is in a state of rest. The separation of the sexes was also proved by the presence of Spermatozoa in the male and ova in female individuals in the protuberances of the pinnulæ.

On the organs of hearing in Mollusca, by Prof. C. Th. von Siebold, p. 148—168, with a plate. In this interesting paper the author first describes the auditory organs as hitherto observed in the lower tribes, *e. g.* the Cephalopods, and then proceeds to a description of the central system of nerves of the Gasteropods, the knowledge of which is requisite for discovering these organs, they being situated in all Gasteropods on the hinder extremity of the two large front ganglionic protuberances. They must always be sought for near the front pair of ganglions of this portion of the nerves, where they are more easily detected on the under than on the upper surface, especially in those Gasteropods (*Limax*, *Helix*) whose pairs of ganglions of the lower portion of nerves are more confluent (*verschmolzen*). They have been found on all species hitherto examined, as *Helix pomatia, arbustorum, nemoralis, hortensis, rotundata* and *hispida, Succinea amphibia, Lymnæus stagnalis* and *minutus, Physa fontinalis, Planorbis marginatus, vortex, nitidus* and *contortus, Clausilia plicata, nervosa* and *minima, Ancylus fluviatilis, Bulimus lubricus, Limax agrestis* and *maximus,* and *Arion empiricorum.* The organs of hearing are always present in pairs, and are formed of two capsules having transparent walls. These capsules may even be detected with the naked eye in the larger species on pressing the ganglion of the brain between plates of glass. Both capsules are situated on the posterior vaulting of the anterior pair of ganglia of the lower central portion of nerves so closely, that where they join the ganglionic mass it is difficult to detect the limits between the ganglion and the wall of the capsule, especially as they nearly agree in colour. In the cavities of these two capsules are inclosed an immense number of transparent crystalline bodies, consisting of carbonate of lime. The form of these otolithes, for as such they must be considered, is oval and flat, their borders seem to be gently rounded off. They oscillate so lively in the capsules as almost to lead to the belief they were jerked one among the other by a vibrating ciliatile epithelium clothing the inner wall of the capsule, but never could a trace of cilia be detected. In a note the author expresses his belief that the Annelides are also furnished with similar organs of hearing, judging from the description which Stannius has given in his anatomy of *Arenicola piscatorum* of bodies resembling otolithes, which likewise occur in closed capsules.

On the Balanidea, by Prof. W. v. Rapp, p. 168—174. The shells of the non-petiolated Cirrhipoda (*Balanidea*) differ from the shells of Mollusca and of the petiolated Cirrhipoda (*Lepadea*) by their peculiar internal structure. The genera *Balanus, Coronula, Tubicinella* all agree in this respect, viz. in their shells being perforated by regular canals. The structure of these canals, as well as of the animal, is described at length in *Tubicinella balænarum, Coronula diadema, C. balænaris, Balanus spinosus,* and other species of this last genus. Speaking of the young of *Tubicinella balænarum*, the author observes that he found here what Thompson and Burmeister had shown to exist in other Cirripedes, a form totally differing from that of the adult; he could detect no eyes, nor a trace of shell. It is not to be admitted that the *Tubicinella* derives its nutriment from the whale, but most probably from the flocks of *Cyamus,* with which the bodies of the latter are infested. The animal of the non-petiolated Cirrhipoda differs essentially from those of the petiolated by the branchiæ; these organs are narrow pointed laminæ in the *Lepadea,* while in the *Balanidea* a large branchia is situated on each side of the animal, formed of a membrane folded in nearly regular laminæ, as already observed by Cuvier and Hunter.* W. Francis.

* Want of space compels us to leave the remainder over for next month. —Ed.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

Oct. 26, 1841.—William Yarrell, Esq., Vice-President, in the Chair.

The following communication, entitled, "Description of the Stomach of the *Colobus Ursinus*, Ogilby," by R. Owen, Esq., was read.

"The body of the Ursine Colobus, which there can be little doubt is the Full-bottom Monkey of Pennant (*Colobus polycomos*, Illig.), lately exhibited in the Society's menagerie, having been transmitted to me for examination by Mr. Waterhouse, with a view more particularly to the determination of the form of the stomach, I have much pleasure in communicating to the Society the result of this examination.

"It may render the interest in the dissection of this Monkey more intelligible to some, if I premise, that the genus to which it belongs is one of recent discovery or establishment, the affinities of which to the Doucs (*Semnopithecus*), though strongly illustrated by the general form of the *Colobi*, and more especially by their skull and dental organs, required a knowledge of the anatomy of their digestive system for its full appreciation.

"The *Colobi*, peculiar among all known old world *Simiadæ* by the rudimental development of the thumbs of the fore-hands, were generically separated on that account by Illiger. Cuvier, at the period of publishing the last edition of the 'Règne Animal,' had not enjoyed the opportunity of determining how far the distinctive character, seized upon by the Berlin naturalist, was real and constant. Temminck, however, had assured Cuvier that the *Colobus* of Illiger possessed the skull and dentition of the *Semnopitheci*. Mr. Ogilby has mainly contributed to establish the Illigerian genus and illustrate its extent by the description of several species founded upon skins transmitted to the Zoological Society; and our excellent establishment has now fulfilled another of its functions, by affording to the anatomist the means of establishing the natural affinities and position of the genus *Colobus*, as it has heretofore done in regard to the *Semnopithecus*.

"The stomach of the *Colobus Ursinus* presents the same complicated saccular structure as in the *Semnopitheci*: if it was somewhat smaller in the present instance, in proportion to the body, this might arise from the immaturity of the individual examined. The sacculation is produced by the same modification of the muscular fibres of the stomach, combined with a great extent of the digestive tunics. A narrow band of longitudinal fibres traverses the lesser curvature of the stomach, and a second band, commencing at the left or blind extremity of the cavity, puckers it up in a succession of sub-globular sacs along the greater end. I deem it unnecessary to pursue the description more minutely in this case, as it would be merely the repetition of that which has already been published in our Transactions in reference to the *Semnopithecus Entellus* *. The form and size of the cæcum, and the length and disposition of the intestinal canal in the *Colobus* equally corresponded with those parts of the anatomy of the closely allied genus *Semnopithecus*."

* Vol. i. p. 65. pl. 8.

Mr. Waterhouse observed, that the animal dissected by Prof. Owen had been presented to the Society by the Earl of Derby, and had lived for some time in the Menagerie. Soon after its death he had carefully examined it with a view to ascertain whether it possessed cheek-pouches. Of these he found not the slightest trace.

Mr. Lovell Reeve then read his "Description of a new species of *Corbis*, a genus of acephalous mollusks of the family *Nymphacea*."

Corbis Soverbii. *Corb. testâ transversâ, tumidâ, gibbosâ, lacteâ aut rubellâ; radiis roseis obsoletis ab umbonibus ad marginem divergentibus; lamellis transversis elevatis, remotiusculis, utrinque serratis, anticè valdiùs; striis numerosis radiantibus, intra lamellas; margine subcrasso, profundè crenulato; umbonibus longitudinalibus, minutis, oppositè incurvis; lunulâ parvâ, subcordatâ.*

Long. $2\frac{5}{8}$; lat. $3\frac{1}{8}$ poll. Mus. Stainforth, Norris.

Junior, testâ depressiusculâ, radiis roseis longitudinalibus plus minusve distinctis.

Long. $1\frac{2}{8}$; lat. $1\frac{7}{8}$ poll. Mus. Stainforth.

Hab. ad insulam Negros, Philippinarum.

Found in loose coral sand on the reefs at low water.

"I have much pleasure in dedicating this beautiful species of *Corbis*, figures of which will appear in the third part of my 'Conchologia Systematica' (pl. lviii.), to that industrious author and artist Mr. G. B. Sowerby, jun. Only one recent species of this characteristic genus of *Nymphacea* has been hitherto known; it is therefore gratifying to be able to make so valuable an addition. The *Corbis Soverbii* differs materially from the *Corbis fimbriata*: instead of the closely fimbriated character of the outer surface, the valves are crossed transversely with distinct elevated lamellar ridges, between which there are numerous striæ running in a longitudinal direction. It is also characterized by being strongly tinged with pink, particularly in an early stage of growth, when the valves are vividly painted with deep-coloured rays passing from the umbones to the margin: as the shell increases in age it increases in convexity, the lamellæ become thickened, and the rays obsolete. This interesting species more nearly resembles the *Corbis lamellosa* of Lamarck, known only in a fossil state; it differs, however, in having the valves much more gibbous or ventricose, and in the lamellæ being strongly serrated on the anterior side. Some little time since I was fortunate enough to obtain, at a public auction at Rotterdam, four specimens of the *C. Soverbii*, two in the young and two in the adult state. At this sale I obtained the beautiful new species of the glassy Nautilus described in the 'Annals of Nat. Hist.' vol. ix. p. 140.

"Mr. Cuming has kindly furnished me with the above locality, having met with a few specimens of the *Corbis Soverbii* in his researches amongst the Philippines, at the island of Negros."

The next paper read was from Mr. Stutchbury, and is entitled, "Description of a new Sponge from Barbadoes."

"The Museum of the Bristol Institution having lately become possessed of a very interesting sponge through the liberality of Dr. Cutting, of Barbadoes, to whom we are also indebted for the 'recent' *Pentacrinus*, 'recent' *Pholadomya*, and numerous other valuable donations; and as this tribe has met with the able attention of microscopists, whose researches appear to have excited considerable interest;—I have thought a brief account of the specimen would be acceptable to naturalists."

"The peculiarities of this very beautiful sponge consist in the following distinctive characters; the most remarkable of which is, its being formed entirely of silex, the reticulate structure of the mass being composed of transparent vitreous tubuli, without any admixture of keratose or calcareous matter; the silex forming the mass itself, and not, as in other instances, arranged as spicula in the horny membranes; consequently, it is perfectly rigid and sonorous when struck.

"When viewed by a simple lens it exhibits a frothy glass-like appearance: under a magnifying power of seventy-five linear, the net-like meshes are seen to be composed of beautiful glassy tubes, anastomosing one with the other in every direction, the external surface of the cylinders having a rugged aspect; the newer or last formed portions appear to emanate from centres, and at certain distances from spherical masses, from which straight tubes again arise, thus forming the reticulate structure.

"Amidst the interstices of the sponge are found numerous small bodies loose and unattached (also composed of silex*), characterized by Ehrenberg under the generic appellation of *Xanthidium*, of which several species in a fossil state are described as occurring in flints and other siliceous minerals; this minute body may be described as a spherical mass of tubuli, arising from a centre, each tubular spine being terminated by an expanded conical aperture, and a strong resemblance is at once observed between these bodies and the mode of extension in the newer portions of the sponge itself; this fact, together with that of the perfect siliceous character of these minute bodies, induces me to come to the conclusion that they are not distinct, free animals, parasites to the sponge, but the *gemmules* of the sponge, in which they are found †; and I think their increase, so as

* In testing the mineral character of the sponge a small portion was examined under the microscope; then placed in a test tube, and upon the addition of dilute hydrochloric acid no effervescence occurred: it was then dried, and again placed in the field of the microscope, when no change appeared to have taken place; upon submitting it to the action of the blowpipe, the only alteration was its losing its glassy aspect by becoming opake, but it was not altered in form.

[† Mr. Stutchbury seems to be perfectly unaware of the fact that species of *Xanthidium* have been observed in a living state; the genus, we believe, was founded by Ehrenberg previous to his knowledge of the existence of similar forms fossil in the flint. Nor is this the first time that they have been mistaken for eggs,—not of sponges, it is true, but of a polype. See Turpin's paper on *Cristatella mucedo*, Ann. Sci. Nat. vol. vii. p. 141. Ehrenberg pointed out the error committed by Turpin.

The bodies here mentioned may be the gemmules of the sponge, but if so, they are no *Xanthidium*, but merely bear resemblance to this genus of Infusoria.—W. F.]

to become perfect sponges when ejected from the parent mass, can be readily understood by comparing their present form with the recently formed portions of the sponge. Supposing the *gemmule* (?) to have arrived at that state which commences its individual life, its increase would not be by an extension of the tubuli in a straight line; but from the edges of the terminal aperture of each spine other and similar tubuli would or might be sent off, and thus the end of every spine become a fresh centre and anastomosing point, and in this way a very slight addition would give the newly formed mass the reticulate and vesicular character of the parent sponge.

"Being anxious to identify the peculiar and entire siliceous character of this sponge with its generic appellation, I have adopted the name of *Dactylocalyx*; the principal characters of which may be thus expressed:—

"Sponge fixed, rigid, siliceous; incurrent canals, uniform in size; excurrent canals large, forming deep sinuosities on the outer surface, radiating from the root to the outer circumference.

"For the species the name *Dactylocalyx pumiceus* is proposed."

November 9.—William Horton Lloyd, Esq., in the Chair.

Mr. Gould exhibited and pointed out the characters of a new species of Goose nearly allied to *Nettapus Coromandelianus* (*Anas Coromandeliana*, Auct.), from N. Australia, which he characterized as

Nettapus pulchellus. *Nett. collo, dorso, alisque intensè resplendenti-viridibus; lateribus, fasciis latis lineisque alternatìm albis et viridescenti-nigris, conspicuè ornatis; remigibus secondariis cum pogoniis externis albis, undè fascia obliqua alam transcurrens.*

Male: head brownish green, indistinctly barred with light brown; beneath the eye an oval spot of white; neck, back and wings deep glossy green; primaries black; outer webs of the secondaries snow-white; feathers of the chest and back of the neck white, with a number of greenish black circles, one within the other, so numerous that the white is nearly lost; the flanks similarly marked, but in them the bars and circles are broader and more apparent; tail black, glossed with green; abdomen white; under tail-feathers black; irides dark brown; bill dark greenish grey, with a yellowish white nail; under mandible greenish grey, irregularly blotched with a lighter colour; legs and feet blackish brown.

Total length, $12\frac{1}{2}$ inches; bill, $1\frac{1}{8}$; wing, $6\frac{1}{2}$; tail, 3; tarsi, 1.

The female resembles the male, but differs in having the crown, occiput, and a stripe down the back of the neck deep brown; in being destitute of the white spot beneath the eye; in having the chin and upper part of the throat white, mottled with small markings of brown; bill French grey, becoming yellowish at the base; lower mandible bluish grey; tarsi fleshy white on the sides; back and front blackish brown; feet dark brown.

Mr. Waterhouse called the attention of the members to a new species of Rodent from Chile, which had been placed in his hands for description by H. Cuming, Esq. This animal, Mr. Waterhouse stated, evidently belonged to a little family of the *Rodentia* (the *Oc-*

todontidæ), which is peculiar to the southern parts of South America, a family of which six species are characterized, and these constitute the four genera, *Ctenomys*, *Poephagomys*, *Octodon*, and *Abrocoma*.

The present Rodent agrees with the two first of these genera in having the fore-feet strong and furnished with large claws formed for burrowing, and approaches most nearly, as regards its external characters, to the genus *Poephagomys* of F. Cuvier, (which appears to be the *Psammoryctes* of Poeppig,) inasmuch as its ears are of moderate size, whilst those of the species of *Ctenomys* are very small.

The skull presents a very large antorbital opening, enclosed externally by the zygomatic process of the superior maxillary bone, the root of which is thrown out almost horizontally, and is on the same plane as the anterior palatal portion of the cranium: a second, very small opening, for the transmission of the infra-orbital nerve, is pierced through the root of the zygomatic process*; the zygoma is deep and compressed; the portion of the palate situated between the molar teeth is contracted in front, and widest between the posterior molars; and the posterior portion of the palate presents a deep V-formed emargination. The descending ramus of the lower jaw, or that part which lies below and behind the alveolar portion, is thrown out from the outer side of the alveolus of the great inferior incisor, which extends almost to the condyle; its posterior portion is emarginated, and lower and hinder portion is produced in the form of an acute angle, terminating behind the vertical line, dropped from the condyle; the lower boundary of the descending ramus is produced externally and internally in such a manner, as when viewed from beneath, this part presents a horizontal platform of small extent, and which is broadest at about one-sixth of an inch from the angle of the jaw, the platform at this part being produced internally so as to form an obtuse angle. The condyloid portion of the lower jaw has a considerable antero-posterior extent, and the articular surface, which is rather broad, occupies rather more than half of this compressed condyloid process. The coronoid process is in the form of an isosceles triangle, the apex of which is of the same height as the condyle, or very nearly so.

The molar teeth are rootless and four in number on each side of each jaw.

These characters of skull and dentition all indicate the affinities of the animal under consideration with the *Octodontidæ*: the cranium compared with that of the known species of the family presents the modifications observable in the burrowing types, differing from the Octodons and Abrocomas, which live more on the surface of the ground and ascend trees and bushes, in the smaller size of the cranial cavity, and in the greater strength of all the parts, arising from the comparatively large size of the teeth, and more especially of the

* This second small opening is found in the skull of *Octodon*, and appears to be represented in the figure (given by Mr. Bennett) in *Ctenomys*, though not so well expressed by the engraver as by the artist of the drawing from which the engraving was made. In *Abrocoma* there is no corresponding opening.

incisors, which are fitted for cutting roots*. The auditory bullæ are of moderate size, but rather smaller than in *Octodon*; the lower jaw is larger and much stronger than in the two genera mentioned. In these characters the present animal makes so near an approach to *Ctenomys*, that it might with propriety be placed in that genus were it not that in the structure of the teeth there exists a difference fully as great as that which gave rise to the generic distinction of the little groups of which the family *Octodontidæ* is composed. In *Octodon*, *Poephagomys* and *Ctenomys*, the enamel of the molar teeth enters, in the form of a fold on each side, into the body of the tooth, but the folds from opposite sides do not meet. In the Rodent which forms the subject of these observations, the crown of each molar is divided into two parts by the meeting of the folds of enamel of the outer and inner side, and the surface of these teeth may be compared to a series of cylinders (two to each tooth), which are much compressed in the antero-posterior direction. The three foremost molars in each jaw are equal in size, and the posterior molar is smaller than the rest. In position, the last molar of the upper jaw differs from the others, being as it were twisted, so that the two transverse lobes are placed obliquely.

With our present very limited knowledge of the small Rodents of the southern parts of South America, and especially of the western coast, it is impossible to judge of the value of such a modification of the molar teeth as is here pointed out. It is possible that the species of *Octodontidæ* may vary more or less among themselves in the structure of these teeth, in which case the so-called genera, established as the species are discovered, will require a revision, as do very many of the genera of *Rodentia*; in the mean time, however, it is necessary that sectional names should be imposed on such species as will not agree tolerably well with the definitions of the genera published as such. Agreeably to these views, the subgeneric title *Schizodon*† is proposed for the present new Rodent. The principal external characters may be thus expressed:—

Schizodon fuscus. *Schiz. suprà griseo-fuscus, subtùs obscure flavo tinctus: pedibus pilis obscurè fuscis tectis; auribus mediocribus; caudâ, fuscâ quoad longitudinem caput ferè æquante, pilis brevissims tectâ.*

	unc.	lin.
Longitudo ab apice rostri usque ad caudæ basin	9	0
——— *caudæ*	1	8
——— *tarsi digitorumque*	1	$5\frac{3}{4}$
——— *auris*	0	$5\frac{1}{2}$

* The burrowing *Sciuridæ* and *Muridæ*, as compared with the typical examples of their respective groups, present a corresponding modification of the skull; the strength of the cranium is greater, and the cranial cavity smaller. It is difficult to estimate the amount of intelligence in these animals, but, judging from the size of the brain, it would appear that there existed an intimate connexion between the food of the animal and its intelligence; the food in one case leading the animal to habits which cause it to be exposed to numerous dangers which do not occur in the other.

† From σχίζω, *divido*, et ὀδοὺς, *dens*.

In size and colouring the Schizodon greatly resembles the Common Rat (*Mus decumanus*); its fur is rather softer than in that animal. Both on the upper and under parts of the body the hairs are of a deep slate-grey colour next the skin; those on the belly are of a dirty yellow colour. On the back, the hairs are most of them brownish, or yellowish brown near the point, and black at the point. The ears are covered both externally and internally with fine short hairs. The hind-feet have five toes; the fore-feet also have five toes, but the inner one is very small and has a very short nail; the other toes have long, compressed and powerful nails. The hairs of the moustaches are of a dusky colour.

The discovery of the Rodent above described is due to Mr. T. Bridges, whose notes relating to it are as follows:—"This species of Rodent is very common on the eastern side of the Andes, where it completely undermines the face of the country, especially in dry places, making it very disagreeable for the rider, as the horses are continually plunging into the burrows. It must lay up a winter store, or otherwise migrate, or remain buried in the snow at least three months during the winter season. The specimen is a female."

November 23.—John Willimott, Esq., in the Chair.

Mr. Lovell Reeve exhibited a beautiful new species of *Mitra*, a genus of pectinibranchiate mollusks, of the family *Columellata*, which he characterized as follows:—

MITRA STAINFORTHII. *Mitr. testâ cylindraceo-fusiformi, exalbidâ; apice basique cinereo-cœrulescentibus; spirâ acuminatâ; anfractibus transversìm leviter striatis, longitudinaliter costatis; costis latiusculis, subdistantibus, maculis rufis quadratis vividè pictis; aperturâ angustâ; columellâ triplicatâ; umbilico parvulo; labro externo simplici, fauce ad marginem rubidè maculatâ.*

Long. $2\frac{1}{4}$; lat. $\frac{1}{2}$, poll. Mus. Stainforth.

Hab. ad insulam Burias, Philippinarum. Cuming.

Found in coarse coral sand, 7 fathoms.

"It is with peculiar gratification that I am allowed to introduce into the nomenclature of the Mollusca, the name of my esteemed friend, the Rev. Mr. Stainforth; a zealous conchologist, and one who, perhaps, stands unrivalled in his beautiful collection of Mitres. The *Mitra Stainforthii* is somewhat allied to the *Mitra sanguisuga* of Lamarck: the whorls are longitudinally ribbed as in that species; but in this, they are wider and more distant from each other; they are also eminently distinguished by a series of square red spots running from the top to the bottom. The magnificent specimen which has furnished the above description is two inches and a quarter in length; a few small specimens have been recently found by Mr. Cuming at the island of Burias, one of the Philippines."

A collection of bird-skins and mammals from Chile was exhibited. The specimens were collected by Thomas Bridges, Esq., in the Andes of Chile, lat. 34°–35°. With this collection Mr. Bridges sent the following notes, which were communicated to the Meeting by H. Cuming, Esq.:—

Canis Azaræ, Pr. Max. Found in valleys on the eastern side of the

Andes. This species of Fox appears to differ from the large Fox of Chile, known by the name of "Culpeo," in the bluntness of its ears.

Schizodon fuscus, Waterh. Proc. Zool. Soc. for November 9, 1841.

Mus, ———— ? This little animal is found about hedges in the province of Colehagua, and is by no means common. There are in Chile at least ten or twelve species of Rats and Mice.

Sturnella loica, Auct. Common in all parts of Chile. Iris brown.

Agelaius Chopi, Vieill. "Tordo" of the natives. Iris dark brown. Common in flocks in all parts of the country.

Chlorospiza xanthogramma, G. R. Gray. Found in valleys near the summit of the Andes on the east and west sides. Iris brown.

Emberiza luctuosa, Gerv. Found in valleys of the Andes. Sings delightfully in summer. Iris dark brown.

Fringilla Gayi, Eyd. and Gerv. Found near the summit of the Andes in valleys amongst bushes. Iris reddish brown.

Muscisaxicola rufivertex, D'Orb. Found on the east and west sides of the Andes near the snow. Iris dark brown.

Agriornis leucurus, Gould. This bird is found in the valleys near the summit of the Andes on the east and west sides. It is called "Mero" by the natives, but differs from the "Zorral Mero" of the warmer parts of the country. Iris brown.

Pteroptochos Tarnii, G. R. Gray. This singular bird is found in the woody parts of the Andes, and is very difficult to shoot; its cry is compared to the neighing of a young colt. Iris dark brown.

Caprimulgus bifasciatus, Gould. Amongst low bushes on the eastern side of the Andes. It is known to the natives by the names of "Plasta" and "Gallina Ciega," *i. e.* Blind Hen. Iris brown.

Upucerthia dumetoria, Isid. Geoff. and D'Orb. Found amongst low bushes and in sandy places in the elevated valleys of the eastern side of the Andes. Iris brown.

Scytalopus fuscus, Gould. Found in hedges in various parts of Chile, also in the Andes. It is called by the natives "Chircan Negro," as the other species common in Chile is light brown. Iris brown.

Geositta canicularia, G. R. Gray. This little bird is found on the plains near the Andes, and is called by the natives "El Caminante," or Traveller, from its running before the traveller on the dry sandy roads of the country. Iris brown.

Alcedo torquata, Auct. Found near the rivers of Chile. Iris brown. Called by the natives "Martin Pescador."

Picus Magellanicus, Vig. Iris brown. This beautiful species of Woodpecker is found in the forests of "Roble" in the Andes, and may always be discovered by its singular scream or call. It is known to the natives by the names of "Concona" and "Carpintero de la Cordilliera."

Colaptes Chilensis, Vig. Known to the natives by the name of "Pitigue," so called from its call or note. This bird is common in the woods of Acacia Cavenia near the Andes, and is also found in the valleys of the Andes in woody places. Molina says that this bird builds its nest in holes on the ground, which is an error, as I have found the nest in holes of trees like the rest of the genus. The eggs are white. Iris pale green or gray.

Vanellus Cayenensis, Steph. This is the "Queltregue" of the natives, and is one of the most common birds found on the plains near the Andes, also in other parts of the country. Food, worms, locusts, &c. The eggs are excellent eating, and resemble in colour and size those of the Lapwing of England. Iris purple.

Tinochorus D'Orbignyanus, Isid. Geof. St. Hilaire. This is the small Partridge of the Andes, and is called by the natives "Perdix Cordellierana." It comes down to the plains in severe winters. Generally found in pairs in the valleys near the summit of the Andes. The male shows the strongest attachment to his mate, and calls her by a melancholy tone or cry when separated. They are so tame that the natives kill them with stones, and so stupid that a stone may be thrown at them several times before they will rise. Iris brown.

Columba Boliviana, Auct. This little dove is found in small flocks in the valleys of the Andes, and, in the winter, visits the coast. It is known to the natives by the name of "Tortola Cordellierana." This is the smallest of the three species found in Chile. It makes a whistling noise with its wings when it rises from the ground. Iris brown.

Dafila urophasianus, Eyton. Iris brown. Found in valleys on the eastern side of the Andes.

Anas ——— ? Iris brown. Found inhabiting the rapid rivers of the Andes. This bird swims and dives against the rapidity of the mountain torrents in a manner truly astonishing. It seldom or never leaves the rivers of the Andes, and, like the Grebes, seldom makes use of its wings, although when disturbed it flies a short distance. Generally seen in pairs.

Mr. Gould made some observations on this collection, and particularly drew attention to the last species in the list, which Mr. Bridges places in the genus *Anas* with a note of doubt. Mr. Gould observed that this bird was unknown to ornithologists, and presented a most singular combination of characters. In many of its characters it approaches the Ducks (*Anatidæ*), but in others it evinced an affinity to the Mergansers (*Mergus*), especially in its long and stiff tail-feathers, and narrow and pointed beak. It differs, however, from either of the groups mentioned in having, in both sexes, a strong spur on the wing. Mr. Gould proposed for this new bird the name *Merganetta armata*.

Genus Merganetta.

Rostrum haud minùs longum quàm caput, rectum; ferè cylindraceum, ungue apicali distincto, incurvato, at minùs abruptè quàm in genere *Mergus* dicto. Mandibula superior lamelloso-dentata, vel tornio crasso carneo, intùs profundè serrato, instructa; naribus linearibus ferè centralibus.

Alæ mediocres primariis secundo et tertio longissimis; humeris calcare valido et acuto armatis.

Cauda, ut in *mergo*, rigida.

Tarsi aliquantò elongati, squamis hexagonis ad latera obtecti, et anticè scutellis. Digiti palmati, medio quàm tarsus paululùm longiore; halluce libero, altè posito, et paululùm lobato.

MERGANETTA ARMATA. *Mas: vertice nigrescenti-fusco, strigâ angustâ, albâ cincto; hac, lineâ faciali ejusdem colore, conjunctâ; infra hanc lineam strigâ nigrâ angustâ, ab occipite super oculum ductâ vittam nigram facialem efficiente, deindè per mediam gulam excurrente, et super pectus totum diffusâ; capitis lateribus, sic et collo albis, hoc apud nucham strigis nigris longitudinalibus tripliciter ornato, quarum centrali latâ, reliquis angustis.*

Fœm.: vertice et dorso saturatè cœrulescenti-cinereis, sic et colli lateribus, his albescente minutè fasciatis; genis infra oculos, gulâ, gutture, et corpore subtùs e rufo castaneis.

Male. Crown of the head blackish brown, surrounded by a narrow stripe of white which unites with another line of white running at right angles down the sides of the face; beneath this a narrow line of black which terminates in a point at the occiput, and running over the eye joins a broader band of the same colour down the sides of the face, is continued down the centre of the throat and spreads over the chest; sides of the head and neck white, interrupted at the back of the neck by three longitudinal stripes of black, the centre one being broad and the lateral ones narrow; feathers of the back and scapularies much lengthened, and conspicuously margined with white, the centres being in some blackish brown, in others greyish brown; wings deep grey, with a beautiful green speculum, bounded above and below with a narrow irregular band of white, produced by the tips of the greater wing-coverts and secondaries being tipped with that colour; primaries brown; rump and upper tail-coverts greyish brown, finely freckled with zigzag lines of white; centre of the abdomen dull light chestnut brown, with a blackish brown mark down the centre of each feather; flanks and under tail-coverts blackish brown; tail brown; irides brown; bill reddish brown; feet brown.

Female. Crown of the head, back and sides of the neck dark slate grey, the sides of the neck regularly barred with minute lines of greyish white; the elongated feathers of the back and scapularies margined with deep grey instead of white as in the male; lower part of the back deep slate grey; upper tail-coverts the same, crossed by numerous minute bars of white; wings grey, the coverts tipped with white; sides of the face below the eye, throat, and all the under surface rich reddish chestnut; tail brown.

Total length $18\frac{1}{2}$ inches; bill $1\frac{5}{8}$; wing 7; spur $\frac{5}{8}$; tail 5; tarsus $1\frac{3}{4}$; middle toe $2\frac{1}{8}$.

The female is rather less in all her admeasurements.

The male from which the description is taken had some of the tail-feathers white, but this would seem to have been produced by wearing and exposure, as they were all old feathers.

Mr. Waterhouse observed, that the Fox contained in Mr. Bridges's Collection he felt little doubt is the *Canis Azaræ*, Pr. Max., but it differed from the specimen figured in the 'Zoology of the Voyage of the Beagle,' in not having the black on the chin and angles of the mouth.

BOTANICAL SOCIETY OF EDINBURGH.

This Society held its eighth meeting for the season at the Botanic Gardens, Dr. Neill in the Chair.

Professor Graham communicated the agreeable intelligence, that the late Dr. Archibald Menzies had bequeathed to the Botanic Garden his interesting and valuable Herbarium, which was chiefly formed in the course of his voyages round the world with Vancouver and other circumnavigators. Dr. Menzies was the last survivor of Vancouver's companions, having lived to the age of eighty-eight. He was a native of Perthshire, and studied at this university, towards which he continued throughout life to entertain the warmest feelings of attachment.

The Chairman adverted, with deep regret, to the loss which the Society, in common with the botanical world, had sustained by the death of Mr. Falconer of Carlowrie, who was a most zealous and successful cultivator of the science, and who enjoyed, in a high degree, the esteem and respect of his friends.

The following papers were read:—

1. Notice of the Discovery of *Phascum alternifolium* (Brinck, &c.) in Dumfries-shire, and of *Arenaria verna* on the west coast of Scotland. Communicated by Mr. J. Cruickshank.—This *Phascum* is not the plant of Hooker, which is the *Archidium phascoides* of continental botanists. The present plant was formerly discovered in Britain, but long ago, and in very small quantity. It is, in the opinion of Mr. Wilson, a good species. *Arenaria verna* was found at Drumlanrig by Mr. Cruickshank. It is very rare, if existing at all, on the west coast of Scotland.

2. Notice on the occurrence of *Avena alpina* and *Saxifraga umbrosa* in Yorkshire, by Mr. J. Tatham, jun.—Mr. Tatham says, "*Avena alpina* grows here (Settle) at an elevation of between 600 and 800 feet above the sea. When growing in our elevated open pastures the plants are generally single, also on our limestone cliffs; but when in our natural woods, which are mostly hazel, it is found in large tufts, where you may get perhaps fifty specimens in the space of a few inches. I believe I could send from the same tuft specimens of *alpina* with the panicle quite as simple as any *pratensis*. I consider *Saxifraga umbrosa* as really wild here. It is met with in Hesletim Gill, which is a deep ravine at the foot of Pen-y-ghant, and Fountains Fell. There are only two houses in about three miles, and these not near the place. *Actæa spicata, Ribes petræum*, &c., grow along with it. The valley runs from west to east, and the *Saxifraga* is found only on the south side, which receives no sunshine except in summer. Some of the plants are inaccessible, the cliffs are so steep."

The impression of the meeting was that no specific distinction existed between the plant now shown as *Avena alpina* and *A. pratensis*, and the same remark may be applied to all other specimens of the former hitherto exhibited from British stations.

3. On three new Species of British Grasses of the genus *Poa*, by Richard Parnell, M.D., F.R.S.E.—The author stated that these

grasses were so unlike in general appearance to any of the other *Poæ*, and possessed such strong marks of specific distinction, that he considered them entitled to rank as distinct species. 1. *Poa sectipalea* (Parnell). This plant differs from *Poa pratensis*, the only species it can well be confounded with, in the branches of the panicle being stouter, more erect and rigid; the spikelets larger. Outer palea seven- or nine-ribbed, seven of the ribs being very distinctly marked; inner palea one-third shorter than the outer, and invariably divided to the very base, whereas in *Poa pratensis* the inner palea has never more nor less than five ribs, and the inner very little shorter than the outer, and always entire. Found growing in sandy situations between Crammond and Queensferry.—2. *Poa polynoda* (Parnell). This species differs from *Poa compressa* in the florets not being ribbed at the base; outer palea five-ribbed. Joints from eight to nine in number, the uppermost joint situated but a short distance from the panicle; whereas in *Poa compressa* the florets are very distinctly ribbed, suspending the calyx by their silky fibres. Outer palea three-ribbed. Joints seldom exceeding four in number.—3. *Poa nemoralis montana*, Koch. Inflorescence simple, panicled, occasionally racemed. Panicle erect, narrow and slender; the branches erect, long and slender, bearing few spikelets. Spikelets lanceolate-ovate, of two or three awnless florets. Calyx of two unequal, acute glumes, three-ribbed. Florets not in the slightest degree webbed. Outer palea five-ribbed, the dorsal and marginal ribs slightly hairy. The whole plant is of a glaucous hue. This grass was first obtained by Dr. Greville, who, in the year 1833, gathered several specimens on Ben Lawers; since then it has been found in many parts of the Highlands, but has hitherto been considered as a glaucous variety of *P. nemoralis*.

These grasses are figured in Dr. Parnell's work on the Scottish Grasses, now in the press, in which he has given 130 figures, with minute descriptions.

ROYAL IRISH ACADEMY.

Jan. 25, 1841.—His Grace the Archbishop of Dublin communicated some observations "On the Leafing of Plants."

It is well known that there is a diversity in the times of leafing and shedding in individual trees of the same species; *e. g.* hawthorn, sycamore, horse-chestnut, beech, &c., sometimes as much as a fortnight; and the earliest in leaf are also the earliest shed, the same individuals keeping their time every year. Hence the question, whether this diversity arises from the "separable accidents" of soil, situation, &c., or whether from "inseparable accidents," which constitute what physiologists call *varieties*?

An experiment was tried by grafting an early hawthorn on a late, and *vice versâ*. The scions kept their times (about a fortnight's difference) as if on their own stocks, thus proving that it was a case of "*seedling variety*."

Many other such varieties are known, not only of apples, peaches, &c., but of wild trees also, differing in shape of leaf, form of growth, colour and size of fruit, &c., and also *time of ripening*. It was therefore to be expected that there should be the like in respect of times of leafing.

This may throw some light on the question respecting "*acclimating*." It may be, that species may be brought to bear climates originally ill-suited,—not by any especial virtue in the seeds *ripened in any particular climate*, but—by multiplying seedlings, a few of which, out of multitudes, may have qualities suited to this or that country, *e.g.* some to cold, some to drought, some to wet, &c.

In some cases, a plant's beginning to vegetate later may secure it from spring frosts, which would destroy a precocious variety; in others, earlier flowering may enable a tree to ripen fruit in a climate in which a later would be useless, &c.

Further, the experiment shows that the common opinion respecting the commencement of spring vegetation,—the rise of the sap from the roots, through the trunk and branches to the twigs,—is groundless; since a scion of an early variety, on a late stock, will be in leaf while the stock is torpid.

BOTANICAL SOCIETY OF LONDON.

April 18, 1842.—Dr. Willshire in the Chair.

Mr. Edward Doubleday exhibited a *Primula* found at Bardfield, Essex, and stated that a few years ago his brother, Mr. Henry Doubleday, observed that the Oxlips growing near Bardfield were strikingly different from those found in the vicinity of Epping, where the Oxlip is not common; and that further observation had induced him to believe that the Bardfield plant was a distinct species, an opinion in which he (Mr. E. D.) was disposed to concur. Mr. Doubleday next referred to an article in the 'Gardener's Chronicle,' and pointed out the resemblance of the Bardfield plant to the one there alluded to. He expressed his opinion very decidedly that there were in England three distinct species of *Primula*, known by the names of Primrose, Cowslip or Pagel, and Oxlip, but that the Oxlip, commonly so called, is nothing more than a hybrid between the Primrose and Cowslip. This hybrid is extensively distributed over the country, especially in localities where the Primrose and Cowslip abound: it constantly exhibits a tendency to revert to the Primrose by throwing up single flowers of precisely the Primrose character, as well as others possessing characters of its other parent, the Oxlip.

As a natural consequence, such a hybrid would reproduce at times both the parent species, a fact Mr. Doubleday believes to be fully proved.

The Bardfield plant, which Mr. Doubleday considers the true Oxlip, differs from the hybrid in the form of the calyx, in its drooping umbel, and in its leaves dying off in autumn: he has examined thousands of plants at and near Bardfield, and never observed a single instance of a solitary flower being thrown up as in the hybrid. The Primrose does not occur for some miles round Bardfield, though the Cowslip is abundant; therefore hybridization cannot well take place in that locality. The plant under cultivation does not change its character. Should it prove a distinct species, Mr. Doubleday claimed for his brother the credit of first detecting the distinction.

May 6.—John Edward Gray, Esq., F.R.S., &c., President, in the Chair.

The following specimens were exhibited and presented to the Society :—*Leskea pulvinata* (Wahl.), on willows by the Ouse near York, and *Dicranum spurium* (Hedwig), Stockton Forest, collected by Mr. R. Spence. *Desmidium mucosum* and *D. Swartzii*, collected near Penzance in December last by Mr. J. Ralfs. Mr. W. Gourlie, jun. presented the following :—*Jungermannia stellulifera* (Taylor), collected at Critch, Derbyshire, by Mr. W. Wilson. *Gymnostomum Hornschuchianum* (Arnott), collected at Cromaglown in July 1840, and first discovered by Dr. Taylor. *Jungermannia voluta* (Taylor), found at Gortagonee in March 1841 by Dr. Taylor. Specimens of *Jungermannia Lyoni* (Taylor), collected at Dunoon, Argyleshire, by Mr. J. G. Lyon. Mr. T. Sansom exhibited specimens of the following mosses, collected by the Rev. C. A. Johns, F.L.S. :—*Bryum Tozeri* (Grev.), Swanscomb, Kent. *Hypnum catenulatum* (Schwæg.), from Belsham, Kent. *Tetraphis pellucida* (Hedw.), Abbey-wood, Erith, Kent.

A paper was read from Dr. Spencer Thomson " On the Anatomy and Physiology of the seed of *Phaseolus vulgaris*." The paper was accompanied by drawings.

May 20.—J. E. Gray, Esq., F.R.S., &c., President, in the Chair.

The following donations were announced. A specimen of Sugarcane from Madeira, by Mr. James Halley. *Bupleurum tenuissimum*, found at Highgate, by Mr. W. Mitten. A paper was read from Edwin Lees, Esq., F.L.S., &c., " On the Flora of the Malvern Hills, Part 3, being a Sketch of the Cryptogamic Vegetation indigenous to the Chain."

Notwithstanding the limited extent of this narrow chain of hills, scarcely exceeding nine miles in length, and only rising to 1500 feet in altitude, yet they offer almost every variety of aspect and condition favourable to the development of cryptogamic vegetation. In fact, the Malvern Hills, when considered only as a ridge without reference to the country around them, are far more remarkable for their acotyledonous than their vascular productions.

Commencing with the northern termination of the hills in Cowleigh Park, several miniature syenitic spurs here appear abrupt and rocky, yet prettily shaded with wood amidst deep glens and shaggy defiles, overtopped by lateral steeps of limestone, amidst whose gullies, streamlets are there gushing with musical intonation. From the " Happy Valley " a verdant park-like glacis leads the wanderer up among the exposed treeless turf, and rugged, jutting-out and lichened rocks of the End and North Hills, those of the latter being more precipitous and remarkable than those of any other hill of the chain, and boasting a great number of lapideous lichens. Between this hill and the Worcestershire Beacon a deep and winding valley extends, watered by bubbling streamlets, and abutted by moist dripping rocks on the southern side, where several species of *Jungermanniæ* shelter; but it must be observed that, excepting in this place and in the " Gullet," as it is termed, of the Holly Bush Hill, almost all the other Malvern rocks are without exception dry and bleached by the wind and sun. At the western base of the Worcestershire Beacon, one of the few bogs that yet remain about the hills, occurs *Aspidium Oreopteris*, marking this and the other boggy places by the profusion in which it covers the margin of the black soil. A mile further south at the "Wych," the syenite and limestone are in contact, and the latter having been extensively quarried, numerous abandoned excavations occur, in many instances embowered with wood, and offering favourite habitats for many mosses unable to fructify on the sunburnt sides of the hills. These limestone rocks also offer an instructive example of the lichens more particularly affecting limestone when compared with the loftier and more exposed syenite. Mr. Lees considered that nearly one-half of the plants occupying the Malvern Hills are Cryptogamic, and the following synopsis will show this to be not an unreasonable supposition, especially as the census the author had taken is not to be considered a perfect one, embracing however all the species Mr. Lees had been enabled to identify after an attentive examination of five years and upwards.

Enumeration.	Species.
Ferns and Equisetaceæ	25
Mosses	121
Jungermanniæ	23
Other Hepaticæ, Characeæ, &c.	15
Lichens	223
Fungi	305
Total	712

The paper was accompanied by specimens, many of which were exhibited.

June 3.—J. E. Gray, Esq., F.R.S., &c., President, in the Chair.

Mr. J. A. Brewer exhibited living specimens of *Ophrys muscifera*, *Aceras anthropophora*, *Orchis ustulata*, *Paris quadrifolia*, and other interesting plants from Reigate, Surrey.

Mr. M. J. F. Sidney presented a specimen of *Lycopodium lepidophyllum* from South America.

The continuation of Mr. Edwin Lees's paper "On the Flora of the Malvern Hills, Part 3, being a Sketch of the Cryptogamic Vegetation indigenous to the Chain," was read.

Hepaticæ.—Among the *Hepaticæ* occur *Anthoceros punctatus* and *Targionia hypophylla*, the latter at the foot of moist rocks on the Worcestershire Beacon; while there are three species of *Marchantia*, *polymorpha*, *conica*, and *hemispherica*.

Jungermanniæ :—*asplenoides*, *ventricosa*, *bicuspidata*, *connivens*, *pusilla*, *resupinata*, *albicans*, *obtusifolia ?*, *complanata*, *scalaris*, *viticulosa*, *Trichomanis*, *bidentata*, *platyphylla*, *ciliaris*, *tomentella*, *Mackaii*, *serpyllifolia*, *dilatata*, *Tamarisci*, *pinguis*, *epiphylla*, *furcata*.

Lichens.—Mr. Lees had observed 223 species; most of the specimens accompanied the paper, and were exhibited.

Fungi.—The moist grassy declivities of the hills are in autumn peculiarly adapted to the growth of the Agaric tribe; and here followed a list of those observed.

On the whole, the flora of Malvern may be considered as most remarkable and abundant rather in its *Cryptogamous* than *Phanerogamous* productions. After an attentive examination of the hills and the district around them for some years, Mr. Lees had been enabled to determine

Dicotyledonous plants	553
Monocotyledonous plants	173
	726

The Cryptogamous census altogether amounts to 712, and with a little more industry and research among *mycological* productions Mr. Lees thought it might be considerably increased, while few he thought could be added to the Phanerogamous list.

Altogether, the entire number of plants Mr. Lees had determined and appropriated as belonging to the flora of the Malvern Hills amount to 1438.

The President announced that Mr. Arthur Henfrey had been appointed Curator, and that the Herbarium might be inspected every Monday, Wednesday and Friday from 10 to 4, and on Friday evenings from 7 to 10.

MISCELLANEOUS.

A new species of Tapering-tailed Phascogale *in the Collection of the British Museum.* By J. E. Gray, F.R.S., &c.

This species agrees in size and appearance with *Phascogale minima*, but differs from it in having long white tips to the dark brown and black hairs, in the tail being short, conical, tapering, and covered with elongated yellowish-tipt hairs, and especially in its having a terminal pencil of black-tipt hairs, for which reasons I am induced to call it *Phascogale apicalis*.

Unlike *Phascogale minima*,—*P. affinis* of Van Diemen's Land, *P. leucogaster* of Western Australia, and *P. rufogaster* of South Australia,—the present species has only two compressed false grinders in the upper jaw, but this may depend on the youth of the specimen, which is a female with a large well-developed abdominal pouch. The specimen here described was procured from Mr. Brandt of Hamburgh, who purchased it during his late visit to London. Its precise habitat is not known, but it is doubtless from Australasia.

STERNA ARCTICA.

I perceive that in the last number of the 'Annals and Mag. of Nat. Hist.' Mr. Thomas Austin is disposed to question the identity of the flocks of Terns seen on the 7th of May with the *Sterna arctica*. Whether the "two or three hundred" that were killed in the harbour of Bristol on that day were the *S. arctica* or the *S. hirundo*, I have no means of deciding, and it is very possible that Mr. Austin may be more correct in his specific determinations than the editor of the Bristol Mirror; but with regard to the numerous specimens obtained in Worcestershire, I can only say that I believe them *all* to have been *S. arctica*. I have myself examined a considerable number of individuals of the latter species procured at the above date, and have neither seen nor heard of a single example of *S. hirundo*. Mr. J. Walcot of Worcester, who is an excellent ornithologist, has also seen many of these birds, and assures me that they are all *S. arctica*.

With respect to the supposed northerly migration of *Sterna arctica* in spring, it is possible that I may be in error, and that the appearance of these birds on the 7th of May was due to the north winds which preceded the westerly gales on that day. But one thing seems clear, that these terns were not blown *overland* from the north, but migrated up the Severn from the Bristol Channel into the interior of England. H. E. Strickland.

GALIUM CRUCIATUM, AN IRISH PLANT.

Of this *Galium*, which is not included in the 'Flora Hibernica,' I lately received fine examples in flower from Dr. Hodges of Downpatrick. In a note accompanying the specimens, and dated June 24, 1842, Dr. Hodges remarks upon the species—"The *Galium cruciatum*, Linn. (Eng. Bot. t. 143.) is found in only two situations in this neighbourhood; at the bottom of a field adjoining the marshes near the cathedral, and on the sides of the old *Rath* where I discovered it about five years ago."

Belfast, July 4, 1842. Wm. Thompson.

METEOROLOGICAL OBSERVATIONS FOR JUNE 1842.

Chiswick.—June 1—3. Very fine. 4—7. Hot and dry. 8—11. Fine: hot and dry: clear at night. 12, 13. Clear and hot, thermometer as high as 90° in shade. 14. Hot and dry. 15. Fine, with clouds. 16. Overcast. 17. Overcast and fine. 18. Heavy showers. 19. Very heavy rain. 20. Cloudy and fine. 21. Slight rain. 22, 23. Very fine. 24. Slight rain. 25. Overcast: cloudy and windy: boisterous, with rain at night. 26. Fine: cloudy: clear, with dry air at night. 27, 28. Clear and fine. 29. Hot and dry. 30. Slight rain: overcast: very heavy rain at night. The mean temperature of the month was 2°·65 above the average.

Boston.—June 1. Cloudy. 2, 3. Fine. 4. Fine: thermometer 76° two o'clock P.M. 5. Fine: rain with thunder and lightning P.M. 6—8. Fine. 9. Cloudy. 10—12. Fine. 13. Cloudy. 14. Fine: thermometer 77° eleven o'clock A.M. 15. Fine. 16, 17. Cloudy. 18. Rain. 19. Cloudy: rain P.M. 20. Fine: rain P.M. 21. Cloudy: rain with thunder and lightning P.M. 22, 23. Fine: rain P.M. 24. Fine. 25. Windy: rain P.M. 26, 27. Windy. 28. Cloudy. 29. Fine. 30. Cloudy. N.B. The warmest June since June 1826.

Sandwick Manse, Orkney.—June 1. Clear: shower. 2. Cloudy: clear. 3. Cloudy. 4. Cloudy: rain. 5. Clear. 6—8. Clear: fog. 9. Clear: fine. 10. Cloudy: fine. 11, 12. Clear: fine. 13. Clear: damp. 14. Damp. 15. Clear: rain. 16. Clear: shower. 17. Sleet: showers. 18. Clear. 19. Clear: fine. 20. Cloudy. 21. Cloudy: damp. 22. Rain: clear. 23. Cloudy: thunder. 24. Clear: cloudy. 25. Clear: shower. 26. Damp: clear. 27. Showers: sleet. 28. Cloudy: rain. 29. Cloudy: showers. 30. Showers: cloudy.

Applegarth Manse, Dumfries-shire.—June 1. Showery. 2, 3. Fair and fine. 4. Fine: shower P.M. 5. Warm and showery. 6—8. Fair and fine. 9—11. Fair and fine: droughty. 12. Fair and fine. 13. Fair and fine: thunder. 14. Fair, but threatening change. 15. Fair till P.M.: a few drops. 16. Fair, but cloudy. 17. Some drops of rain. 18. Fair and fine. 19. Shower early A.M. 20. Showers and thunder. 21. Showers: warm. 22. Shower early A.M. 23. Heavy rain P.M. 24. Frequent showers. 25. Heavy rain. 26. Showers. 27. Showers: mackerel sky. 28. Rain all day. 29. Showers A.M.: cleared up. 30. Fine, but cloudy.

Meteorological Observations made at the Apartments of the Royal Society, London, *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; *by the* Rev. W. Dunbar, *at Applegarth Manse,* Dumfries-shire; *and by the* Rev. C. Clouston, *at Sandwick Manse,* Orkney.

Days of Month.	Barometer.								Thermometer.										
1842. June.	London: Roy. Soc. 9 a.m.	Chiswick. Max.	Chiswick. Min.	Boston. 8½ a.m.	Dumfries-shire. 9 a.m.	Dumfries-shire. 9 p.m.	Orkney, Sandwick. 9½ a.m.	Orkney, Sandwick. 8½ p.m.	London: R.S. Fahr. 9 a.m.	London: R.S. Self-reg. Mx.	London: R.S. Self-reg. Mm.	Chiswick. Max.	Chiswick. Min.	Boston. 8½ a.m.	Dumf.-shire. Max.	Dumf.-shire. Min.	Orkney, Sandwick. 9½ a.m.	Orkney, Sandwick. 8½ p.m.
☾ 1.	30·281	30·211	30·125	29·47	29·98	29·85	29·94	29·89	64·5	81·5	53·2	76	56	68	58	48	52	49
2.	30·250	30·265	30·169	29·47	30·08	30·18	30·07	30·25	64·5	72·3	60·0	73	41	63	63½	47	53	49
3.	30·368	30·296	30·160	29·74	30·18	30·10	30·14	30·07	63·3	76·5	53·0	76	42	63·5	66	38	60	59
4.	30·168	30·112	29·965	29·51	30·00	29·90	30·01	30·00	66·3	77·5	54·0	82	48	68	69	41½	55	50
5.	30·018	29·953	29·809	29·36	29·88	29·85	29·99	30·03	66·4	76·0	59·4	80	48	68	66	48½	58	52
6.	30·002	30·038	29·915	29·40	29·93	30·03	30·06	30·17	68·5	77·0	57·4	82	41	66	70	45	53½	51½
7.	30·264	30·217	30·163	29·63	30·11	30·20	30·26	30·40	66·7	76·0	56·4	78	51	68	74½	50	62	52
● 8.	30·324	30·244	30·204	29·75	30·27	30·30	30·45	30·45	66·8	72·7	55·3	81	47	66	75½	54	54	52
9.	30·314	30·218	30·103	29·75	30·27	30·24	30·45	30·43	63·4	78·3	54·0	76	49	56·5	75	51	55	56
10.	30·182	30·100	30·064	29·65	30·20	30·17	30·39	30·37	66·3	74·2	52·7	81	51	66	72	48	58	55
11.	30·254	30·180	30·133	29·74	30·20	30·22	30·35	30·40	65·2	77·4	53·8	89	54	62	75	48	58	54
12.	30·362	30·263	30·214	29·77	30·28	30·29	30·46	30·42	68·3	82·2	56·6	90	51	68·5	78½	52½	56½	59
13.	30·358	30·293	30·153	29·77	30·23	30·10	30·29	30·18	64·8	82·4	58·2	90	55	59	78½	49	62	53
14.	30·168	30·094	30·012	29·50	30·05	30·00	30·10	30·07	72·3	79·7	62·6	88	53	73	75	50½	54	50
☽ 15.	30·110	30·048	29·989	29·47	30·02	29·91	30·06	29·95	66·3	82·4	59·0	80	48	59	70	52½	51	50½
16.	30·062	29·995	29·989	29·44	29·90	29·97	30·03	30·14	66·3	79·2	57·2	76	48	63	68	52½	48	45
17.	30·132	30·084	30·058	29·58	30·08	30·08	30·15	30·16	61·0	72·7	56·7	73	51	57	62	48½	46½	45
18.	30·086	30·041	29·888	29·59	29·96	29·79	29·93	29·92	59·5	68·8	51·4	71	49	53	64	46	50	42
19.	29·806	29·769	29·688	29·25	29·68	29·65	29·85	29·85	60·3	66·8	54·6	71	49	62	62	45	50	43
20.	29·788	29·731	29·665	29·23	29·62	29·55	29·76	29·73	66·2	69·7	56·2	72	52	65·5	66	50	53½	53
21.	29·696	29·670	29·640	29·14	29·48	29·44	29·67	29·60	65·8	76·3	59·3	73	51	60·5	67	51½	54½	54
○ 22.	29·824	29·767	29·725	29·19	29·57	29·60	29·60	29·69	65·7	83·6	56·8	75	48	65	63½	49½	53	53
23.	29·896	29·823	29·767	29·25	29·63	29·38	29·67	29·50	62·5	78·7	53·0	73	57	63	64	42	52½	52½
24.	29·732	29·679	29·420	29·05	29·37	29·34	29·30	29·22	62·3	71·6	61·0	72	54	67·5	62	53	59	55½
25.	29·861	29·806	29·585	29·20	29·40	29·15	29·28	29·12	64·7	71·3	57·3	66	54	62	59	52½	59	53
26.	29·748	29·915	29·674	29·05	29·35	29·68	29·23	29·56	62·0	74·0	57·0	70	49	63	60½	49	53½	53½
27.	30·228	30·213	30·143	29·54	29·98	30·10	29·82	30·03	63·3	78·3	53·3	73	44	60	63	51½	51	53
28.	30·344	30·274	30·128	29·68	30·00	29·82	30·03	29·72	65·3	83·6	53·0	80	51	61·5	59	47½	58½	52½
29.	30·154	30·078	29·989	29·45	29·80	29·87	29·68	29·76	66·5	79·8	57·8	82	52	66·5	61	53	55	53
☾ 30.	30·006	29·933	29·791	29·40	29·88	29·80	29·85	29·90	61·2	77·3	57·0	71	50	66	63½	47½	54	55
Mean.	30·093	30·043	29·945	29·46	29·910	29·886	29·962	29·966	65·1	76·6	58·3	73·33	49·80	63·7	67·0	48·9	54·76	51·85

Days of Month.	Wind.					Rain.					Dew-point.
1842. June.	London: R.S. 9 a.m.	Chiswick. 1 p.m.	Boston.	Dumfries-shire.	Orkney, Sandwick.	London: R.S. 9 a.m.	Chiswick.	Boston.	Dumfries-shire.	Orkney, Sandwick.	Lond. R.S. 9 a.m.
☾ 1.	s.	sw.	w.	s &sw.	sw.	·019	......	......	......	......	54
2.	nw.	nw.	w.	wnw.	w.	......	......	......	......	·12	60
3.	e.	nw.	calm	sw.	s.	......	......	......	......	......	55
4.	nw.	w.	calm	sw.	n.	......	......	......	......	......	54
5.	s.	e.	calm	sw.	se.	......	......	......	......	·70	58
6.	n.	e.	calm	ne&e.	se.	......	......	·13	......	......	61
7.	e.	ne.	calm	sse.	calm	......	......	......	0·25	......	55
● 8.	nw.	ne.	ne.	ese.	e.	......	......	......	......	......	63
9.	n.	ne.	e.	se&ne	s.	......	......	......	......	......	60
10.	ne.	ne.	e.	ne.	e.	......	......	......	......	......	61
11.	n.	ne.	e.	ne.	calm	......	......	......	......	......	62
12.	n.	se.	e.	ne.	ne.	......	......	......	......	......	66
13.	n.	ne.	calm	se.	w.	......	......	......	......	......	61
14.	e.	sw.	calm	wnw.	w.	......	......	......	......	......	63
☽ 15.	nw.	ne.	calm	nw.	nw.	·033	......	......	0·00	......	63
16.	nw.	nw.	w.	nw.	nw.	......	......	......	......	·11	58
17.	s.	e.	calm	e.	n.	......	......	......	......	·07	58
18.	e.	s.	calm	sw.	nw.	......	·12	......	......	·04	56
19.	s.	w.	calm	nw.	ne.	·069	·31	......	......	......	58
20.	se.	s.	calm	ese.	se.	·263	·01	·51	......	......	60
21.	sse.	sw.	calm	sw.	se.	·077	·01	·06	......	......	58
○ 22.	w.	w.	w.	ssw.	nw.	·027	·20	·22	0·60	·25	59
23.	w.	w.	calm	s.	se.	·011	·01	·03	......	·12	58
24.	s.	sw.	w.	s.	s.	·033	......	·03	......	·16	61
25.	s.	sw.	w.	sw.	sw.	·033	·09	......	......	......	58
26.	nwvar	sw.	w.	wsw.	nw.	·019	......	·07	......	·05	52
27.	nw.	w.	w.	nw.	nw.	·016	......	......	......	·10	57
28.	w.	sw.	w.	sw.	s.	......	......	......	......	·05	55
29.	w.	w.	w.	wnw.	sw.	......	......	......	1·37	·51	61
☾ 30.	n.	ne.	w.	w.	w.	......	·80	......	......	·06	60
Mean.						Sum. 6·30	1·58	1·05	2·22	2·34	Mean. 59

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

SUPPLEMENT TO VOL. IX. SEPTEMBER 1842.

LV.—*The Physical Agents of Temperature, Humidity, Light, and Soil, considered as developing Climate, and in connexion with Geographic Botany.* By Richard Brinsley Hinds, Esq., Surgeon R.N.

[Concluded from p. 475.]

I have frequently had an opportunity of observing that plants produce two kinds of mould, with what has appeared to me sufficient distinctive characters to justify a separation. It is in humid atmospheres that growth and decay take place with such rapidity, and here is the proper field for studying the unobtrusive deeds of the vegetable kingdom. The *first* kind is formed around the surface of attachment of plants, and indifferently whether they are fixed to rocks or the trunks of trees. On separating Algæ from rocks, or removing an investment of mosses from the surface of forest trees, a thin layer of mould of a dingy yellow colour is exposed; but it is always very sparingly produced. The origin may be from several sources; in some cases from the partial disintegration of the supporting rock, but in all probability the greater part is derived from matter excreted from the plants themselves, increased by foreign substances getting entangled among the leaves and fronds. This is the kind produced on those surfaces recently occupied by a few plants for the first time. The *second* variety results from dead vegetable matter; it has its origin in the decomposition occurring in the solid parts of vegetables, as the trunks of trees, their branches and the stems of shrubs. A beautiful deep black rich mould is produced, when rubbed between the fingers feeling like an impalpable powder, and consisting entirely of soluble matter capable of administering to the nutrition of future plants. After trees fall from their ranks in the forest the destructive agents are soon at work, and the huge trunks become converted into this black mould. Their external appearance often does not indicate the state within; and it is only when a stray footstep, or some other external violence, breaks through the thin crust of bark, that the metamorphosis becomes evident.

Still I am not prepared to admit, that lichens and mosses are such active agents in the generation and increase of soil as is generally allowed; and for the reasons, that under a variety of climates and circumstances I have never witnessed the process in any extent, and can see no correspondence between cause and effect. If a tract of rocky country were left in the undisturbed possession of a multitude of lichens, I feel confident we might wait for a space bordering on eternity before anything like productive soil would appear. If there are any plants more conspicuous than others for this kind of influence I believe them to be grasses; for they are to be seen clothing the black weather-worn volcanic mountain ridges of the different groups of islands in the Pacific Ocean, to the almost total exclusion of everything else, and entirely covering the exposed shoulders of many of the hills, which consist nearly altogether of lava rocks. In the numerous singular coral islands grasses are the first to prepare the way for the herbaceous vegetation, and in a number of other islands, as the inhospitable St. Paul's, there is little other vegetation than grass or reeds. Scattered about the world are many small dreary rocky islets, which lift their solitary heads a few feet above the extensive waste of waters around them. If the chinks and crevices of these are examined, they will usually be found to contain a little starved grass and a few stunted bushes. The mode of growth of these grasses is peculiar, and perhaps suited to their situation. Each plant forms a separate and independent tuft, which, whilst it preserves in its centre the active functions of life, increases from the exterior, and often attains such a size as to impede the surface. Grasses seem to me to be usually the earliest plants to occupy waste grounds, but an active rivalry is sometimes displayed in nearly all that class of plants, which, sending a taper root downwards, spread their branches horizontally in a gradually dilating circle. If lichens are really so efficient to this end, the *Roccella tinctoria* ought, long before this, to have reclaimed the barren Dejertos to something of the rich fertility of their beautiful neighbour, Madeira; and sheep are pastured here during certain times of the year on their spontaneous grasses.

The chief portion of the soil of the rich and fruitful parts of the globe will be found to exist about the deltas of rivers, in plains, or in valleys, or some other situation where it is probable it has one time or other been deposited by water. Bearing in mind the twofold nature of soil, the inorganic portion has not, as a general rule, resulted from the disintegration of subjacent rocks; but in the abrasion, by moving water and the substance hurried with it in its course, of the channels of mountain streams, cascades, and the torrent courses of the wet season. The resulting materials are gradually deposited on reaching the lower lands, and constitute the basis of soil. In this manner have rivers ever been, and are still, the most active agents in originating soil, whilst vegetation subsequently enriches it.

Even after a clear acquaintance is gained with the mineral composition of soils, and of the different organic substances which also contribute to their formation, other circumstances require to be taken into consideration before our knowledge is complete; for though these are extraneous, or form no part of its physical characters, they have an influence over it as a source of fertility. However good the soil, an unsuitable substratum may deprive it of nearly all its good qualities: a good substratum should retain or dismiss moisture according to the constitution of the incumbent soil. Inclined surfaces allow the finer and more soluble substances to gravitate towards the base, and are generally a good deal drained of moisture. Plains have usually good and extensive soils, particularly any valleys which may descend from them, and indeed valleys in general: these may be regarded likely to have been formerly the bottoms of lakes or other large bodies of water, in which case an important portion of carbonaceous matter is mixed up with the soil.

The state of cohesion, or the condition of the aggregation of the particles, has its effects on vegetation, since the roots of plants have a variety of different forms, which require some adaptation of the soil to their organization. Argillaceous soils are too consistent for many roots to penetrate, and plants growing on them are fixed more on the surface than in the soil. Sandy soils, though easily penetrated by the roots, are so moveable, that the latter experience many chances of exposure; thus there are many large tracts of sand on the surface of the globe which do not support the smallest vestige of vegetation. Where sandy soils are not liable to be swept away, and are moderately supplied with moisture, they support a very tolerable vegetation. Solid rocks resist any attempts to penetrate them according to their structure; quartz rocks strongly oppose the roots of plants as well as those which are granular or crystalline; schistose rocks and the various sandstones are more easily disintegrated; and marl and chalk, though not particularly favourable, support a moderate vegetation.

Soils possess different capacities for retaining moisture; and this is a highly important property, since a very great share of their nutritive qualities is dependent on it. Aluminous and argillaceous soils surpass all others in the quantity of water they will retain, calcareous come next, and siliceous the last. It is by a judicious mixture of these that a fruitful soil is made, for it is quite possible for a soil to be too moist as well as too dry. Einhof, who has paid some attention to soils, has named the variety which occurs in low meadows and marshes, acid vegetable mould; it is marked by excessive moisture, and nourishes species of *Juncus*, *Carex*, *Eriophorum*, *Arundo*, &c.: a notable quantity of the acetic and phosphoric acids exists in it.

Nor are the effects on temperature to be overlooked; dark-coloured rocks and soils, as volcanic and slaty, are more easily warmed by the sun from their superior power of absorbing heat; the clay-slate, on which the vineyards of the Rhine are cultivated, owes its superiority to the dark colour; and at Constantia at the Cape of Good Hope, the excellence of the grape has been attributed to the same. DeCandolle mentions that the peasants in the valley of Chamouni are accustomed to reduce a black slaty rock to powder and sprinkle it over the snow in spring; the dark substance absorbs the sun's rays, and by the melting of the snow beneath vegetation is accelerated from one to two weeks. The vegetation of the perennial grasses commences at least a fortnight sooner on limestone and sandy soils than on clay, *or even deep rich moulds*; hence has arisen the appellation of cold soils. The tenacity with which a soil retains moisture is in some measure a guide to its power of modifying temperature. Soils in which there is much nutrient matter resist the effects of cold temperatures better than poor or watery ones. Compact soils have the same influence on low temperatures.

Though these circumstances exert at times and seasons their proper influence over the productiveness of soils, it must still be held in mind that the latter are of very secondary importance in the existence of the vegetable kingdom. The cases where the condition of the soil decidedly defines the vegetation are the exceptions, and instances of plants being able to thrive in a particular soil and no other are extremely rare. Many of these exceptions are of interest, and an investigation of them is not unlikely to make us better acquainted with the relations between vegetation and soil. An examination of the constituent parts of plants which have been growing on different soils shows that they vary with the mineral ingredients: Saussure found that those which came from a granitic soil contain certain quantities of silica and metallic oxides, and others from a calcareous soil possessed little or none of these, but their proportion of calcareous earth. There are some experiments and observations which tend to prove that these mineral substances are a necessary part of plants, but it seems more probable that they are foreign matters entering the tissues with the nutrient fluids, and of no use in the œconomy of vegetation. In mentioning a few instances, we shall pass over altogether the results which have been elicited by cultivation, as in this state it is frequently the object to obtain an engagement of, or a determination of nutrient matter to, a particular organ or set of organs, very different to what is observed in natural healthy vegetation.

The vegetation of *chalky* soils can nowhere be better studied than in our own country; chalk being unknown in some of the large continents, though limestone is one of the most abundant rocks. The natural families of *Labiatæ, Orchideæ,* and some members of *Leguminosæ,* display the greatest partiality, whilst many other families have species which show a decided preference. DeCandolle gives the following as chalk-loving plants :—*Buxus sempervirens, Potentilla rupestris, P. caulescens, Polypodium calcareum, Gentiana cruciata, Asclepias vincetoxicum, Cyclamen europæum, Trifolium montanum, Adonis vernalis,* with several species of *Oxalis, Bupleurum, Sedum, Lichen,* &c.

As partial to a *siliceous* soil the same talented botanist mentions *Castanea vesca, Digitalis purpurea, Sedum villosum, Pteris crispa, Polystichum oreopteris, Saxifraga stellaris, Achillea moschata, Carex pyrenaica.*

Soils impregnated strongly with *saline* matter are frequently spread over extensive districts ; a large tract in Mesopotamia is covered with a species of *Artemisia* ; several genera of *Ficoideæ* and *Chenopodiæ* will grow nowhere else ; and *Umbelliferæ, Compositæ, Plantagineæ, Polygoneæ, Plumbagineæ, Nyctagineæ* (*Abronia,* several species,) have all members with a similar bias. The cocoa-nut palm will not thrive out of the influence of the salt air of the ocean, and it is in its happiest vigour among the low coral islands of the Pacific, when its roots are almost bathed by the waves. The sugar-cane also prefers a saline soil, and some of the plantations of the West Indies occupy land originally overflowed by the sea. The vegetation of the Natron lakes of Central Africa does not seem very abundant, but on the margins of some date trees thrive, and their marshy borders are invested by grasses and a species of *Juncus.* A distinction may be made according to the saline constituent; in some cases this is nitrate of potash, as in the maritime parts of Chili and Peru ; natron or carbonate of soda prevails in Egypt; in others it is the chloride of sodium, and this is more frequent in saline marshes near the sea, where also there will be an admixture of the other salt-water constituents.

A number of particular plants are generally found attached to old walls, or among the ruins of deserted buildings, where the source of attraction is the nitrate of lime and potash existing in the *old mortar*; among these are *Parietaria officinalis, Urtica dioica, Antirrhinum majus, Linaria cymbalaria, Hieracium pilosella* and some other species, *Arenaria serpyllifolia*, &c.

In no country is vegetation so sure a guide to the qualities of the soil as in New Holland: the different visitors speak with confidence on this subject, and represent the settlers as guided in their choice of a location by the nature of the sustained vegetation. *Angophora lanceolata*, the native apple, indicates a good soil; the spotted gum and stringy bark a bad; the Australian mahogany is found on white sand; and the red and blue gum, both species of *Eucalyptus*, select clayey districts; the numerous *Banksia* and *Protea* are sand-loving plants.

Von Martius was agreeably surprised at seeing some arborescent lilies on elevated lands in the Brazils; they consisted of several species of *Villosia* and *Barbacenia*, and appeared only to thrive on quartzy mica-slate. The allspice, *Pimenta vulgaris*, is cultivated with profit only on white limestone. Many of the *Cellulares* adhere with much tenacity to particular kinds of rock, and among them lichens are especially distinguished. From Sir Wm. Hooker's 'English Flora,' where some discrimination has been used in assigning a locality, I have calculated the following distribution :—

Attached to trees	144
Attached to posts and shingle boards	35
Epiphytic or other agamics	11
Growing on heathy soils	24
Growing on soils usually sandy	30
Growing on old walls	16
Growing on bricks and tiles	7
Attached to rocks generally	97
Calcareous and limestone rocks	19
Flinty stones	11
Slaty rocks	9
Sandstones, white and red	8
Whinstone	4
Granite	3
Quartz	1

or, considered in another view, attached to organized substances 190, to mineral 175, and to what may be called neutral 54; making a total of 419 species.

Vicinity to large towns has a visible influence over vegetation. Around London it possesses a good deal of luxuriance. A cause for this may be sought in the state of the atmosphere liable to exist among such a crowd of habitations and human beings. Pure air, after being once respired by man, contains about 3·6 per cent. carbonic acid; but the extreme dilution this must undergo in mixing with the bulk of the atmosphere, renders it unlikely that it will have any visible effect. It is more probable that the immense quantity of carbon, in an extremely fine, light, and divided state, which escapes in smoke after combustion, is a more influential cause. It is now in a condition to be suspended, if not dissolved, in water, and can pass readily through the structures of plants; and the good effects of certain proportions of carbon in a convertible state has been proved by experiment. In estimating the influence of large towns on vegetation, it must not be lost sight of, that combustion also gives rise to some of a deleterious tendency. Sulphurous acid is produced in a sufficient quantity to impair the functions of plants in a sensible manner, and even the bad effects of an extremely minute proportion have been noticed. Those plants which are observed to prefer the vicinity of clustered habitations have then, most probably, some connexion with the resulting state of the atmosphere whence they derive benefit; some may receive positive benefit or stimulus from it, and others be equally injured.

LVI.—*A Catalogue of Shells from the Crag.* By S. V. Wood, Esq., F.G.S.

[Concluded from p. 462.]

Class GASTEROPODA.

Ord. Phytophaga.

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*

1. Capulus ungaricus, *de Montf.* (Patella ungarica, *Mont. Test. Brit.* p. 486. Patella unguis, var. *β. Min. Con.* t. 139. f. 7).

Ramsholt.	Sutton.	. . . .	Britain.

This exceeds in magnitude the recent British specimens. My largest fossil has attained the (transverse) diameter of two inches and a quarter. A very variable species: some of my specimens are conical, with the apex nearly central, while others are so much depressed, that the apex is on a level with the base projecting beyond it.

2. — obliquus, n. s.

	WaltonNaze.		

3. — recurvatus, n. s.

	WaltonNaze.		

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*

4. Capulus fallax, n. s.

	Sutton.		

1. Emarginula crassa, *Sow.* (*Min. Con.* t. 33).

Ramsholt.	Sutton.		

2. — fissura, *Flem.* (*Brit. An.* p. 365. Patella fissura, *Linn. Syst.* p. 1261. Emarginula reticulata, *Min. Con.* t. 33).

Sutton.	Sutton.	....	Britain.

3. — punctura, n. s.

Sutton.			

1. Fissurella cancellata (Patella cancellata, *Lister*, t. 527. f. 2. Fissurella græca, *Min. Con.* t. 483).

Sutton.	WaltonNaze.	....	Britain.

var. *β*. depressa.

Ramsholt.			

This is larger than the generality of recent British specimens, reaching one inch and a half in its longitudinal diameter. The perforation is of an oblong form, rounded at each extremity and slightly contracted in the middle. In very young specimens the vertex is visible, recurved, and directed towards the *posterior*, which might cause it to be mistaken for another genus. When the shell has attained the length of one quarter of an inch this recurvature is lost.

1. Dentalium costatum, *Sow.* (*Min. Con.* t. 70. f. 8).

Sutton.	Sutton.		

Perfect specimens have a dorsal cleft at the posterior extremity to the depth of a line; the aperture is then partially covered with a convex sort of epiphragm which has a cleft across it, as is well represented in *D. fissura* of Sowerby's 'Genera'; this I have only seen when the posterior extremity has attained the diameter of nearly a line: very small specimens (corresponding in all other respects, and as such I have considered them as the young of this species) have a circular opening at the posterior extremity without the cleft. The number of costæ in this species varies from ten to eighteen, with occasionally a small one between them. My largest specimen measures one inch and seven-eighths, but fragments indicate a greater magnitude.

Dent. striatum, Mont. Test. Brit. p. 495, appears, from the description, to correspond with my small specimens.

1. Velutina lævigata (Helix lævigata, *Linn. Syst.* p. 1250. Bulla velutina, *Müller*, *Zool. Dan.*).

Sutton.	....	Bramerton.	Britain.

2. — elongata, *Forbes* (*Report Brit. Assoc.* 1839, p. 80).

This has been identified by Mr. Forbes.

(Sigaretus similis? *Woodward, Geol. of Norf.* t. 3. f. 8).

		Thorpe.	Britain.

3. — capuloïdes, n. s.

Sutton.			

1. Marsenia depressa.

Sutton.			

Spec. Char. Shell depressed, subtrapezoidal; outer lip much expanded; inner replicate, lower part slightly projecting; lines of growth visible. Diameter one-eighth of an inch. Pl. V. f. 8, 9.

Only two specimens (perhaps young ones), but they appear to differ from the young of the recent species (*Marsenia producta,* Leach, Moll. p. 47; *Bulla haliotoidea,* Mont. T. B. p. 211. t. 7. f. 6.) in their more expanded outer, and the projection at the lower part of the inner lip, and more depressed form.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
1. Natica catenoïdes (Natica glaucinoïdes, *Min. Con.* t. 479. f. 4; not N. glaucinoïdes, *Deshayes*).	Sutton.	Sutton.	Bramerton.	

It is necessary to change the name of this species, as the two shells figured in 'Min. Con.' as *glaucinoïdes* are, I believe, distinct. I have not yet seen a London clay shell that can be identified with our crag species, of which a faithful representation is given at the above reference.

2. — catena (Nerita glaucina, *Mont. Test. Brit.* p. 469. Cochlea catena, *Da Costa,* p. 83. t. 5. f. 7).		Sutton.	....	Britain.
3. —? multipunctata (Natica patula, *Min. Con.* t. 373).	Ramsholt.	WaltonNaze.		

This differs from *Nat. millepunctata* in the greater size of the umbilical callosity, at all ages sufficient, I think, to constitute a specific difference. There are the remains of spots in two of my specimens from the red crag of Walton Naze similar to those upon the *millepunctata,* and as the name of *patula* is preoccupied, I propose the one above as expressive of its ornament and of its affinity.

A thick calcareous operculum is in the cor. crag at Ramsholt, which may possibly belong to this; if so, it is not the *millepunctata,* as it differs from the operculum of that species. Risso has justly separated from *Natica* those species with a calcareous operculum, for which he has proposed the name of *Nacca*; this may probably be referred to it.

4. — hemiclausa, *Sow.* (*Min. Con.* t. 479).		WaltonNaze.		

The umbilicus of this is closed in the adult shell.

5. — cirriformis, *Sow.* (*Min. Con.* t. 479).	Ramsholt.			
6. — helicoïdes, *Johnston* (*Hist. of the Berwickshire Nat. Hist. Club,* 1834).		Sutton.	Bramerton.	Scottish coast.
7. — clausa, *Gray* (*Zool. of Beechey's Voy.* t. 37. f. 6. and t. 34. f. 3. Nat. clausa, *Smith, Werm. Mem.* vol. viii. pl. 1. f. 16).		Sutton.	....	North Seas.
8. — elevata, n. s.	Ramsholt.			

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
9. Natica proxima, n. s.				
	Ramsholt.			
10. — depressula, n. s.?				
	Sutton.			

Not more than one-eighth of an inch. Three specimens of this small shell, which I cannot affiliate to any of my crag species, although I have many young specimens quite as minute; however, till more be found, it must be considered doubtful.

Natica depressa, Min. Con. t. 5, is probably a French shell, or from the Isle of Wight, figured by mistake as from the crag.

An abundance of individual specimens are found, especially in the red crag; but the labour of identification is great, from the difficulty of procuring specimens that are not more or less altered by decomposition, or rather decortication, many having the outer covering entirely removed, showing in some instances a striated surface upon a shell which in its natural state is perfectly smooth; and in most of the species of this genus a deep depression is visible at the suture when the exterior coating is removed, which materially alters the appearance of the shell.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
1. Adeorbis (n. g.) striatus, *mihi.*				
	Sutton.			

Gen. Char. Whorls subdiscoidal, volutions few, peritreme sharp, inner lip sinuous, umbilicus large and deep.

Spec. Char. Shell depressed; volutions four, rounded, slightly impressed by the preceding whorl, spirally striated; outer lip sharp, projecting; inner sinuous; umbilicus large, open, volutions visible to the apex. Diameter one-seventh of an inch. Pl. V. f. 4 and 6.

There is an incipient sinus in the upper part of the aperture, which gives in one of the species particularly (*supra-nitida*) a depression at the upper part of the volution at a little distance from the suture.

I consider this distinct from *Skenia* in the form of the peritreme, which, in that genus, is circular and not sinuous.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
2. Adeorbis supra-nitidus, n. s.				
	Sutton.			
3. — tricarinatus, n. s.				
	Sutton.			
4. — subcarinatus (Helix subcarinata, *Mont. Test. Brit.* p. 438. pl. 7. f. 9. Trochus subcarinatus, *Brown, Conch. Illust.* pl. 51. f. 16, 17).				
	Sutton.	....	....	Britain.
5. — ? subimbricatus, n. s.				
	Sutton.			
1. Margarita helicina, n. s.				
	Sutton.			
2. — trochoidea, n. s.				
	Sutton.			
1. Scissurella crispata? *Flem.* (*Brit. An.* p. 366).				
	Sutton.	....	....	Britain.

My only specimen is unfortunately imperfect. It is strongly ribbed and spirally striated, and what there is of it remaining appears to agree with Dr. Fleming's full description.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
1. Solariella (n. g.) maculata, *mihi.*				
	Sutton.			

Gen. Char. Subtrochiform, depressed; spire acute; peritreme subcircular, umbilicus large, deep and crenulated; shell nacreous.

Spec. Char. Subtrochiform; volutions five, subcircular, carinated; carinæ three, rugose; base striated; umbilicus crenulated; shell nacreous. Diameter three-eighths of an inch. Axis one-fourth of an inch nearly. Pl. V. f. 7 and 10.

The elevated carinæ give an angulated appearance to the otherwise nearly cylindrical form of the volutions, which are slightly impressed by the preceding whorl; carinæ of different sizes and at unequal distances, the upper one most prominent, producing a depressed ambulacrum or furrow at the suture; upper part of the peritreme projecting a little beyond the lower: fragments and small specimens are abundant.

I have ventured to propose a new genus for this shell, conceiving the subcylindrical form of the volutions to have no generic connexion with the quadrangular opening of the *Solarium.* It is probably intermediate between *Trochus* and *Margarita.*

The specific name is added from the remains of coloured spots in one specimen.

Sect. β. imperforate.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
1. Trochus ziziphinus, *Auct.*				
		Sutton.	....	Britain.
2. — pseudo-ziziphinus (*Schlott. Pet.* p. 160. Trochus Sedgwickii, *Min. Con.* t. 272. f. 1).				
	Ramsholt.			
3. — granosus, *Lamarck* (*Hist. des An. sans Vert.* vii. p. 20).				
		WaltonNaze.	....	Mediterranean.
4. — conulus? *Lamarck* (*Hist. des An. sans Vert.* vii. p. 24).				
	Sutton.	....	....	Mediterranean.
5. — quadricinctus, n. s.?				
	Sutton.			
6. — Montacuti.				
	Sutton.	... .	....	Britain.

Identified by Mr. Edward Forbes.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
7. — subexcavatus, n. s.				
		Sutton.		
8. — asperulus, n. s.				
	Sutton.			

The shells of this genus from the crag are much altered by decortication, consequently difficult of identification.

Sect. α. umbilicated.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
9. — cinereoïdes, n. s.				
		Walton Naze		

Cor. Crag. *Red Crag.* *Mam. Crag.* *Recent.*

10. Trochus tumidus, *Mont.* (*Test. Brit.* p. 280. t. 10. f. 4. Trochus nitens? *Woodward, Geol. of Norf.* t. 3. f. 10).
Sutton. | Sutton. | .... | Britain.

11. — littoralis, *Brown* (*Illust. Brit. Conch.* pl. 45. f. 1, 4).
| Sutton. | .... | Britain.

12. — obconicus, n. s.
Sutton. | | |

13. — bicariniferus, n. s.
Sutton. | | |

14. — tricariniferus, n. s.
Sutton. | | |

1. Vermetus intortus, *Bronn* (*Lethæa Geognostica,* taf. 36. f. 18).
Sutton. | Sutton. | |

1. Valvata piscinalis, *Gray* (*Edit. of Turt. Man.* pl. 10. f. 114).
| | Bulcham. | Britain.

Captain Alexander's cabinet.

1. Paludina unicolor, *Swainson* (*Zool. Illust.* pl. 98. Paludina media, *Woodward, Geol. of Norf.* t. 3. f. 5, 6. Paludina rotundata, *id.* t. 3. f. 7. Paludina lenta, *Min. Con.* t. 31. f. 3).
| | Bramerton. | Bengal.

1. Bithynia tentaculata, *Gray* (*Edit. of Turt. Man.* pl. 10. f. 120. Paludina impura, *Lamarck,* vi. p. 175).
| | Bulcham. | Britain.

Captain Alexander's cabinet.

1. Littorina littoreus (Turbo littoreus, *Min. Con.* t. 71. f. 1. Turbo rudis, *id.* t. 71. f. 2. Turbo carinatus, *Woodward, Geol. of Norf.* t. 3. f. 11. Turbo ventricosus, *id.* t. 3. f. 12. Turbo bicarinatus, *id.* t. 3. f. 13. Turbo sulcatus, *id.* t. 3. f. 14, 15. Delphinula carinatus, *id.* t. 3. f. 9. Littorina squalida, *Zool. of Beechey's Voy.* pl. 34. f. 12).
| Sutton. | Bramerton. | Britain.

I have considered the above as referrible to one species, as they can be connected by every shade of difference. The cause of these deformities may perhaps have been a more than ordinary alteration of the water, both in respect to its density and temperature, in the estuary which these shells in all probability inhabited. Specimens occasionally found in the red crag preserve a uniformity of shape similar to those with which our markets are supplied.

2. — elongata (Turbo elongatus, *Woodward, Geol. of Norf.* t. 3. f. 16–18).
| | Bramerton. |

I have never seen this shell.

3. — ? suboperta (Vivipara suboperta, *Min. Con.* t. 31. f. 1).
| Sutton. | |

4. — ? phasianelloïdes, n. s.
| Sutton. | |

Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*

1. Turbo ? sphæroidea, n. s.

Sutton.			

Spec. Char. Spheroidal; whorls three, rapidly enlarging, convex; suture deep, spirally striated; peritreme sharp; outer lip curved; umbilicus surrounded by a prominent keel; shell nacreous. Axis one-twentieth of an inch. Pl. V. f. 3.

The exterior is covered with six or seven raised striæ or ridges unequally distributed, being nearer together at the lower part of the volution, where one is elevated into a sort of keel that surrounds the umbilicus, within which it is naked. The figure appears rather too elongated.

1. Rissoa Zetlandica (Cyclostrema Zetlandica, *Flem. Brit. An.* p. 312. Turbo Zetlandica, *Mont. Linn. Trans.* xi. t. 13. f. 3).

Sutton.	....	....	Zetland.

2. — reticulata (Turbo reticulata, *Mont. Test. Brit.* p. 322. t. 21. f. 1. Cingula reticulata, *Flem. Brit. An.* p. 306).

Sutton.	....	....	Britain.

3. — semicostata (Turbo semicostatus, *Mont. Test. Brit.* p. 326. t. 25. f. 5. Turbo semicostatus, *Woodward, Geol. of Norf.* t. 3. f. 19. Cingula semicostata, *Flem. Brit. An.* p. 307).

	Sutton.	Bramerton.	Britain.

4. — subumbilicata (Turbo subumbilicatus, *Mont. Test. Brit.* p. 316. Turbo minutus, *Woodward, Geol. of Norf.* t. 3. f. 20).

		Bramerton.	Britain.

Axis three-sixteenths of an inch.

5. — supracostata, n. s.

Sutton.			

6. — crassistriata, n. s.

Sutton.			

7. — obsoleta, n. s.

Sutton.			

8. — confinis, n. s.

Sutton.			

9. — concinna, n. s.

Sutton.			

10. — ? costellata, n. s.

Sutton.			

11. — ? angusta, n. s.

Sutton.			

The above small shells are occasionally much eroded, and their exterior markings sometimes obliterated; this is often the case with recent shells found in sand, where attrition, produced by the movement of the waves, has removed the striæ and other distinguishing characters; there is in consequence a doubt of the correctness of these identifications.

Cor. Crag. | *Red Crag.* | *Mam. Crag.* | *Recent.*

12. Rissoa striata (Turbo striatus, *Mont. Test. Brit.* p. 312. Cingula striata, *Flem. Brit. An.* p. 307).
Sutton. | .... | .... | Britain.

13. — ? vitrea (Tubo vitreus, *Mont. Test. Brit.* p. 321. t. 12. f. 3).
Sutton. | .... | .... | Britain.

1. Alvania albella, *Leach MS.*
Sutton. | .... | .... | Britain.

2. — supranitida, n. s.
Sutton. | | |

Spec. Char. Shell turriculate; whorls eight, convex, spirally ridged; suture deep; upper part of volution naked; apex acute; outer lip curved; umbilicus small. Axis one-seventh of an inch. Pl. V. f. 2.

Differs from *Turbo ascaris*, Turt., in the unequal distribution of the striæ or ridges, which are five in number, the lower one not so prominent as the others; it is also more slender, and the upper part of the volution smooth, with a thickening behind the outer lip.

1. Turritella incrassata, *Sow.* (*Min. Con.* t. 51. f. 6).
Ramsholt. | Sutton. | |

This much resembles a recent shell, probably identical.

2. — terebra, *Lamarck* (Turbo terebra, *Linn. Syst.* p. 1239).
| Sutton. | Bramerton. | Britain.

3. — conoidea, *Sow.* (*Min. Con.* t. 51. f. 1, 5, 6).
| Sutton. | |

My specimens are all much rubbed and water-worn.

4. — bicincta, *mihi* (Turritella duplicata, *Dubois, Geol. Wolhyn. Podol.* pl. 2. f. 19, 20).
Gedgrave. | Sutton. | |

This strongly resembles a recent shell, but is quite distinct from *T. duplicata*, Lamarck, Ency. pl. 449. f. 1. *a*, *b*.

5. — planispira, n. s.
Sutton. | | |

1. Eulima polita, *Risso* (Turbo politus, *Linn. Syst.* p. 1241. Helix polita, *Mont. Test. Brit.* p. 398).
Ramsholt. | Walton Naze. | .... | Britain.

2. — subulata, *Risso* (iv. p. 122. Helix subulata, *Mont. Test. Brit. Sup.* p. 142. Melania Cambessedesii, *Bronn, Leth. Geog.* taf. 42. f. 46. Turbo subulatus, *Don. Brit. Shells*, t. 172).
Sutton. | .... | .... | Britain.

3. — glabella, n. s.
Sutton. | | |

4. — ? pendalia, n. s.
| Sutton. | |

1. Scalaria similis, *Sow.* (*Min. Con.* t. 16).
| Sutton. | Thorpe. |

This much resembles *Sc. Gröenlandica, Turbo Clathrus Gröenlandicus*, Chemn. Conch. xi. t. 19. f. 1878–79; but a comparison with three recent specimens presents the following differences :—the volutions of the fossil are more convex, the suture deeper, and the whole shell less conical with a more prominent keel upon the base of the body whorl.

Cor. Crag. | *Red Crag.* | *Mam. Crag.* | *Recent.*

2. Scalaria clathratulus, *Flem.* (*Brit. An.* p. 311. Turbo clathratulus, *Walker, Test. Min. rar.* t. 2. f. 45. Scalaria minuta, *Min. Con.* t. 390. Scalaria pseudo-scalaris, *Dubois, Geol. Wolhyn. Podol.* pl. 2. f. 36, 37).
Sutton. | Sutton. | .... | Britain.

3. — fimbriata.
Sutton. | .... | .... | Mediterranean.

4. — foliacea, *Sow.* (*Min. Con.* t. 390. f. 2).
Sutton. | Sutton. | |

This is given by Philippi, Enum. Moll. Sic. p. 167, as a synon. to *Sc. pseudo-scalaris.* The crag shell differs in not having a keel upon the body whorl.

5. — subulata, *Sow.* (*Min. Con.* t. 390. f. 1).
Sutton. | | |

6. — frondosa, *Sow.* (*Min. Con.* t. 577. f. 1).
Sutton. | | |

7. — frondicula, n. s.
Sutton. | | |

8. — fimbriosa, n. s.
Ramsholt. | | |

9. — ? obtusicostata, n. s.
Sutton. | | |

10. — ? decussata, *Desh.* (*Hist. Coq. foss. des Env. de Par.*).
Sutton. | | |

The French shell appears to have the volutions more convex and the suture deeper; but my crag specimens are all imperfect.

1. Phasianema sulcata.
Sutton. | | |

Gen. Char. Spire slightly elevated ; volutions few; aperture ovate ; exterior striated, umbilicated.

Spec. Char. Ovato-fusiform ; volutions three, convex ; suture deep ; apex obtuse, spirally sulcated, decussated by lines of growth ; aperture ovate ; outer lip sharp, inner slightly replicate ; umbilicus small, with an incipient fold upon the columella. Axis one-seventh of an inch. Pl. V. f. 15.

2. — lineolata, n. s.
Sutton. | | |

Sect. *a.* columella plain.

1. Turbonilla elegantissima, *Leach MS.* (Turbo elegantissimus, *Mont. Test. Brit.* p. 298. t. 10. f. 2).
Sutton. | .... | .... | Britain.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*

2. Turbonilla rufa? (Melania rufa, *Phil. Enum. Moll. Sic.* t. 9. f. 7).

	Sutton.	....	....	Mediterranean.

Specimens imperfect.

3. — acicula? (Melania acicula, *Phil. Enum. Moll. Sic.* t. 9. f. 6).

Sutton. | | |

Specimens imperfect.

4. — curvicostata, n. s.

Sutton. | | |

5. — cylindrella, n. s.

Sutton. | | |

A recent species in Mr. G. B. Sowerby's possession is identical with this; locality unknown.

6. — subulata, n. s.?

Sutton. | | |

This may possibly be a very slender variety of *elegantissima*: only one specimen.

7. — filosa, n. s.

Sutton. | | |

8. — costaria, n. s.

Sutton. | | |

9. —? —?

Sutton. | | |

Specimens imperfect.

10. —? —?

Sutton. | | |

Specimens imperfect.

Sect. β. with a fold upon the columella.

11. — elegantior, n. s.

Sutton. | | |

12. — elegans, n. s.

Sutton. | Sutton. | |

All the shells I have included in this genus (proposed by Dr. Leach in MS. and adopted by Risso) have a mammillated apex, caused by the reversed position of the extreme spire.

1. Odostomia plicata, *Flem.* (*Brit. An.* p. 310. Turbo plicatus, *Mont. Test. Brit.* p. 325).

Sutton. | .... | .... | Britain.

Var. β convexa.

Sutton. | | |

Axis five-sixteenths of an inch; outer lip toothed within.

Auricula hordeola (*Desh. Coq. foss. des Env. de Par.* pl. 6. f. 21, 22).

The crag shell is rather larger than the recent, which is the only difference I can detect.

Cor. Crag. *Red Crag.* *Mam. Crag.* *Recent.*

2. Auricula pupa (Melania pupa, *Dubois, Geol. Wolhyn. Podolien.* t. 3, f. 34, 35).
Sutton. | | |

3. — reticulata, n. s.
Sutton. | | |

1. Acteon Noæ, *Sow.* (*Min. Con.* t. 374).
| WaltonNaze. | |

2. — subulatus, n. s.
Sutton. | Sutton. | |

3. — levidensis, n. s.
Sutton. | | |

4. — tornatilis (Acteon striatus, *Min. Con.* t. 460. f. 2. Voluta tornatilis, *Mont. Test. Brit.* p. 231).
Sutton. | Sutton. | .... | Britain.

1. Pyramidella læviuscula, n. s.
Sutton. | | |

This differs from the figure of *P. plicosa* (Bronn, Leth. Geogn. taf. 40. f. 24) in having only three plicæ, one large and two small.

1. Trichotropis borealis, *Lowe* (*Zool. Journ.* Fusus umbilicatus, *Smith, Mem. of Wernerian Nat. Hist. Soc.* vol. viii. p. 50. fol. 1. f. 2).
Ramsholt. | .... | .... | Rothsay Bay.

1. Macromphalus reticulatus.
Sutton. | | |

Gen. Char. Shell fusiform; spire elevated; aperture ovate; outer lip sharp; umbilicus linear.

Spec. Char. Shell fusiform; volutions convex; suture deep; surface reticulate; aperture ovate; peritreme sharp, continuous; umbilicus linear, striate. Axis one-fourth of an inch. Pl. V. f. 16.

The lengthened form of the umbilicus has suggested the name proposed for the genus.

Sect. *a.* dextral.

1. Cerithium punctatum, *Woodw.* (*Geol. of Norf.* t. 3. f. 29).
| Sutton. | Bramerton. |

2. — trilineatum, *Phil.* (*Enum. Moll. Sic.* p. 195. t. 13. f. 13).
Sutton. | .... | .... | Mediterranean.

I presume this to be identical; the lower part corresponds, but the apex of the crag shell is obtuse, and the two first volutions possess longitudinal costæ. This portion is not shown in the figure above referred to.

3. — tuberculare (Murex tubercularis, *Mont. Test. Brit.* p. 270).
Sutton. | .... | .... | Britain.

4. — creperum, n. s.?
Sutton. | | |

Numerous specimens, but all much mutilated.

5. — cribrarium, n. s.?
Sutton. | | |

About a dozen fragments.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
6. Cerithium punctulum, n. s.		Walton Naze.		
7. — funiculatum? *Sow.* (*Min. Con.* t. 147).		Sutton.		
One mutilated specimen only.				
Sect. β. sinistral.				
8. — adversum (Murex adversus, *Mont. Test. Brit.* p. 271).	Sutton.	....	....	Britain.
9. — granosum, n. s.	Sutton.	Walton Naze.		

Ord. Zoophaga.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
1. Cancellaria costellifer (Murex costellifer, *Min. Con.* t. 119. f. 3. Cancellaria buccinoides, *Couthouy, Boston Journ. of Nat. Hist.* vol. ii. pl. 3. f. 3. p. 105).	Sutton.	Sutton.	....	Coast of United States.
2. — concinna, n. s.	Sutton.			
Specimens imperfect.				
3. — subangulosa, n. s.	Sutton.			
Specimens imperfect.				
4. — mitræformis (Voluta mitræformis, *Brocchi.* p. 645. t. 15. f. 13).	Gedgrave, near Orford.	Sutton.		
5. — lævicosta, n. s.	Sutton.			
6. — granulata (fragment).	Ramsholt.			
7. — —?		Sutton.		
Two much-worn specimens.				
1. Cassidaria bicatenata (Cassis bicatenata, *Sow. Min. Con.* t. 151).	Ramsholt.	Felixtow.		
1. Purpura incrassata, *Sow.* (*Min. Con.* t. 414).		Sutton.		
2. Purpura lapillus, *Lamk.* (Buccinum lapillus, *Linn. Syst.* p. 1202. Buccinum crispatum, *Min. Con.* t. 413. Murex angulatus, *Woodward, Geol. of Norf.* t. 3. f. 23, 24. Murex lapilliformis, *id.* t. 3. f. 25. Murex compressus, *id.* t. 3. f. 26).		Sutton.	Bramerton.	Britain.

These deformed varieties from the mam. crag are probably produced by the same cause to which I have assigned the many different shapes of *Littorina littoreus.*

Cor. Crag. *Red Crag.* *Mam. Crag.* *Recent.*

1. Columbella sulcata (Buccinum sulcatum (var. *a*.), *Sow. Min. Con.* t. 375, f. 2. Buccinum sulcatum (var. β.), *id.* t. 477. f. 4).
Sutton. | WaltonNaze. | |

Litiopa papillosa, n. s.
Sutton. | | |

Spec. Char. Shell smooth; whorls four, slightly convex; apex obtuse; aperture subovate; outer lip sharp, inner slightly replicate, forming a minute umbilicus. Axis one-sixth of an inch. Pl. V. f. 11. Distinct from the recent species found in the Gulf weed in being free from striæ, and in having an obtuse apex.

1. Ringicula buccinea, *Desh.* (2nd edit. *Lamk. Hist. des An. sans Vert.* viii. p. 344. Auricula buccinea, *Min. Con.* t. 465. Pedipes buccinea, *Bronn. Leth. Geog.* p. 1014. taf. 42. f. 8).
Sutton. | Sutton. | |

2. — ventricosa (Auricula ventricosa, *Min. Con.* t. 465).
Sutton. | Sutton. | |

1. Nassa incrassata, *Flem.* (*Brit. An.* p. 340. Tritonium incrassatum, *Zool. Dan. Prod.* p. 244. no. 2946. Buccinum macula, *Test. Brit.* p. 241. t. 8. f. 4).
| Sutton. | .... | Britain.

2. — rugosa, *Sow.* (*Min. Con.* t. 110. f. 3).
| Sutton. | |

3. — reticosa, *Sow.* (var. *a*. *Min. Con.* t. 110. f. 2. Nassa elongata, var. β. *Min. Con.* t. 110. f. 1).
Sutton. | WaltonNaze. | |

Var. γ. tiara, mihi.
| Sutton. | |

Var. δ. angulata, mihi.
| WaltonNaze. | |

Var. ϵ. deformis, mihi.
| WaltonNaze. | |

4. — reticulata? *Auct.*
| WaltonNaze. | .... | Britain.

This differs in the general form of the volutions being more ventricose, the whole contour more elegant, and in the absence of that gibbosity and slight deformity by which the recent shell is disfigured; it is a doubtful identification.

5. — fenestrella, n. s.
| Sutton. | |

6. — microstoma, n. s.
| Sutton. | |

7. — propinqua, *Sow.* (*Min. Con.* t. 477).
| Sutton. | |

8. — elegans, *Sow.* (*Min. Con.* t. 477. f. 1).
| WaltonNaze. | |

Not *Buc. elegans* of Dujardin.

9. — granulata, *Sow.* (*Min. Con.* t. 110. f. 1).
Sutton. | Sutton. | Bramerton. |

Cor. Crag. *Red Crag.* *Mam. Crag.* *Recent.*

10. Nassa labiosa (Buccinum labiosum, *Min. Con.* t. 477).
Sutton. | Sutton. | - |

11. — proxima, n. s.
| Sutton. | |

12. — costula, n. s.
Sutton. | Sutton. | |

13. — conglobata (Buc. conglobatum, *Broc. Conch. Foss. Subapennina*, p. 334. t. 4. f. 15. Buc. pupa, *id.* t. 4. f. 14).

This unique specimen was recently found in the red crag of Walton-on-the-Naze by Mr. Charlesworth, and liberally deposited in my cabinet.

1. Buccinum Dalei, *Sow.* (*Min. Con.* t. 486. f. 1, 2).
Ramsholt. | Walton Naze. | |

The difference between this and *Buc. ovum*, Turt. Zool. Journ. xi. p. 366. t. 13. f. 9, is in the striæ with which the former is more or less ornamented, and it has rather a deeper suture.

2. — undatum, *auct.* (*Ency. Méthod.* t. 399. f. 1. Buc. tenerum (var. β.), *Min. Con.* t. 486).
Gedgrave. | Butley. | .... | Britain.

Buc. tenerum, var. γ. elongatum.
Ramsholt. | | |

Sect. α. dextral.

1. Terebra canalis, n. s.
Gedgrave. | | |

A few specimens in bad condition.

Sect. β. sinistral.

2. — heterostropha, n. s.
Gedgrave. | Sutton. | |

1. Murex ? alveolatus, *Sow.* (var. α. *Min. Con.* t. 411. f. 2).
| Walton Naze. | |

Var. β. abbreviata, mihi (Purpura tetragona, *Sow. Min. Con.* t. 414. f. 1).
| Sutton. | |

Var. γ. obsoleta, mihi.
| Sutton. | |

2. — tortuosus, *Sow.* (*Min. Con.* t. 434).
Sutton. | Sutton. | |

3. — erinaceus, *Mont.* (*Test. Brit.* p. 259. *Don. Brit. Shells*, 1. t. 35).
| | Near Norwich. | Britain.

1. Fusus antiquus (Tritonium antiquum, *Müller, Zool. Dan. Prod.* no. 2939. Murex striatus, *Min. Con.* t. 119. Murex striatus var. carinatus, *id.* t. 22. Murex contrarius, *id.* t. 23. Murex despectus, *Mont. Test. Brit.* p. 256).
| Sutton. | Bramerton. | Britain.

A reversed specimen of the recent species in the possession of Mr. Bunbury corresponds in every respect with some of my specimens from the crag.

Cor. Crag. *Red Crag.* *Mam. Crag.* *Recent.*

2. Fusus ? elegans, *Charlesworth* (*Mag. Nat. Hist.* 1837, p. 218).

The specimen figured at the above reference is the only one I have seen; it enriches the cabinet of Mr. Fitch, of Norwich, and was procured at Felixtow on the Suffolk coast. Mr. Charlesworth considers it to have been taken from the beach, and states that the finest specimens of *Voluta Lamberti* are thrown up by the sea at that spot.

3. — angustius (Buc. angustius, *List. An. Ang.* 157. t. 3. f. 4. Murex corneus, *Don. Brit. Shells*, pl. 38. Fusus corneus, *Sow. Min. Con.* t. 35).

| Sutton. | .... | Britain.

4. — altus, n. s.

| Butley. | |

Not very unlike the preceding species, but differs in the shortness of its canal, in its more attenuated form and more mammillated apex.

5. — scalariformis, *Gould* (*Report, Inverteb. Massachusetts*, p. 288. f. 203. Murex Peruvianus, *Min. Con.* t. 434. f. 1. Fusus lamellosus, *Zoöl. of Beechey's Voy.* pl. 36. f. 13).

| Sutton. | .... | North Seas.

Two varieties are found in the red crag.

6. — costatus, *Sow.* (*Min. Con.* t. 34. and var. t. 39).

| WaltonNaze. | |

7. — echinatus, *Sow.* (*Min. Con.* t. 199).

Sutton. | WaltonNaze. | |

This much resembles *M. muricatus*, Mont. Test. Brit. p. 262. t. 9. f. 2, but differs in having its canal shorter and more open at the upper part, and less straight, more elevated spire, and striæ more distant.

8. — alveolatus, *Sow.* (*Min. Con.* t. 525).

| Sutton. | |

9. — curvirostris, n. s.

Ramsholt. | Sutton. | |

10. — intortus ? *Lamarck.*

| Sutton. | |

One imperfect specimen.

11. — porrectus ? (Murex porrectus, *Brander, Foss. Hant.* pl. 2. f. 36).

| Ramsholt. | |

One specimen, much mutilated.

12. — ? turriculus (Murex turriculus, *Mont. Test. Brit.* t. 9. f. 1. Murex angulatus, *Don. Brit. Shells*, t. 156. Pleurotoma clavula, *Dujardin, Geol. Trans. of France*, 1837, tom. ii. pt. 2. p. 291).

| Sutton. | Bramerton. | Britain.

Two varieties from the red crag.

13. — assimilis, n. s. ?

| Sutton. | |

Two imperfect specimens.

14. — gracilior, n. s.

Sutton. | | |

15. — ? nebula (Murex nebula, *Mont. Test. Brit.* p. 267. t. 15. f. 6).

Sutton. | Sutton. | .... | Britain.

My specimens are larger than the generality of the recent British, and they are also less slender, but otherwise correspond.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
16. Fusus paululus, n. s.	Sutton.			

Axis one line. This much resembles a small shell figured and described as *Fusus nanus* by Lea, Contribut. to Geol. pl. 5. f. 155; but the crag shell is beautifully cancellated on the body whorl, which I do not see in the above figure, nor is there any mention made of such ornament. I have only one specimen.

17. —? rufus (Murex rufus, *Mont. Test. Brit.* p. 263).			Thorpe.	Britain.
1. Pleurotoma? variegatum, *Phil.* (*Enum. Moll. Sic.* p. 197. t. 11. f. 14).	Sutton.	....	....	Mediterranean.
2. —? lineare (Murex linearis, *Mont. Test. Brit.* p. 261. t. 9. f. 4. Mangelia linearis, *Leach MS.*).	Sutton.	Sutton.	....	Britain.
3. —? cancellatum (Fusus cancellatus, *Min. Con.* t. 525).	Sutton.	Sutton.		
4. —? mitrula (Buccinum mitrula, *Min. Con.* t. 375).	Sutton.	Sutton.		
5. — intorta (Murex intorta, *Brocchi, Conch. Foss. Subapen.* t. 8. f. 17).		Butley.		
6. — —?	Sutton.	Sutton.		
7. — —?	Sutton.	Sutton.		
8. — —?		Sutton.		
9. — —?		Sutton.		

The markings of these four species of true *Pleurotomæ* are so much obliterated as to render them unfit for comparison.

10. — tuberculosum.	Sutton.	Walton Naze.		
11. — porrectum.	Sutton.			

Identical with a Touraine shell in Mr. Lyell's collection.

12. —? scabriusculum, n. s.		Sutton.		
13. —? pliciferum, n. s.	Sutton.			
14. —? —?	Sutton.			

There are probably two or three more species from the coralline crag of these canaliculated shells, but my specimens are very imperfect.

Cor. Crag. *Red Crag.* *Mam. Crag.* *Recent.*

1. Rostellaria plurimacosta, n. s.
| Sutton. | |

1. Aporrhais pespelicani (Aporrhais quadrifidus, *Da Costa, Brit. Con.* p. 136. t. 7. f. 7. Strombus pespelicani, *Linn. Syst.* p. 1207. Rostellaria pespelicani, *Min. Con.* t. 558).
Sutton. | Sutton. | .... |

1. Pyrula reticulata? *Lamarck* (*Hist. des An. sans Vertèb.* t. vii. p. 141. *Ency. Méth.* pl. 432. f. 2).
Ramsholt. | .... | .... | East Indies.

The exterior markings resemble those of the recent shell, but the upper part of the outer lip is more elevated. My fossil has lost a considerable portion of its canal, which makes it appear shorter, while the lines of growth indicate a length very nearly equal to that of the *reticulata*; it may possibly be a new species, but the condition of my single specimen is insufficient for such determination; as it is a rare shell, I have given a figure. Pl. V. f. 17.

1. Mitra plicifera, n. s.
Sutton. | | |

The mouths of all my specimens are broken.

1. Voluta? Lamberti, *Sow.* (*Min. Con.* t. 129. Mitra Lamberti, *Flem. Brit. An.* p. 333).
Ramsholt. | Sutton. | |

The inhabitant of this shell, in all probability, differed from the true *Volutes*. It may constitute the type of a new genus; the want of an emarginated base will remove it from *Voluta*, and its mammillated apex from *Fasicolaria*.

Section *a*. with dorsal sulcus.

1. Trivia avellana (Cypræa avellana, *Min. Con.* t. 378. f. 3).
| Sutton. | |

2. — testudinella, n. s.
Sutton. | WaltonNaze. | |

This is intermediate between *avellana* and *affinis*, and is exceedingly variable; specimens ranging in size from eleven-sixteenths of an inch (axis) to some scarcely one-fourth; ridges varying from as many as forty upon the exterior to one that has only twenty-four.

3. — affinis?
Sutton. | Sutton. | |

Only three specimens, and those appear like monstrosities, probably varieties of the preceding.

4. — Angliæ, n. s.
| Sutton. | |

Section *β*. without dorsal sulcus.

5. — Europæa, *Gray* (Cypræa pediculus, *Mont. Test. Brit.* p. 200, *and Sup.* p. 88).
Sutton. | Sutton. | .... | Britain.

This also varies considerably in size, from eleven-sixteenths to less than one-fourth of an inch.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
6. Trivia retusa (Cypræa retusa, *Min. Con.* t. 378. f. 2).	Sutton.	Sutton.		
7. — globulosa, n. s.		Sutton.		
1. Erato lævis, *Gray* (Erato cypræola, *Risso, Hist. Nat. des prin. prod. de l'Eur.* vol. iv. p. 240. pl. 7. f. 85. Marginella voluta, *Flem. Brit. An.* p. 335. Cypræa voluta, *Mont. Test. Brit.* t. 6. f. 7. Voluta lævis, *Don. Brit. Shells*, t. 145).				
2. — Maugeriæ, *Gray* (*Sow. Conch. Illust.* f. 47).	Sutton.	Sutton.	....	West Indies.

The West Indian specimens are generally a little smaller and rather more delicately formed than the crag shell.

	Cor. Crag.	*Red Crag.*	*Mam. Crag.*	*Recent.*
1. Ovulum Leathesii, *Sow.* (*Min. Con.* t. 478. Calpurna Leathesii, *Flem. Brit. An.* p. 331).	Sutton.	Walton Naze.		

Corrigenda.

Vol. vi. page 245. *Note* § refers to *Cultellus*, and not to *Solen siliqua*.
Do. do. *Sphenia cylindrica* is the young of *Panopæa*.
Do. page 251. *Cardium nodulosum* is *Cardium nodosum*, Turt.
Do. do. *Nucula tenera* is *Arca tenuis* of Mont.

LVII.—*Observations on the Structure of the Pollen Granule, considered principally with reference to its eligibility as a means of Classification.* By Arthur Hill Hassall, Esq., M.R.C.S.L., Corresponding Member of the Natural History Society of Dublin.

[Continued from vol. viii. p. 108.]

[With 6 Plates.]

The second portion of this communication comprises a particular description of the principal forms of pollen granules met with by the author during his investigations, together with the names of all the plants examined, arranged according to Lindley's 'Natural System,' which is followed in every particular, save that the order of arrangement is reversed, the lower tribes of Phanerogamic plants being first enumerated.

VASCULARES.

ENDOGENS OR MONOCOTYLEDONS.

Glumosæ.

Cyperaceæ.

Char.—Outline of pollen grain ovate-lanceolate; extine covering only a portion of the intine, being deficient on either side, and at the smaller end of the figure; but one pollen tube, which issues from the larger extremity of the granule. The entire figure bears a rude resemblance to an acorn when in its cup. Pl. XIII. fig. 1.

Isolepis Holoschœnus.	Scirpus capitatus.
I. romana.	Carex tomentosa.
Cyperus longus.	C. Œderi.
Scirpus atrovirens.	C. præcox.
S. carinatus.	C. acuta.
S. triqueter.	

The pollen grain of the following plant resembles that of the next order in every particular but size. See fig. 2.

Papyrus Antiquorum.

Graminaceæ.

Pollen granules separate, circular at first, but on the emission of the single pollen tube with which each grain is furnished generally becoming ovoid, the larger end corresponding to that from which the pollen tube issues; extine containing a distinct circular aperture for the escape of the pollen tube, which aperture is said by Fritzsche to be provided with a valve, of which I have not been able to detect the smallest trace. Pl. XIII. fig. 4.

Dactylis glomerata.	Triticum hibernum.	Zea Mays.
D. abbreviata.	Lolium perenne.	Zizania aquatica.
Sesleria elongata.	Avena fatua.	Andropogon furcatus.
Poa fertilis.	Aira vaginata.	Panicum palmifolium.
Elymus striatus.	Spartina juncea.	Phragmitis communis.
E sabulosus.	S. cynosuroides.	Arundo littorea.
Triticum rigidum.		

Spadicosæ.

Typhaceæ.

Pollen grains united in fours, generally disposed upon the same plane, and each emitting a single pollen tube. See fig. 5.

Typha latifolia.

Araceæ.

Calleæ.

Pollen grain, when dry, in outline describing a parallelogram, very flat; in water it changes to an ellipse, emitting a pollen tube from each extremity. See fig. 6.

Calla palustris.

Pollen grain of an elongated ovoid form, bearing some resemblance to a flask. Extine apparently without any provision for the pollen tube, which escapes from the small end of the figure by the rupture of that membrane. See fig. 7.

Calla æthiopica.

Hypogynosæ.

Junceæ.

Pollen granules united in fours, three being placed upon the same plane and one resting upon these; each granule emits a single pollen tube. Pl. XIII. fig. 8.

Juncus articulatus.

Obs.—The plants examined in the following orders of the groups *Hypogynosæ* and *Epigynosæ*, commencing with the *Butomaceæ* and going up to *Musaceæ*, are with two exceptions characterized by the possession of a pollen grain of the same form and structure as indicated below. The first exception occurs in *Limnocharis Humboldtii*, and is very remarkable, inasmuch as its pollen granule presents a more complicated structure than that of any other endogenous plant hitherto met with, while the second is seen in *Anigozanthus coccineus*.

Char.—Granules of an elongated form, tapering towards either extremity, sometimes slightly curved, each having on one side down its long axis a fissure through which the pollen tube quits the extine; this fissure is sometimes covered by an oval piece of membrane which curls up and falls off the extine when placed in water; extine either plain or reticulated. The whole granule may be very aptly compared to a grain of wheat while it remains dry; but as soon as it is immersed in fluid, and before the emission of the pollen tube, it becomes nearly circular. Extine often reticulated, and presenting a very beautiful appearance under the microscope. See fig. 10 and the following ones up to fig. 26.

Butomaceæ.

Butomus umbellatus.

1*st Exception.*

Pollen grain of *Limnocharis Humboldtii* circular; extine reticulated, perforated with six or seven apertures for the escape of pollen tubes. See fig. 9.

Commelinaceæ.

Pollen grain somewhat curved. See fig. 10.

Tradescantia virginica.	Tradescantia discolor.

Liliaceæ. Pl. XIII. fig. 11, 12.

Haworthia radula.	Arthropodium cirrhatum.
Aloe obscura.	Hyacinthus orientalis.
A. saponaria.	Bessera elegans.
Yucca filamentosa.	Eucomis striata.
Asparagus officinalis.	Albuca minor.
Peliosanthes Teta.	Ornithogalum speciosum.
Convallaria majalis.	Allium fragrans.
Czackia Liliastrum.	Scilla maritima.

Pollen granules of most of the following genera reticulated, and furnished with an oval appendage; (two of the genera enumerated above, *Yucca filamentosa* and *Czackia Liliastrum*, have their pollen grains provided with a similar appendage). See fig. 13, 14, 15.

Polianthes tuberosa.	Tulipa Gesneriana.
Agapanthus umbellatus.	Lilium longiflorum.
Funkia Sieboldiana.	L. album.
Hemerocallis flava.	L. tigrinum.

MELANTHACEÆ.

Pollen granule reticulated.

Colchicum autumnale.

PALMACEÆ.

Kunthia speciosa.

EPIGYNOSÆ.

BROMELIACEÆ.

Billbergia amœna.

IRIDACEÆ.

Iris florentina. Ixia florida. Antholyza æthiopica.
Moræa racemosa. Crocus vernus.

Pollen granule reticulate. See fig. 16.

Watsonia irioides. Gladiolus florabundus.

XÆMODORACEÆ.

2nd Exception.

Pollen grain of an elongated form, expanding into a bulb at either extremity, from an aperture in each of which a pollen tube issues; it may be compared to a dumb-bell, in which the cross bar connecting the two globes is somewhat curved. See fig. 17, 18, 19.

Anigozanthus coccineus.

AMARYLLIDACEÆ. See Pl. XIII. fig. 23, 24, 25, 26.

OBS.—An *apparent* exception to the usual form occurs in the pollen granule of *Crinum amabile*, which possesses two furrows instead of one. See fig. 20, 21, 22.

Galanthus nivalis. Narcissus Jonquilla.
Amaryllis purpurea. Zephyranthes grandiflora.
Hæmanthus tigrinus. Alströmeria ovata.
Griffinia hyacinthina. A. psittacina.
Imatophyllum Aitoni. Hypoxis stellata.
Pancratium declinatum.

OBS.—The closely allied orders *Musaceæ, Marantaceæ, Zingiberaceæ* or *Scitamineæ* possess a pollen granule of the same form and structure, which is thus characterized.

CHAR.—Circular; extine of considerable thickness, either smooth or spinous, not provided with apertures or fissures for the escape of pollen tubes, but bursting irregularly, and so exposing the intine, which elongates into a pollen tube wherever thus denuded. Plate XIV. fig. 30, 31, 32, 33.

MUSACEÆ.

Extine smooth. See Pl. XIV. fig. 30, 31.

Strelitzia humilis. Strelitzia Reginæ.

MARANTACEÆ.

Extine covered with spines, having their summits perforated, which disappear on the immersion of the pollen in water, leaving only small apertures in the surface of the now smooth extine, but the pollen tubes do not pass through these. See fig. 32, 33.

Canna Occidentalis. C. Indica.

Zingiberaceæ.

Extine covered with spines, which are permanent.

Roscoea purpurea.

Extine smooth.

Hedychium Gardnerianum. H. flavescens. H. coronarium.

VASCULARES.

EXOGENS OR DICOTYLEDONS.

Gymnosperms.

Coniferæ or Pinaceæ.

Pollen grain kidney-shaped, and according to Fritzsche furnished with three membranes; extine cracking to admit of the emission of the pollen tubes. See fig. 34, 35.

Pinus sylvestris. Pinus Nova Zealandica.
P. Pinaster. P. Tæda.

Pollen granule circular, furnished with three membranes and pollen tubes escaping by the rupture of the extine, as in the previous instance.

Juniperus communis. J. Sabina.

Taxaceæ.

Pollen granule similar to that of Juniperus.

Taxus baccata.

Angiosperms.

Dicarposæ.

Jasminaceæ, Oleaceæ, and Loganiaceæ.

Pollen grain in its dry state of an elongated form, trilobate, each lobe being separated from the others by a fissure passing through the extine; in water becoming spherical or triangular and emitting three pollen tubes; this change of form results from the approximation of each end of the granule, occasioned by the imbibition of the fluid surrounding it.

Obs.—As the above type of pollen granule occurs hereafter in families not allied to the above, in order to avoid the repetition of its characters, just enumerated, the term cylindrical will be employed to designate it when again met with. Although the same *type* of granule is of frequent occurrence, it is not to be inferred that it agrees either with that of the above orders or any others in its exact form or size, which varies considerably. It is to be regretted that the size of all granules of the above form has not been ascertained.

Jasminum odoratissimum. Olea europæa.
Ornus europæa. Gærtnera racemosa.
Syringa vulgaris.

Apocynaceæ.

Primary form of pollen granule cylindrical, very large, but when taken from the stigma spherical, from the imbibition of the abundant secretion furnished by that organ.

Allamanda cathartica.	Vinca herbacea.
Plumeria conspicua.	V. rosea.

Pollen grain spherical when removed from the stigma and furnished with four pollen tubes. Pl. XIV. fig. 37.

Nerium Oleander.

Gentianaceæ.

Pollen grain cylindrical, three-lobed.

Chironia pubescens. Gentianella cruciata. Gentiana asclepiadea.

Solanaceæ.

Cylindrical, three-lobed. Pl. XIV. fig. 38, 39, 40, 41, 42.

Hyoscyamus niger.	Saracha viscosa.
H. pallidus.	Atropa belladonna.
Petunia atropurpurea.	Physalis oxalidifolia.
P. violacea.	P. Alkekengi.
P. rosea.	Solanum Dulcamara.
Lycopersicum erythrocarpum.	S. stramonifolium.
Datura Stramonium.	Capsicum annuum.

Many of the granules of the two following species are four-lobed.

Nicotiana Tabacum.	Solanum tuberosum.

Scrophulariaceæ.

Pollen grain cylindrical, three-lobed. See fig.43.

Buddleia globosa.	Franciscea mutabilis.
Veronica longifolia.	Schizanthus pinnatus.
V. Chamædrys.	Rhodochiton volubile.
Gratiola officinalis.	Antirrhinum majus.
Mimulus guttatus.	Linaria pilosa.
M. elatus.	L. genistoides.
M. roseus.	L. purpurea.
Digitalis purpurea.	L. dalmatica.
Russelia juncea.	Scrophularia nodosa.
Penstemon pubescens.	S. aquatica.
P. pentaphyllum.	Alonsoa urticifolia.
P. speciosum.	Calceolaria elegans.
P. diffusum.	Celsia Cretica.
Anthocercis albicans.	Verbascum Phœniceum.
Franciscea Hopeana.	V. Thapsum.

Exception.

Pollen granules united in fours, three upon the same plane and one resting on these; the three lower granules appear to emit but two pollen tubes, the third being most probably suppressed by the union of the granules, while the upper one sends off three tubes; those in the lower grains issue opposite to each other near the point of juncture of the granules, while those of the upper one are given off at equal distances round the circumference, alternating with the others. See fig. 44. This form seems to result from the union of four of the preceding granules.

Salpiglossis atropurpurea.

GESNERACEÆ.

Gloxinia speciosa. Gesnera bulbosa.
Trevirania coccinea. G. Douglassii.

ACANTHACEÆ.

Pollen granules cylindrical, not diminishing in size towards either extremity; ends rounded; extine perforated apparently with minute apertures. Pollen tubes three, issuing through longitudinal fissures. Pl. XIV. fig. 45.

Justicia variabilis.

Pollen grain of an oval form, with but one longitudinal fissure and one pollen tube issuing from the smaller end. The comparison of pollen of this form to a *Pholas* is not inapt. See fig. 46.

Acanthus spinosa.

Circular, surface presenting a lobulated appearance, the lobes being separated by lines which cross each other, in some of which fissures are placed for the escape of the pollen tubes. See fig. 47.

Thunbergia alata.

Pollen grain in its dry state cylindrical; when moist nearly circular, reticulated, reticulation apparently formed in the same way as that of *Cobæa scandens*. See fig. 48.

Eranthemum pulchellum.

BIGNONIACEÆ.

Pollen grain cylindrical, three-lobed.

Eccremocarpus scaber. Bignonia radicans.

DUCAMENTOSÆ.

MYOPORACEÆ.

Pollen grain cylindrical, three-lobed.

Myoporum parviflorum.

VERBENACEÆ.

Pollen grain cylindrical, three-lobed.

Lantana Sellowii. Clerodendrum florabundum.
Verbena teucroides. Aloysia citriodora.

Pollen grain of considerable size, triangular, sides of triangle much incurved, furnished with three membranes, the second of which, or exintine, protrudes through the apertures in the extine, forming at each angle of the figure a prominent rounded projection; a pollen tube of large dimensions issues from each angle. Extine covered with a number of oval-looking bodies. See fig. 49, which exhibits an abnormal form of the pollen granule of Stachytarpheta mutabilis.

Stachytarpheta mutabilis. S. Jamaicensis.

LABIATÆ OR LIMARIACEÆ.

Pollen grain cylindrical, three-lobed.

Teucrium lucidum. T. pyrenaicum.

Molluccella lævis.
Marrubium vulgare.
Ballota nigra.
Sideritis fœtida.
S. taurica.
Stachys iberica.
S. setifera.
Stachys coccinea.
Galeobdolon luteum.
Physostegia virginica.
Dracocephalum speciosum.
Westringia ermicola.
Scutellaria galericulata.
S. lupulina.

Many of the granules of *Sideritis scordioides* are four-lobed.

Pollen grain oval, six-lobed, resembling a melon, changing its form in water and emitting six pollen tubes. See fig. 51, 52.

Gardoquia multiflora.
Origanum heracleoticum.
Glechoma hederacea.
Monarda didyma.
Salvia splendens.
S. Sclarea.
Ocimum basilicum.

Cylindrical, three-lobed.

Lycopus europæus.

Boraginaceæ.

Pollen granule of an elongated form with either rounded or truncated extremities, centre constricted in its dry state. See Pl. XIV. fig. 53, 54, and Pl. XV. fig. 55, 56, 57, 58.

Pollen tubes two, opposite each other, issuing from longitudinal fissures placed near the centre of the figure. See fig. 53, 54.

Symphytum officinale. Cerinthe aspera. C. major.

Pollen tubes ten; pollen granule before the emission of the tubes becoming circular. Pl. XV. fig. 55, 56, 57, 58.

Borago officinalis.

Number of pollen tubes not known.

Myosotis palustris.

Pollen tubes four.

Anchusa semperflorens. Cynoglossum pictum?

Pollen granule three-lobed, pyramidal.

Onosma echioides. Echium fruticosum.

Hydrophyllaceæ.

Cylindrical, three-lobed. See fig. 59.

Phacelia bipinnatifida.
Eutoca viscosa.
Eutoca multiflora.
E. Wrangelana.

Pollen granule small, triangular, sides of triangle straight; pollen tubes three. See fig. 60.

Nemophila phacelioides. N. atomaria. N. insignis.

Aggregosæ.

Plumbaginaceæ.

Pollen granule reticulated, in its dry state cylindrical, when moist somewhat triangular, with the sides of the triangle curved outwards to some extent; pollen tubes three, issuing from the angles of the grain. See fig. 61.

Armeria vulgaris. Statice latifolia. S. tartarica.
Statice sinuata. S. speciosa.

Pollen granule of large size, not reticulated, cylindrical, three-lobed in its dry state, when moist nearly circular; between each lobe is a fissure, in connexion with which is a small strip of membrane. Pl. XV. fig. 62, 63.

Plumbago rosea. P. cærulea.

PLANTAGINACEÆ.

Pollen granule small, circular, perforated with about ten apertures for the escape of pollen tubes. It is probable that the number of apertures in each granule is determinate, but it is no easy matter to ascertain what that is exactly. See fig. 64.

Plantago lancifolia. P. oblongifolia.

DIPSACEÆ.

Pollen granule three-lobed in its dry state, extremities not tapering and nearly truncate; in connexion with each of the fissures is almost invariably a piece of membrane of not any very defined form; extine spinous, with traces of reticulation; in water becoming nearly triangular and emitting three pollen tubes.

Scabiosa caucasica. Dipsacus fullonum.
S. atropurpurea. D. sylvestris.

COMPOSITÆ.

Pollen granule of the following species of *Cynaraceæ* does not differ materially from that of the preceding order *Dipsaceæ*; the spines are however more strongly marked. See fig. 65, 66.

Centaurea scabiosa. Arctium Lappa.
Cnicus Marianus. Echinops sphærocephalus.
C. nutans. Cynara scolymus.
C. tenuiflorus.

Pollen granule polyhedral, emitting three pollen tubes; extine covered with a raised hexagonal reticulation of some breadth, on which are placed a number of spines touching each other. See fig. 67.

Scorzonera hispanica.

Pollen grain small, if examined in a sufficiently early stage of its formation trilobate; subsequently becoming spherical or triangular and emitting three pollen tubes; extine covered with strong spines. No pieces of membrane in connexion with the fissures. See fig. 68, 69.

Leontodon Taraxacum. Pascalia glauca.
Siegesbeckia orientalis. Silphium cornutum.
Catananche cærulea. Helianthus annuus.
Relhania pungens. Dahlia glabrata.
Senecio nemorensis. Inula Helenium.
Ozothamnus cinereus. Solidago Virgaurea.
Tanacetum vulgare. Tussilago Farfara.
Artemisia vulgaris. Eupatorium purpureum.
Chrysanthemum viscosum. Chrysocoma coma-aurea.
Anthemis nobilis. Cineraria Andersonii.
Bellis perennis.

EPIGYNOSÆ.

STELLATÆ OR GALIACEÆ.

Pollen granule oval, extine containing about eight longitudinal fissures. See fig. 70, 71.

Crucianella stylosa. Galium porrigens.

Caprifoliaceæ.

Pollen granule large, cylindrical, three-lobed; extine of *Leycesteria formosa* dotted with a few small spines.

Viburnum Lantana. Sambucus Ebulus. Leycesteria formosa.

Cinchonaceæ.

Pollen granule cylindrical, three-lobed in its dry condition. See fig. 73, 74.

Serissa fœtida. Pavetta Caffra. Burchellia capensis.

Pollen granules of *Oxyanthus speciosus* united in fours in the same manner as those of *Salpiglossis atropurpurea*, from which I cannot discover that they differ in any more material respect than size. See fig. 72.

Goodeniaceæ.

Pollen grain flattish, somewhat triangular, united in fours, the union of which forms an oval figure; each of the two lateral granules, which are somewhat larger and more in contact with each other than those which form the ends of the oval figure, contain eight apertures for the passage of pollen tubes, one placed at each free angle of the granule, and three on either surface, while the end ones have each but six apertures, one at each free angle and two on either surface. See fig. 75.

Lechenaultia formosa.

Campanulaceæ.

Pollen granule spherical; pollen tubes varying from three to five, and issuing from apertures placed upon the equator of the granule. Extine slightly spinous. See fig. 76, 77.

Campanula pyramidalis. Campanula Speculum.
C. pumila alba. C. rotundifolia.
C. patula.

Lobeliaceæ.

Cylindrical, three-lobed. See fig. 78.

Siphocampylus bicolor. Lobelia decumbens. L. erinus.
Lobelia teucroides. L. ignea.

Monopetalæ.

Polycarposæ.

Cobæaceæ, Don.

Pollen granule globular, covered with an elevated hexagonal reticulation, which is apparently formed by the apposition of a number of elongated cells placed vertically in reference to the circumference of the granule; apertures amounting to about forty, each being situated in one of the hexagonal spaces formed by the reticulation, and surrounded by a circle of six hexagonal spaces not perforated with apertures. The sides of those hexagons in which apertures are placed are all of equal length, while the unperforated ones have three short and three long sides. Pl. XV. fig. 79.

Cobæa stipularis. Cobæa scandens.

Polemoniaceæ.

Pollen granule describing a circular flattened disc; pollen tubes eight, issuing from apertures placed upon the equator of the granule. Pl. XVI. fig. 80.

Collomia grandiflora. Collomia coccinea.
C. rosea. C. lateritia.

Pollen granule spherical; extine perforated with about sixteen apertures, which are scattered irregularly over its surface. See fig. 81.

Gilia achilleæfolia. Leptosiphon densiflorus.
G. tricolor. L. androsaceus.
G. capitata. Polemonium cæruleum.

Pollen granule reticulated, spherical, apertures about fourteen. See fig. 82.

Phlox acuminata. Phlox Drummondii.
P. paniculata. P. undulata.

Pollen granule reticulated; pollen tubes six or seven, issuing from apertures placed upon the equator of the granule. See fig. 83, 84.

Ipomopsis elegans.

CONVOLVULACEÆ.

Pollen granule cylindrical, three-lobed, but quite characteristic. See fig. 85, 86.

Convolvulus farinosus. Convolvulus pentanthus.
C. arvensis. C. Scammonia.

Pollen granule spherical, extine perforated with very large apertures. See fig. 87.

Calystegia arvensis.

Extine covered with spines; in other respects the pollen granule same as that of the preceding species. See fig. 88.

Ipomæa Sellowii. Ipomæa purpurea. Convolvulus major.
I. Horsfalliæ. I. insignis.

NOLANACEÆ.

Pollen granule cylindrical, three-lobed. See fig. 89.

Nolana paradoxa.

AQUIFOLIACEÆ.

Pollen granule cylindrical, three-lobed.

Ilex Aquifolium.

EBENEACEÆ.

Pollen granule cylindrical, three-lobed.

Cargillia australis.

PRIMULACEÆ.

Pollen granule cylindrical, three-lobed. See fig. 90.

Anagallis arvensis. Primula vulgaris.
Primula Sinensis. Cyclamen autumnale.

EPACRIDIACEÆ.

Pollen granules permanently united in fours, three being placed upon the same plane and one upon these; three pollen tubes (the emission of which is produced artificially with great difficulty) in each granule, which issue in pairs opposite to each other. See Pl. XVI. fig. 91.

Epacris grandiflora.

ERICACEÆ.

Pollen granule resembling that of the preceding order.

Kalmia latifolia.
Azalia indica.
Rhododendron ponticum.
R. maximum.
R. caucasicum.
Sedum latifolium.
Gaultheria procumbens.
Gaultheria Shallon.
Arbutus Unedo.
Andromeda multiflora.
Menziesia Daboeci.
Erica multiflora.
E. vulgaris.

Pollen granule cylindrical, three-lobed.

Clethra ferruginea.

BREXIACEÆ.

Pollen granule cylindrical, three-lobed.

Brexia spinosa.

CURVEMBROSÆ.

NYCTAGINACEÆ.

Pollen granule very large, spherical; extine perforated with from forty to fifty apertures. See fig. 92.

Mirabilis Jalapa.

TUBIFEROSÆ.

PROTEACEÆ.

Pollen granule elongated, curved, furnished with three membranes; pollen tubes two, one from each extremity of the granule. See fig. 93.

Dryandra formosa.
D. longifolia.
D. armata.
Banksia verticillata.
B. speciosa.

Pollen granule furnished with three membranes; triangular pollen tubes three, one from each angle. See fig. 94, 95, 96, 97, 98.

Lambertia formosa.
Hakea pedunculata.
H. pugioniformis.
Grevillea linearis.
Grevillea sulphurea.
Anadenia Manglesii.
Isopogon anemonifolium.

THYMELACEÆ.

Cylindrical, three-lobed.

Pimelea hispida.
P. decussata.
Daphne Mezereum.
D. Laureola.

ACHLAMYDOSÆ.

SALICACEÆ.

Cylindrical, three-lobed.

Salix viminea.

RECTEMBRYOSÆ.

JUGLANDACEÆ.

Pollen granule spherical; pollen tubes seven, usually issuing through apertures placed in a line round the centre of the granule. See fig. 99.

Juglans regia.

Ulmaceæ.

Pollen granule spherical, emitting five pollen tubes.

Ulmus campestris.

Urticaceæ.

Pollen granule spherical, emitting three pollen tubes. See fig. 100.

Parietaria officinalis. Urtica dioica.

Betulaceæ.

Pollen granule either circular or quadrangular, according as three or four pollen tubes are emitted from it.

Alnus glutinosa. Betula alba.

Cupuliferæ or Corylaceæ.

Pollen granule cylindrical, three-lobed.

Quercus robur. Castanea vesca. Ostrya vulgaris.

The majority of granules in *Ostrya vulgaris* are four-lobed.

Pollen granule nearly spherical, furnished with three membranes, and emitting three pollen tubes.

Corylus Avellana.

Apocarposæ.

Crassulaceæ.

Pollen granule cylindrical, three-lobed. See fig. 102.

Sedum glaucum. Crassula coccinea.

Saxifragaceæ.

Pollen granule cylindrical, three-lobed.

Heuchera americana. Adamia cyanea.
Saxifraga longifolia. Hydrangea nivea.
S. umbrosa.

Baueraceæ.

Pollen granule cylindrical, three-lobed. See fig. 103.

Bauera rubioides.

Leguminosæ or Fabaceæ.

Rectembriæ.

Tribe Mimoseæ.

Pollen granules very small, united in fours or multiples of four up to sixteen. See fig. 104, 105, 106, 107.

Pollen granules united in fours, spherical, three upon the same plane and one resting on these. See fig. 104.

Mimosa Mexicana. Mimosa marginata.

Pollen granules cohering in eights, each emitting two pollen tubes, the third being suppressed by the union of the granules. See fig. 105.

Acacia rigens.

Pollen granules cohering in twelves. See fig. 106.

Acacia decipiens. Acacia ciliata.
A. nigricans. A. pulchella.

Pollen granules cohering in sixteens. See fig. 107.

Acacia undulæfolia. Acacia trigonocarpa. Acacia sulcata.
A. marginata. A. Lophantha. A. linearis.
A. decurrens glauca. A. flavescens. A. ruscifolia.

Cæsalpineæ.

Pollen granule cylindrical, three-lobed.

Cassia australis.

Papilionaceæ.

Pollen granule elongated, more or less prismatic, with three fissures for the escape of pollen tubes. See fig. 108.

Pterocarpus erinaceus. Trifolium pratense.
P. echinatus. Medicago arborea.
Faba vulgaris. Anthyllis polycephalus.
Pisum sativum. Ononis hircina.
Hedysarum Onobrychis. Cytisus capitatus.
Astragalus virescens. Genista tinctoria.
Swainsonia alba. Spartium scoparium.
Colutea arborescens. Lupinus luteus.
Indigofera psoraloides. Viminaria denudata.
Psoralea glandulosa. Virgilia capensis.
Callistachys ovata. Sophora racemosa.
Lotus corniculatus.

Pollen granule provided with three membranes, triangular, sides nearly straight. See fig. 109.

Erythrina laurifolia.

Amygdaleæ.

Pollen granule cylindrical, three-lobed.

Amygdalus persica. Prunus Cerasus. Armeniaca vulgaris.
A. lævis. P. domestica.

Pomeæ.

Pyrus Malus. P. communis.

Rosaceæ.

Spiræa ulmifolia. Agrimonia nepalensis. Fragaria vesca.
S. ariæfolia. Geum sinense. Rosa bracteata.
S. Ulmaria. Potentilla anserina. Rubus fruticosus.
Agrimonia Eupatoria. P. argentea.

Many of the granules in *Rosa bracteata*, and nearly all of *Rubus fruticosus*, are four-lobate.

Gynobaseosæ.

Limnanthaceæ.

Pollen granule reticulated, bent twice nearly at right angles; pollen tubes three, one issuing from each end and one from the centre of the granule. Pl. XVI. fig. 110, 111.

Limnanthus Douglassii.

Surianaceæ.

Pollen granule cylindrical, three-lobed.

Cneorum tricoccum.

Tropæoleæ.

Pollen granule cylindrical, three-lobed.

Tropæolum peregrinum. Tropæolum majus.

Balsaminaceæ.

Pollen granule elongated, quadrilateral, and emitting a pollen tube at each angle. Pl. XVII. fig. 112.

Impatiens noli me tangere. I. glandulifera. I. parviflora.

Geraniaceæ.

Pollen granule very large, somewhat spheroid in its moist condition, emitting three pollen tubes. See fig. 113.

Geranium sylvaticum. Pelargonium peltatum.

Rutaceæ.

Pollen granule cylindrical, three-lobed.

Correa alba. Ruta graveolens.

Alsinaceæ.

Pollen granule spherical; extine perforated with about ten apertures, placed nearly at equal distances from each other. See fig. 114.

Dianthus barbatus. D. deltoides. Gypsophila elegans.

Silenaceæ.

Pollen granule same as the preceding.

Silene Armeria. Silene vespertina. Saponaria officinalis.
S. inflata. Saponaria viscida.

Portulacaceæ.

Pollen granule cylindrical, three-lobed. See fig. 115.

Calandrinia speciosa. C. discolor.

Malpighiaceæ.

Pollen granule spherical, pollen tubes about sixteen. See fig. 116.

Malpighia punicea.

Celastraceæ.

Pollen granule cylindrical, three-lobed.

Celastrus Pyracanthus.

Euphorbiaceæ.

Pollen granule cylindrical, with three lobes.

Ricinus communis.

Rhamnaceæ.

Pollen granule small, triangular, furnished with three membranes. Pl. XVII. fig. 117.

Zizyphus Paliurus.

Pollen granule cylindrical, three-lobed.

Ceanothus pallidus.

AURANTIACEÆ.

Pollen granule, in its primary condition, four-lobate; subsequently it becomes circular, and emits four pollen tubes. See fig. 118.

Citrus Aurantium. C. Limonium.

LYTHRACEÆ.

Pollen tube cylindrical, three-lobed.

Lythrum Salicaria. Cuphea viscosa.

TILIACEÆ.

Pollen granule spherical, furnished with three membranes; extine not covering entirely the exintine. See fig. 119.

Tilia europæa. Tilia americana.

MALVACEÆ.

Pollen granule globular; extine reticulated, spinous, and perforated with apertures, fitting into which, in many species, are circular detached pieces of membrane; apertures very numerous, amounting in some genera to between fifty and sixty; each reticulum is the seat of either a spine or an aperture. See fig. 120.

Hibiscus liliflorus. Althæa officinalis.
H. syriacus. Malva sylvestris.
H. annuus. M. fragrans.
Pavonia præmorsa. M. virgata.
Lavatera acerifolia. Kitaibelia vitifolia.

Pollen granule with but three pollen tubes. See fig. 121.

Aubutilon striatum.

CISTACEÆ.

Pollen granule cylindrical, three-lobed.

Cistus Helianthemum.

LINACEÆ.

Pollen granule somewhat square, emitting six pollen tubes, one from each angle of the figure, and one on either surface. See fig. 122. Linum usitatissimum.

Cylindrical, three-lobed.

Linum africanum.

ÆSCULACEÆ.

Pollen granule cylindrical, three-lobed.

Æsculus hippocastanus.

ACERACEÆ.

Pollen granule cylindrical, three-lobed.

Acer Pseudo-platanus.

POLYGALACEÆ.

Primary form of pollen granule cylindrical, fluted; extremities truncate, in water becoming spherical and emitting about twenty pollen tubes. Pl. XVII. fig. 123, 124, 125.

Muraltia filiformis. Polygala myrtifolia.
M. Myxta. P. speciosa.
Polygala grandiflora. P. Chamæbuxus.

Parietosæ.

Hypericaceæ.

Cylindrical, three-lobed. See fig. 126.

Hypericum hircinum.

Turneraceæ.

Pollen granule cylindrical, three-lobed.

Turnera elegans.

Passifloraceæ.

Pollen granule spherical, reticulated, and provided with three large valves, first noticed by Purkinje. See fig. 127.

Passiflora cærulea. P. cærulea, var. racemosa. P. alata.

Violaceæ.

Pollen granule of an elongated form, four-sided, with square truncate extremities; in water it changes its shape and becomes square in outline, emitting four pollen tubes which issue from fissures concealed in the dry granule, one in each of the lines which separate the four sides of the figure. The change of form arises from the approximation of the ends of the granule occasioned by the water which it imbibes, which stretches the membrane, which can only yield in one direction. See fig. 128, 129.

Viola tricolor.

Pollen granule cylindrical, three-lobed. See fig. 130, 131.

Viola montana.

Resedaceæ.

Cylindrical, three-lobed.

Reseda odorata.

Capparidaceæ.

Pollen granule cylindrical, three-lobed.

Cleome spinosa.

Cruciferæ or Brassicaceæ.

Pollen granule three-lobed, cylindrical. See fig. 132, 133.

Heliophila arabioides. Alyssum maritimum.
Sinapis alba. Cheiranthus Cheiri.
Brassica oleracea. C. mutabilis.
Iberis alba. Matthiola incana.

Epigynosæ.

Begoniaceæ.

Pollen granule same as the preceding.

Begonia glabrata.

Ficoideæ or Mesembryaceæ.

Pollen granule cylindrical, three-lobed.

Mesembryanthemum reflexum.

Cactaceæ.

Pollen granule same as the preceding.

Opuntia vulgaris.

LOASACEÆ.

Pollen granule cylindrical, three-lobed.

Bartonia aurea.

CUCURBITACEÆ.

Pollen granule cylindrical, three-lobed. See fig. 134.

Momordica Elaterium.

HAMAMELACEÆ.

Pollen granule cylindrical, three-lobed.

Trichocladus crinitus.

CORNACEÆ.

Pollen granule cylindrical, three-lobed.

Cornus canadensis. Aucuba japonica.

MYRTACEÆ.

Pollen granule cylindrical, three-lobed.

Punica Granatum. Leptospermum ambiguum.

Pollen granule triangular, that of *Calothamnus villosus* possessing three membranes, and the extine of *Angophora racemosa* exhibiting three radiating lines upon its surface. Pl. XVII. fig. 135, 136, 137.

Melaleuca hypericifolia. Angophora cordata.
Calothamnus villosus. Tristania neriifolia.
Angophora racemosa.

MELASTOMACEÆ.

Pollen granule cylindrical, three-lobed.

Melastoma corymbosa. M. heteromalla. Arthrostemma lineata.

ONAGRACEÆ.

Pollen granule furnished with four membranes; either triangular, and emitting three pollen tubes, one from each angle; or cylindrical, and sending forth two pollen tubes; this difference of form arising merely from the suppression of one of the pollen tubes. Generally separate, but sometimes united in threes or fours.

Pollen granule triangular, separate.

Lopezia coronata. L. racemosa. Gaura biennis.

Pollen granule united in threes.

Epilobium hirsutum.

Pollen granule united in fours. Pl. XVIII. fig. 138.

Epilobium roseum.

Pollen granule triangular, separate. See fig. 139, 140, 141.

Epilobium angustifolium. Œnothera biennis.
Clarkia elegans. Œ. quadrivalva.
C. pulchella. Œ. suffruticosa.
Godetia rubicunda. Œ. Drummondii
Œnothera serotina.

Pollen granule triangular, separate. See fig. 142.

Fuchsia coccinea. Fuchsia globosa major.
F. gracilis. F. conica.
F. grandiflora. F. lycioides.
F. longipedunculata.

OBS.—Many of the pollen granules of some hybrid *Fuchsia* appear to acquire a fourth pollen tube, and hence become of a square form. Pl. XVIII. fig. 143.

Fuchsia Devonia. F. Clintonia. F. Atkinsonia.

Pollen granule cylindrical, a pollen tube issuing from either extremity. See fig. 144, 145.

Fuchsia fulgens.	Fuchsia Thymifolia.
F. corymbifera.	F. cylindrica.

Albuminosæ.

Francoaceæ.

Pollen granule cylindrical, three-lobed.

Francoa racemosa.

Vitaceæ.

Pollen granule cylindrical, three-lobed.

Vitis vinifera.

Berberaceæ.

Pollen granule cylindrical, three-lobed.

Epimedium alpinum.

Escalloniaceæ.

Pollen granule cylindrical, three-lobed.

Escallonia rubra.

Grossulaceæ.

Pollen granule in its dry state obscurely six-lobed, and when moist becoming circular and emitting six pollen tubes.

Ribes grossularia. Ribes rubrum.

Araliaceæ.

Pollen granule cylindrical, three-lobed.

Hedera Helix. Aralia sambucifolia.

Umbelliferæ or Apiaceæ.

Pollen granule most probably furnished with three membranes, of a prismatic form in its dry state, with slightly contracted sides, becoming in water cylindrical, with rounded ends, and emitting three pollen tubes, which issue from fissures placed in the angles of the prism. See fig. 146, 147, 148.

Conium maculatum.	Œnanthe crocata.
Daucus Carota.	Œ. fistulosa.
Pastinaca sativa.	Bupleurum rotundifolium.
Anethum fœniculum.	B. fruticosum.

Pollen granule cylindrical, ends rounded, three fissures for the pollen tubes; form but slightly changed by water. See fig. 149.

Eryngium alpinum. Didiscus cæruleus.

Dilleniaceæ.

Pollen granule cylindrical, three-lobed.

Hibbertia dentata. Candollea cuneiformis.

Magnoliaceæ.

Pollen granule elliptical, tapering towards either extremity, *with a single furrow* running down its long axis. Pl. XVIII. fig. 150.

Magnolia grandiflora. Magnolia glauca.

Nymphæaceæ.

Pollen granule oval, with but a *single furrow* passing down one side. See fig. 151, 152.

Nymphæa alba. Nymphæa lutea.

Fumarieæ.

Pollen granule furnished with three membranes, spheroidal; extine perforated with six apertures for the passage of pollen tubes; four of these are placed on a line dividing the granule into two hemispheres, in the centre of each of which one of the two remaining apertures is situated. See fig. 153.

Fumaria officinalis. F. lutea. Diclytra formosa.

Obs.—Most of these granules in the last two species appear to be imperfectly formed, having but three or four pollen tubes; but the presence of three membranes in them all, and the occasional appearance of a perfectly formed granule, prove that there is no essential difference in the pollen of the three species.

Papaveraceæ.

Pollen granule cylindrical, three-lobed.

Papaver Rhœas. Argemone mexicana.
P. somniferum. Glaucium luteum.

Pollen granule spherical, with six fissures for the escape of pollen tubes. See fig. 154, 155.

Eschscholtzia californica.

Ranunculaceæ.

Pollen granule cylindrical, three-lobed.

Pæonia corallina. Helleborus fœtidus.
Aconitum Napellum. H. niger.
Delphinium Staphysagria. Thalictrum minus.
Aquilegia vulgaris. Clematis Flammula.

Pollen granule mostly four-lobed, cylindrical, in water becoming square and emitting four pollen tubes. See fig. 156, 157, 158.

Ranunculus acris.

Obs.—The term cylindrical, as applied to that form of pollen granule distinguished by the presence of three furrows, which divide it into three more or less prominent lobes, is perhaps objectionable, inasmuch as it is not properly cylindrical, and should have been removed for a more appropriate one, were it not that it has already been employed in that portion of the paper already published. All that is intended to be conveyed by the term is, that all pollen to which it is applied is of an elongated form.

One of the first things to be remarked, on a review of the preceding descriptions, is the great and striking simplicity of form and structure which characterizes the pollen of endogenous plants, compared with exogenous; and not alone is this difference observable between the pollen of the two grand classes of the vegetable kingdom, but it will be further noticed, that the more or less complex structure of the pollen bears some reference to the station of the plant in these divisions, especially in the monocotyledonous; a fact hitherto denied by all vegetable microscopists who have paid attention to the subject, but one which can scarcely again be called in question after the very conclusive evidence of its truth furnished in the antecedent pages.

The pollen granule of *Cyperaceæ* and *Graminaceæ* is either oval or spherical (the simplest forms in nature), and has but a single pollen tube. Mounting a step higher to the *Typhaceæ* and *Juncaceæ*, we meet with the same type and structure of granule; but instead of being separate, as in the *Graminaceæ* and *Cyperaceæ*, the grains are united in fours. In *Calla* the form is oval, and a pollen tube issues from either end. In the genus *Butomus*, in the *Liliaceæ*, *Melanthaceæ*, *Bromeliaceæ*, *Iridaceæ*, and *Amaryllidaceæ*, it is more complex; each grain is of an elongated shape, tapering almost to a point towards either extremity, with a furrow running down one side, from which, however, only a single pollen tube issues, as in the *Cyperaceæ* and *Graminaceæ*. In *Zingiberaceæ*, *Marantaceæ*, and *Musaceæ*, the form of each granule again becomes very simple; it is a perfect sphere, and the extine, which is of great thickness, contains no provision in it for the passage of the pollen tubes, but possesses the power of cracking (a peculiarity met with only in the pollen of these allied orders and that of the *Taxaceæ* and *Coniferæ*), and so allowing of their escape. In *Orchideæ* the granules are united in fours, and are likewise of a very simple structure.

The *Taxaceæ* and *Coniferæ*, which, though usually placed among dicotyledons, ought to be regarded as forming the connecting links between monocotyledons and dicotyledons, also possess pollen of a very simple form and structure, but still somewhat more complex than that of any of the preceding orders. It is here for the first time that I have met with the third membrane, which Fritzsche however mentions as existing in *Tigridia pavonia*, and Mr. Giraud in *Crocus vernus**, both monocotyledons.

We come now to a class of plants decidedly exogenous, the *Jasminaceæ*: here the pollen is much more complicated; when dry it is cylindrical, and 3-lobed; in water it becomes triangular and emits three pollen tubes; while in *Labiatæ*, an order not very far removed from the preceding, it is 6-lobed and furnished with as many pollen tubes. In the remaining

* Mr. Giraud's papers on the structure of the pollen appeared in vol. ii. p. 399. pl. XVIII., and vol. iii. p. 127 of this Journal.—Ed.

orders of dicotyledons the pollen does not indicate any regular gradation of structure, although in many of the higher families it is surprisingly complex.

So great is the difference between the pollen of Exogens and Endogens, that it alone furnishes a character by which it may be at once determined to which class any plant belongs. The pollen granule of an endogen may thus be characterized. It is either spherical, oval, or elliptical; generally, if not always, composed of two membranes, rarely possessing more than one pollen tube, and, with a single exception, never more than two. This exception occurs in *Limnocharis Humboldtii*, in which the granule is spherical, and the extine perforated with six or seven apertures for the passage of the pollen tubes. The elliptical formation of granule prevails much among monocotyledons, and has been met with in forty-four of the seventy-three genera of Endogens submitted to the microscope. An exogenous pollen granule may be thus defined: it generally presents a more complicated organization; the number of enveloping membranes is either two, three, or four; its form is various, being most commonly either three-lobed, spherical, or triangular; and it is furnished with pollen tubes varying in number, exclusive of three exceptions, from three to upwards of fifty. Of these forms the three-lobed type is of the most frequent occurrence, and is absolutely characteristic, so far as my experience goes, of an exogen, being found in 187 of the 332 genera of dicotyledons examined by me.

The exceptions occur in the genera *Acanthus* (see fig. 44.), *Dryandra*, and *Magnolia*, the last a genus so evidently dicotyledonous as not to admit a doubt of its real nature; and yet here, strange to say, the granule, so far as has been observed, perfectly resembles the elliptical form so prevalent among monocotyledons. (See fig. 150.) The pollen granule of *Dryandra*, although provided with but two pollen tubes, is curved and has *three* distinct tunics. (See fig. 93.)

We come now to the more immediate purpose of this paper, viz. to consider how far the pollen granule may be relied on as a means of classification. It has already been said that by it alone a monocotyledon may be distinguished from a dicotyledon, and hence should be carefully consulted when any doubts are entertained of the position of a plant in the vegetable kingdom. Much has been written upon the position which the *Nymphæaceæ* occupy in the vegetable kingdom; some arguing that they ought to be placed among Endogens, to which they are united by so many evident affinities,—others referring them to Exogens; but the question is as yet an undecided one among botanists, although admitting, in my opinion, of easy determination by a reference to the form and structure of the pollen granule. This would place them, as was originally done by L. C. Richard, among monocotyledons; and that this is their true station not the smallest doubt remains in my own mind, notwithstanding that the opinion of most modern botanists appears to lean in the opposite direction. The pollen granule of *Nymphæa* is oval, hispid, with a furrow down one side, and emits a single pollen tube, thus coming under the definition already given of endogenous pollen. (See fig. 151, 152.)

Mohl declares that the pollen varies extremely in form not only in genera of the same family, but also in species of the same genus; and that it even occurs that in some species the anthers contain grains "de formation assez diverses." The two latter assertions, and more especially the last one, are so contrary to the results of my own investigations, and are so opposed to all analogy and to that order and evident design that reign with such constancy throughout all the beautiful works of creation, that I should not have hesitated in confidently denying the accuracy of remarks, which would cause such confusion and chaos to hold dominion where nothing but creative skill and wisdom might have been looked for, even before I had personally examined a single granule.

With regard to Mohl's first statement, it must be admitted that the form and structure of the pollen granule does vary considerably in genera of the same family; but this is by no means the rule, which should be stated on the other side; and is, that natural orders, or sections of orders, are characterized by the possession of a pollen granule of one type, and that the more natural and more distinct the affinities of an order, the more frequently will the pollen be found characteristic of that order. That it should vary considerably in genera of the same family is nothing more than reason would lead us to anticipate; for it must be allowed that the exact limits of many of our orders are far from being satisfactorily determined, and that some of them contain genera whose true alliances are far from being clearly ascertained.

Again, the exact structure of the anthers of some of the genera forming a family will sometimes differ; and, where this is the case, it is only natural to anticipate that a corresponding deviation from the usual form of the pollen granule in that family should accompany such difference. Reference to this fact would frequently account for what otherwise might be ignorantly regarded as a senseless freak of nature, viz. the difference sometimes met with in pollen, the contents of two anthers derived from genera nearly allied, but which anthers a close inspection will disclose to be not identical in their structure.

The same type of granule is frequently found to extend through more than one allied order, and sometimes through a whole alliance; thus, among monocotyledons, we find one form extending, with slight variations of size, &c., not only through the group *Glumosæ*, but likewise through the Alliance *Typhales* and the genus *Juncus*. Another distinct form is met with in the genera *Butomus* and *Tradescantia*, from these passing through *Liliales*, *Ixiales*, *Bromeales* and *Narcissales*; and lastly, a third formation of granule occurs which connects the orders of the Alliance *Amomales*. Among dicotyledons the three-lobed form prevails through the obviously connected orders *Rosaceæ*, *Pomeæ*, *Amygdaleæ* and *Saxifrageæ*. The same type, differing only in exact form and size, unites the Alliances *Scrophulales* and *Solanales*. *Papaveraceæ* and *Cruciferæ* are also joined with each other in the form and structure of their pollen granules.

It is unnecessary to enumerate in this place the various orders and sections of orders which are characterized by the possession of a pollen granule of a peculiar and distinctive form, as all the information which can at present be given upon this subject may be learned by reference to the lists of plants examined under each order already mentioned. Further research will doubtless extend the number of these orders, clear up many apparent anomalies, and also, it may be reasonably expected, add somewhat to the number of exceptions.

The truth of Mohl's second and third assertions, contained in the statement in the preceding page, I would most distinctly deny, more especially that of the last; and in doing so I would observe, that I rely solely on the evidence which my own experience furnishes. Out of 366 genera submitted to the microscope, two exceptions only have occurred to the rule, that species of the same genus possess the same type of pollen granule; but I have little doubt future investigation will explain these isolated exceptions. The first exception occurs between two species of *Linum*, *L. usitatissimum* and *L. africanum*; in the former the granule is somewhat square, and the extine contains six perforations for the escape of pollen tubes; in the latter it is three-lobed, with three pollen tubes: the second is found in the genus *Viola*. In *Viola tricolor* the pollen is an elongated six-sided figure, emitting four pollen tubes, and in *Viola montana* and *V. odorata* it is small and three-lobed.

If the above statements be correct, it would appear that an examination of the pollen granule establishes and confirms in a remarkable manner the naturalness of many orders and sections of orders, and that where it does not go so far as this, it is to be relied on as affording a character of at least generic importance.

Now with reference to the third assertion of Mohl, that in some plants the same anther contains distinct forms of pollen, I can affirm it to be wholly and without exception incorrect. The only difference ever observed in pollen of the same species arises either from the addition to the distinguishing type, or subtraction from it—most frequently the former—of one or more pollen tubes, generally of one; an anomaly which is of frequent occurrence in some species, especially in the following, *Stachytarpheta mutabilis, Rubus fruticosus, Nicotiana Tabacum, Solanum tuberosum*; and those granules so changed are to be regarded as malformations or monstrosities, of which an instance is exhibited in fig. 50, which represents a granule of *Stachytarpheta mutabilis* thus deformed. Every organ and part of the vegetable and animal fabric is subject to similar occasional departures from normal structure.

When a number of flowers are placed together for some time in a vessel, an intermixture of the pollen of each not unfrequently occurs, so that when that of any species is examined, more than one form of pollen granule may be observed; but no person would be so careless as to suppose for a moment that these were derived from the same anther.

These monstrosities are of very frequent occurrence among hybrid species, particularly of the *Fuchsiæ*. In the *pure* species of *Fuchsia* each granule is furnished with either two or three pollen tubes; now among the pollen of *F. Standishii*, a hybrid between *F. fulgens*, whose grains of pollen have but two tubes, and another species the granules of which have three tubes, the greatest confusion seems to prevail, some of the granules having but two or three tubes, thus following the type of either parent, while others have four tubes; and many of them appear altogether abortive, and consist of nothing more than the extine, which does not even contain fovilla. Here then a satisfactory reason is afforded why the seeds of hybrid species should be so frequently unproductive, since they either have not received the influence of the degenerated pollen at all, or have so in an imperfect manner.

The same form of pollen granule met with in one order sometimes occurs in another separated from it by every point of structure; but when this does happen, most frequently a difference either in the size of the granule, the number of membranes which envelope it, or of pollen tubes which issue from it, is observable; and when no such distinction can be discovered, the family in which it occurs may be so estranged from that possessed of pollen of similar formation, as that it may serve equally as a means of distinguishing it from those orders to which it is evidently more or less closely allied.

The difference in the size of the pollen tubes of granules which in every other particular resemble each other, might of itself, were there no other cause, constitute a physical impediment to the fertilization of the seeds of one species by the pollen of another, as, on account of their magnitude, they might be unable to make their way through the intercellular passages of the style.

From all that has now been said it will be observed, that from an examination of the form and structure of the pollen granule, a useful confirmation may be gathered of the correctness of the principles upon which a natural system of classification is based. The propriety, likewise, of employing the pollen as a character, with others, in the definition of natural orders, will, I think, be at once acknowledged, as I am glad to see that it is by Dr. Lindley, who in a few cases has so employed it; but in the instances in which he has thus availed himself of it, the true structure of the pollen appears to have been either imperfectly or erroneously defined. As all the essential characters of the pollen granule of each family may be comprised in a few words, no difficulty can arise in employing it in the definitions of orders, sections of orders, or genera, on the score of its adding too much to their bulk; but, at the same time, I would observe, that great care is necessary in determining what the real structure of the pollen granule is, before venturing to make use of it; and this is not to be ascertained by a momentary examination of it on the field of the microscope, but requires frequently much patient and troublesome investigation.

For the numerous and beautiful drawings which accompany this communication, all of which have been carefully executed from rough sketches of my own, made of the object while under the microscope, I am indebted to the friendship of two ladies, Miss Hunter and Miss Nolcken, who are ever ready to lend their time and their talents to works of usefulness; and that not a little of either is requisite in undertaking the drawing of so many illustrations, will be readily allowed. About two-thirds of them were done by the latter lady, and the remainder by the former.

It now only remains for me to acknowledge the great obligation I am under to Mr. Smith of the Royal Botanic Gardens * at Kew, for the privilege so readily granted of ob-

* Under the active management of their present director, Sir William Hooker, as well as that of Mr. Smith, the usefulness and efficiency of these Gardens will doubtless be much increased.

taining flowers for the purposes of my inquiry, without which the extent of my investigations must have been much narrowed. My best thanks are likewise due to Dr. Lindley, to Mr. Loddiges, and Mr. Anderson of the Chelsea Gardens, for a similar favour ; but more particularly are they due to Dr. Lindley. To Mr. Choules of the Kew Botanic Gardens I am also much indebted for the correction and revision of the list of species.

I have now brought to a termination but one of a series of papers which it is my intention, if health and time permit, to publish on the subject of the pollen granule.

EXPLANATION OF THE PLATES.

All the figures are drawn to the same scale, and exhibit the relative sizes of the pollen granules.

Plate XIII.

Fig. 1. Pollen granule of Cyperus longus.
2. —— ——— of Papyrus Antiquorum.
4. —— ——— of Zea Mays.
5. —— ——— of Typha latifolia.
6. —— ——— of Calla palustris.
7. —— ——— of Calla æthiopica.
8. —— ——— of Juncus lacustris.
9. —— ——— of Limnocharis Humboldtii.
10. —— ——— of Tradescantia ; side view.
11, 12. Pollen granule of Asparagus officinalis ; 11, front view, exhibiting the single furrow with which it is furnished ; 12, end view.
13, 14, 15. Pollen granule of Lilium longiflorum ; 13, front views ; 14, end ditto ; 15, the appendage which rests upon and partly conceals the furrow.
16. Pollen granule of Watsonia irioides.
17, 18, 19. Represent three views of the pollen granule of Anigozanthus coccineus ; 17, front aspect ; 18, side ditto ; and 19. exhibits its form when upon the stigma and just about to emit its two pollen tubes.
20, 21, 22, 23. Represent the pollen granule of Crinum amabile ; 20, front view ; 21, a section of the granule ; 22, the form which it assumes previous to the emission of the pollen tubes ; 23, one of the appendages to the furrows.
24, 25, 26 : 24, front view of the pollen granule of Pancratium declinatum ; 25, side view ; 26. exhibits the intine with its contents just escaping through the fissure in the extine ; 24 *a*, appendage.

Plate XIV.

Fig. 30, 31. Pollen granule of Strelitzia humilis ; 31. shows the manner in which the extine cracks either on coming in contact with solutions of the mineral acids or when applied to the stigma.
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46. —— ——— of Acanthus spinosa.

47. —— ——— of Thunbergia alata.

48. —— ——— of Eranthemum pulchellum.

49. Represents the pollen granule of Stachytarpheta mutabilis.

51, 52. Two views of the pollen granule of Monarda didyma : the first represents it as it appears in its dry state ; the second, the change of form which it assumes prior to the emission of the pollen tubes, and which arises simply from the approximation of the two extremities of the first figure (the resemblance of which to a melon is striking), and the protrusion of the intine through the extine ; this approximation being due to the operation of the principle of endosmosis.

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60. —— ——— of Nemophyla insignis.

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62, 63. Pollen granule of Plumbago cærulea in its dry and moist conditions. A small valvular strip of membrane, not represented in the figure, is placed over each of the three furrows.

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72. Shows the mode of union and structure of the pollen granules of Oxyanthus speciosa.

73, 74. Pollen granule of Burchellia capensis ; 73, in its primary, and 74, in its moist condition.

75. Shows the structure and arrangement of the pollen granules of Lechenaultia formosa.

76, 77. The first figure represents the pollen granule of Campanula pyramidalis, with the pollen tubes just emerging through the apertures in the extine ; the second that of Campanula patula, with the pollen tubes in the same condition.

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79. —— ——— of Cobæa stipularis.

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Fig. 80. Pollen granule of Collomia grandiflora.

81. —— ——— of Gilia tricolor.

82. —— ——— of Phlox Drummondii.

83, 84. Pollen granule of Ipomopsis elegans.

85, 86. —— ——— of Convolvulus arvensis in its dry and moist conditions.

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88. —— ——— of Ipomæa Sellowii.
89. —— ——— of Nolana paradoxa.
90. —— ——— of Cyclamen autumnale.
91. —— ——— of Rhododendron maximum, showing its structure and the mode of cohesion of the granules.
92. Pollen granule of Mirabilis Jalapa.
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108. —— ——— of Colutea arborescens in its dry state.
109. —— ——— of Erythrina laurifolia, showing its 3 membranes.
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Fig. 112. Pollen granule of Impatiens noli me tangere.
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114. —— ——— of Dianthus caryophyllus.
115. —— ——— of Calandrinia discolor.
116. —— ——— of Malpighia punicea.
117. —— ——— of Zizyphus Paliurus.
118. —— ——— of Citrus Aurantium as it appears upon the stigma: in its dry state it is of an elongated form and four-lobed.
119. Pollen granule of Tilia europæa. Three membranes only should have been represented in the figure instead of four.
120. Pollen granule of Lavatera acerifolia.
121. —— ——— of Aubutilon striatum.
122. —— ——— of Linum usitatissimum.
123, 124, 125. Pollen granule of Polygala grandiflora; 123, in its primary; and 124, 125, in its secondary forms.
126. Pollen granule of Hypericum hircinum.
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130, 132. Pollen granule of Viola montana in its dry and moist conditions.
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134. Pollen granule of Momordica Elaterium in its primary form.
135. —— ——— of Calothamnus villosus.
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Plate XVIII.

Fig. 138. Shows the mode of union and structure of the pollen granules of Epilobium roseum.

Fig. 139. Pollen granule of Epilobium angustifolium.

140, 141. Pollen granule of Godetia rubicunda; 141. exhibits the extine separated from the other membranes.

142. Pollen granule of Fuchsia coccinea.

143. —— ——— of Fuchsia Devonia.

144. —— ——— of Fuchsia fulgens.

145. —— ——— of Fuchsia thymifolia.

146, 147, 148. Pollen granule of Heracleum Spondilium; 146, its dry or primary form; 147, its moist or secondary condition; and 148, end views of it in the same state.

149. Pollen granule of Didiscus cæruleus.

150. —— ——— of Magnolia grandiflora.

151, 152. Pollen granule of Nymphæa alba; 151, in its dry, and 152, in its moist condition.

153. Pollen granule of Fumaria officinalis.

154, 155. Pollen granule of Eschscholtzia californica; in the second figure the pollen tubes are just emerging from the extine.

156, 157. Pollen granule of Ranunculus acris; 156. represents a side view of it in its primary form; 157, an end ditto in the same state; and 158, in its secondary form, with a pollen tube issuing through each fissure.

[The above paper was consigned to our care in the autumn of last year, the delay in its appearance having been occasioned by the number of illustrations.—Ed.]

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 30, 1841.—"A description of a portion of the skeleton of the Cetiosaurus, a gigantic extinct Saurian Reptile occurring in the Oolitic formations of different portions of England," by Professor Owen, F.R.S., F.G.S.

The remains described in this memoir consist of vertebræ and bones of the extremities obtained by Mr. Kingdon from the oolite quarries of Chipping Norton, in Oxfordshire; of vertebræ and other bones from the oolite of Blisworth, near Northampton, transmitted to the author by Miss Baker; and of other remains from the oolite of Staple Hill, Wotton, three miles north-west of Woodstock; from the oolite near Buckingham; the Portland stone at Garsington and Thame, in the collection of Dr. Buckland: Mr. Owen has likewise examined a vertebra and some bones of the extremities of the same saurian from the Yorkshire oolite, and preserved in the Scarborough Museum.

Caudal Vertebræ.—A caudal vertebra from near Buckingham, which presented the anchylosed neural arch entire, but with the transverse, oblique and spinous processes broken off, equalled in dimensions a middle caudal vertebra of a full-sized whale, the antero-posterior diameter being five inches, the transverse eight inches six lines, and the vertical seven inches. The sides and under part of the centrum are described as very concave; and the shape of the articular extremities as nearly circular, with a greater concavity in the anterior one than in the posterior. The posterior hæmapophysial articular surfaces slope downwards and forwards in the form of semicircular facets for nearly two inches upon the under surfaces. The neurapophyses commence close to the anterior surface of the centrum, their antero-posterior extent being three and a half inches, and they meet at a rather acute angle above the spinal canal. The vertical diameter of the spinal canal was one inch nine lines, the transverse two inches, and the breadth of the base of the neural arch, from the outside of the neurapophyses, five inches three lines. The transverse process is developed from the centrum just below the neurapophysial suture. In all the caudal vertebræ of the Cetiosaurus the posterior half of the centrum is left uncovered by the neural arch.

The substance of another fractured vertebra, showing the upper third of the centrum, presented an uniform coarse spongy texture; whilst in a third specimen, which exhibited also a similar texture, the layers affected a direction parallel with the articular extremities for about half an inch from their surfaces, and inclined to the longitudinal course in the intermediate space. This structure, Mr. Owen states, proves that the vertebra cannot belong to the *Poikilopleuron Bucklandi.*

A caudal vertebra also from Buckingham, and assigned by Professor Owen to the middle part of the tail, on account of the development of short, narrow transverse processes just below the neurapophysial sutures, exhibited a centrum of a subtrihedral form, with one angle inferiorly and the other two at the origin of the transverse processes, but all three largely rounded off. The marginal circumference of the centrum was convex, and separated from the lateral or free surface by a rough, irregular, elevated ridge, the inferior part of which encroached upon the under surface of the vertebra in the form of two semicircular facets, both anteriorly and posteriorly. The free surface of the vertebral centre is marked by the coarse lines of the bony fibrous structure, decussating like an irregular net-work. The spinal canal of this specimen did not sink into the body of the vertebra. The size of this vertebra, and the proportions and position of neurapophyses and hæmapophysial articulations, might suggest a relationship of the animal to which it belonged with the Cetacea; but it differs, Mr. Owen says, in the concavity of the terminal articulations, which show no sign of separation as laminar epiphyses, and more particularly in the place of the origin of the transverse process being close to the neurapophysis instead of proceeding from the middle of the side of the centrum. In these deviations from the Cetacea, the Cetiosaurus approaches, the author states, the saurian order.

Mr. Owen then describes, with his wonted minuteness and perfect acquaintance with the subject, other caudal vertebræ found at Blisworth, but it is not possible to abridge the details.

Among the remains discovered near Chipping Norton are eleven caudal vertebræ without transverse processes, and therefore assigned by the author to the terminal half of the tail. They progressively diminished in transverse diameter from five inches to two inches, but without losing in equal ratio their length, which continues the same, or five and a half inches in the vertebra which has only three inches and three lines of breadth, five inches in that which is two inches and nine lines broad, and four inches in that which has a breadth of two inches. These eleven vertebræ do not constitute, Mr. Owen shows, a regular sequence, but detached links of the termination of the spinal column. In all the existing genera of Cetacea the posterior caudal vertebræ become shorter in proportion to their thickness, and the terminal ones are depressed. The slender elongated form of the corresponding vertebræ in the Cetiosaurus, is, Mr. Owen shows, a striking crocodilian character; and he adds, it is important to observe that not any of the series of caudal vertebræ described in this paper exhibit the vertical canals or perforations of the side of the centrum or base of the transverse process which so peculiarly characterizes most of the cetacean caudal vertebræ.

In his comparison between the vertebræ of the Cetiosaurus and the Poikilopleuron, Professor Owen states that the caudal vertebræ of the former resemble those of the latter and most other reptiles from strata below the chalk in the articular surfaces being slightly concave; and the vertebræ of the Poikilopleuron, especially in the elongated and rounded form of the body; in its median compression, and in the articulation of the hæmapophyses to the inferior part of the vertebral interspaces, though they are larger; on the contrary, the Cetiosaurus vertebræ differ in their proportions, in their structure, as in the absence of the remarkable medullary cavity in the middle part of the centrum of the Poikilopleuron; in the shortness of the neurapophyses as compared with the centrum; and in other minor points, which are fully detailed by Professor Owen.

The author then proceeds to institute further comparisons between the vertebræ of the Cetiosaurus and other reptilia: thus he shows that they differ from the vertebræ of the Crocodilians in retaining the cylindrical form of the body to the end of the tail, instead of being compressed and four-sided; that there is no trace of the vertical median division which the bodies of the caudal vertebræ present in Iguanæ, Anolides and other Lacertians; that they are not only larger than in the Megalosaurus, but relatively longer; that they differ from the anterior caudal vertebræ of the Iguanodon, which are nearly as large, in the absence of the well-marked concavity below the transverse processes, in the form of the centrum not being so quadrilateral, and especially in the transverse breadth of the inferior surface being less; and from the posterior caudal vertebræ of the Iguanodon, which slightly increases in length, in being less compressed and the centrum not having a triangular form; the slender terminal caudal vertebræ of the Iguanodon are also hexagonal, and not cylindrical as in the Cetiosaurus.

As there is no known extinct saurian which can so nearly compete in size with the Cetiosaurus as the Iguanodon, it is fortunate, Prof. Owen observes, that the distinguishing characters are so well marked and easily recognizable.

Dorsal vertebra.—The only portion of a dorsal vertebra described in the memoir is the extremity of a spinous process, the posterior surface of which is rough and flattened, 4 inches across, at about the same distance below the end of the spine; the sides are traversed to a certain extent by a longitudinal ridge, anterior to which they are concave and smooth, but their anterior margin is again flattened and rough, though it is not so broad as the posterior.

In referring all the vertebræ described in this paper to the same species of saurian, Prof. Owen admits that they present a somewhat greater variety of form and proportion in different regions of the tail than is observable in that part of the vertebral column in the smaller and recent species of Crocodile or Lizard; not only becoming larger in proportion to their thickness, but increasing slightly in length for a short distance as they recede from the sacrum. They appear likewise to exchange from a cylindrical to a subtriedral form of the body, but to resume the cylindrical shape in the terminal half of the tail. These modifications, he says, are possible, as in the *Plesiosaurus brachydeirus* still greater discrepancies in the proportions of the vertebræ prevail; and they are inferior in degree to any of the modifications which distinguish the vertebræ of known genera of saurians from those under consideration, in pointing at their distinguishing features from the hitherto known sauria; and in thus treating of them collectively, the inference that they belong to the same gigantic species is, the author observes, almost irresistible, that they belong to a new and distinct genus, which, on account of the vertebræ approximating in size and structure to the vertebræ of the whale, he has termed Cetiosaurus.

In the cuttings for the London and Birmingham Railway near Blisworth, there were found, scattered over an area of 12 feet by 8 feet, the following remains:—1. A bone resembling the episternal of an Ichthyosaurus, the length or antero-posterior extent of the preserved portion of the median plate being $1\frac{1}{2}$ foot, and the breadth of the posterior fractured end 5 inches, from which it gradually expands to the root of the side branches, where its breadth is 1 foot. From its obtuse termination to the end of the longest branch is $2\frac{1}{2}$ feet, and from this end to that of the opposite branch $4\frac{1}{2}$ feet. 2. The remains of a coracoid and scapula apparatus of equally gigantic proportions. 3. A fragment, considered to be the shaft of a humerus, 1 foot 9 inches in length, 6 inches in diameter across the middle and 8 inches across the widest end. 4. A portion of the opposite humerus. 5. Another fragment, believed to be part of a radius or ulna, about a yard in length, 6 inches across the proximal end, and 5 inches across the middle of the shaft. 6. A slightly curved portion of a rib, a yard long and from $1\frac{1}{2}$ to 2 inches thick. 7. Five caudal vertebræ agreeing in dimensions with the vertebræ of Chipping Norton.

Numerous fragments of long bones without a trace of a medullary cavity have been found at Chipping Norton, and correspond in magnitude with the vertebræ. The articular surfaces which are preserved are covered with large tubercles for the attachment of thick cartilages. The best-preserved fragments are considered to belong to metacarpal or metatarsal and phalangeal bones, and are therefore, Prof. Owen says, decisive evidence against the cetacean nature of the animal; but he adds, they possess characters by which they may be distinguished from the corresponding bones of known extinct gigantic saurians. One of these bones, believed to be a metacarpal or a metatarsal, is double the bulk of the largest analogous bone of a full-grown elephant, though the metacarpals or metatarsals are much smaller in proportion in Saurians than in Pachyderms. The bone is 7 inches in length, 9 in circumference in its middle, 5 in the antero-posterior diameter of its proximal end, and 4 inches 8 lines in the transverse diameter of the distal end. A proximal phalanx is shown to be remarkable for its short and broad proportions, which are more massive than those of the phalanges of existing Crocodilians or of the Poikilopleuron.

An ungueal phalanx, also found at Chipping Norton, was 6 inches in length, $2\frac{1}{2}$ in breadth, and upwards of 3 in depth. It was slightly curved, obliquely compressed, obtusely terminated with a shallow, concave, trochlear articular surface, divided by a vertical convexity; it was marked on each side by a smooth curved groove, 3 inches in length, with the concavity downwards, and the lower edge projecting beyond the upper at the posterior part of the groove; but it is shown to be by no means produced in so large and thick a ridge as that which characterizes each side of the more depressed and broader phalanx of the Iguanodon. From the ungueal phalanges of that Saurian it differs in being much less compressed from side to side and less curved downwards. It vastly surpasses in size any of the ungueal phalanges of the Poikilopleuron. A smaller ungueal phalanx, resembling in general shape the above, was found at Chipping Norton; and portions of metacarpal or metatarsal bones, agreeing in form and size with the fragments obtained at Chipping Norton, have been discovered at Buckingham: also a fragment 8 inches long, which Prof. Owen considers to have belonged to a radius, a fibula, or a long distal phalanx.

With reference to a comparison of the remains of the Cetiosaurus with those of the Polyptychodon, the bones of the extremities present in both cases the cancellous structure throughout the central part, which indicates aquatic rather than terrestrial habits. Prof. Owen states that he has not found any of the remains of the extremities of the Cetiosaurus to agree exactly in shape with those belonging to the Polyptychodon; also that no specimen of a tooth agreeing in characters with the teeth of the Polyptychodon has been detected in secondary strata inferior to the greensand. Certain large conical teeth, found in the Malton oolite, may, Mr. Owen thinks, appertain to the Cetiosaurus, but he is of opinion that they more probably belong to the Steneosaurus.

In conclusion, it is stated that the vertebræ described in the paper prove the existence of a saurian genus distinct from the Megalosaurus, Steneosaurus, Poikilopleuron, Plesiosaurus, or any other large extinct reptile, remains of which have been discovered in the oolitic series; that the vertebræ, as well as the bones of the extremities, prove its marine habits; and that the surpassing bulk and strength of the Cetiosaurus were probably assigned to it with carnivorous habits, that it might keep in check the Crocodilians and Plesiosauri.

January 5, 1842.—A paper "On the Mouths of Ammonites, and on Fossils contained in laminated beds of the Oxford Clay, discovered in cutting the Great Western Railway, near Christian Malford in Wiltshire." By J. Chaning Pearce, Esq., F.G.S., was read.

Mr. Pearce commences by stating, that his attention was first directed to this part of the railway by the impression of a crushed Ammonite procured at Cheltenham in April 1841, but that he was prevented from examining the locality for three or four months.

The following section of the beds is given by Mr. Pearce:—

1. Alluvial soil......................	2 feet.
2. Gravel.........................	8 —
3. Four or five bands of laminated clay, alternating with sandy clay, almost entirely composed of broken shells....	6 —
4. Clay, containing *Gryphæa bilobata.*	

The objects of the author are, first to draw attention to the organic bodies discovered in the laminated clay; and secondly, to describe the various forms which the mouth of the Ammonite assumes in different species and in different stages of growth in the same species.

The fossils obtained from the laminated clay are stated to be as follows:—1. A succulent plant. 2. Lignite, with oysters sometimes affixed to it. 3. Crustaceans, supposed to have inhabited the dead shell of the Ammonite*. The specimen described is stated to have a finely tuberculated and delicately thin covering; the tail to have the appearance of being divided into three portions, finely corrugated towards their edges; the body to have on each side internally five or more processes; and the head to be furnished with several short arms and two long ones jointed a little above the head and terminated in two claws, the longer being serrated on its inner edge. 4. Another allied crustacean is stated to have also an extremely thin and finely tuberculated covering; to be furnished with two long arms of similar shape, each terminated at its extremity by one claw, and two others projecting from about the centre, and passing off posteriorly are two fan-like processes of similar shape. 5. Trigonellites, two species. 6. One valve of a Pollicipes. 7. The remains of an animal considered to have been probably allied to a Sepia. 8. Shells of the genera Unio, Cyclas, Astarte, Avicula, Gervilla, Pinna, Nucula, Rostellaria, Turritella, Ammonites†, Belemnites, and an animal to which he has applied (since the paper was read) the name of Belemnotheutis. In describing the last fossil, he states that the lower part is conical, blunt at the apex, and chambered internally like the alveolus of a Belemnite, with an oval siphunculus near the edge of the chambers; that it has a brown thick shelly covering which gradually becomes thinner towards the superior part; that immediately

* To this organic body Mr. Pearce has given since the paper was read the name of Ammonicolax.

† Since the paper was written Mr. Pearce has consulted Mr. Pratt's account in the Annals of Natural History for November 1841, of Oxford clay Ammonites, and ascertained that he possesses [*A. Lonsdalii*, *A. Brightii*], [*A. Gulielmi*, *A. Elizabethea*], *A. Comptoni*, and *A. Königii*. The fossils included between brackets the author considers to belong to one species.

above the chambers is an ink-bag resting on what resembles the upper part of a sepiostaire, and composed of a yellow substance finely striated transversely, being formed of laminæ of unequal density; that in some specimens, broken longitudinally through the middle, are exposed long, flat, narrow processes of a different structure; that immediately beneath the superior contraction are two long feather-like processes, and one or more which are short, indicating, the author thinks, probably the situation of the mouth. With reference to the first part of the paper, Mr. Pearce also notices an animal allied to Sepia or Loligo, one side being covered by a pen resembling that of the Loligo, and having immediately underneath it, at the junction of the middle with the lower third, an ink-bag resting on what resembles a sepiostaire. He mentions likewise ten or twelve species of fishes, but without giving names; also coprolites.

2. Respecting the form of the mouth of the Ammonites and the changes at different periods of growth, Mr. Pearce states his belief, that the terminal lip or mouth has a different shape in the young shell of almost every species, but assumes in the old a straight outline, and that he has been aware of this circumstance several years. Of cases of young shells with differently shaped lips, he mentions *Ammonites Brongniarti* (Inf. oolite), *A. sublævis* (Oxf. clay), *A. obtusus* (Lias), *A. Kœnigii* (Kelloway Rock, the mature shell is stated to have a straight mouth), *A. Calloviensis* (Kelloway Rock, the lip of the old shell is stated to be slightly contracted and to terminate with gently undulating sides), *A. Walcottii* (Lias), and *A. Goodhalli*, furnished in the mature state with a single horn-like projection at the front of the mouth. In addition to these species he enumerates those noticed in the preceding part of the paper. Mr. Pearce is further of opinion that at different periods of the formation of the shell the lateral processes were absorbed and reproduced, and that therefore they are found in various stages of growth, but are invariably wanting in the mature shell. In some species in which the successive mouths were much contracted or expanded, the new shell the author says was continued without the absorption of the lip, leaving a highly projecting rib or a deep furrow*.

After a careful examination of upwards of twenty species in his collection, with perfect mouths of all ages and from different strata, not including the Oxford clay, Mr. Pearce has found the external chamber to vary considerably in extent, occupying in some specimens the whole of the last whorl, but in others less than one-third, and without reference to age or species; and he therefore suggests that the young animal of the Ammonite filled the whole of the outer chamber, extending also to the extreme points of the lateral processes in those species which were provided with them; and thereby not only received support but afforded protection to a portion of the shell extremely liable to injury. In old individuals he is of opinion that the animal when quiescent was entirely contained within the last chamber.

* The author was not acquainted with M. Al. d'Orbigny's work, *Pal. Francaise*, when he wrote the paper, and was not aware of the views given in it respecting the mouth of the Ammonite.

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END OF THE NINTH VOLUME.

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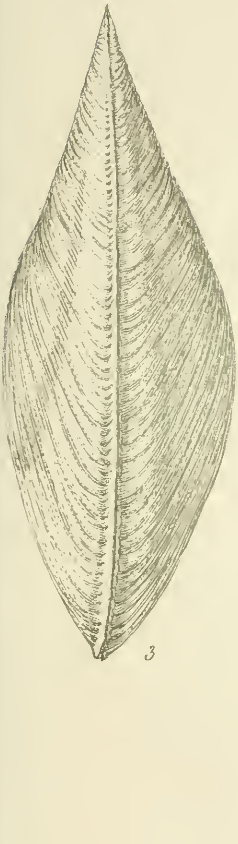

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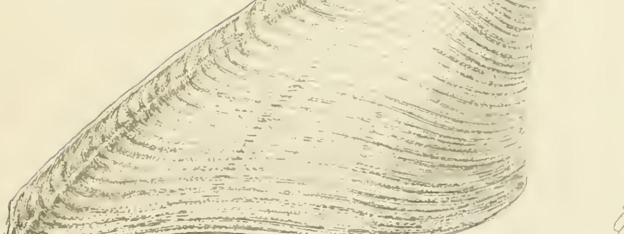

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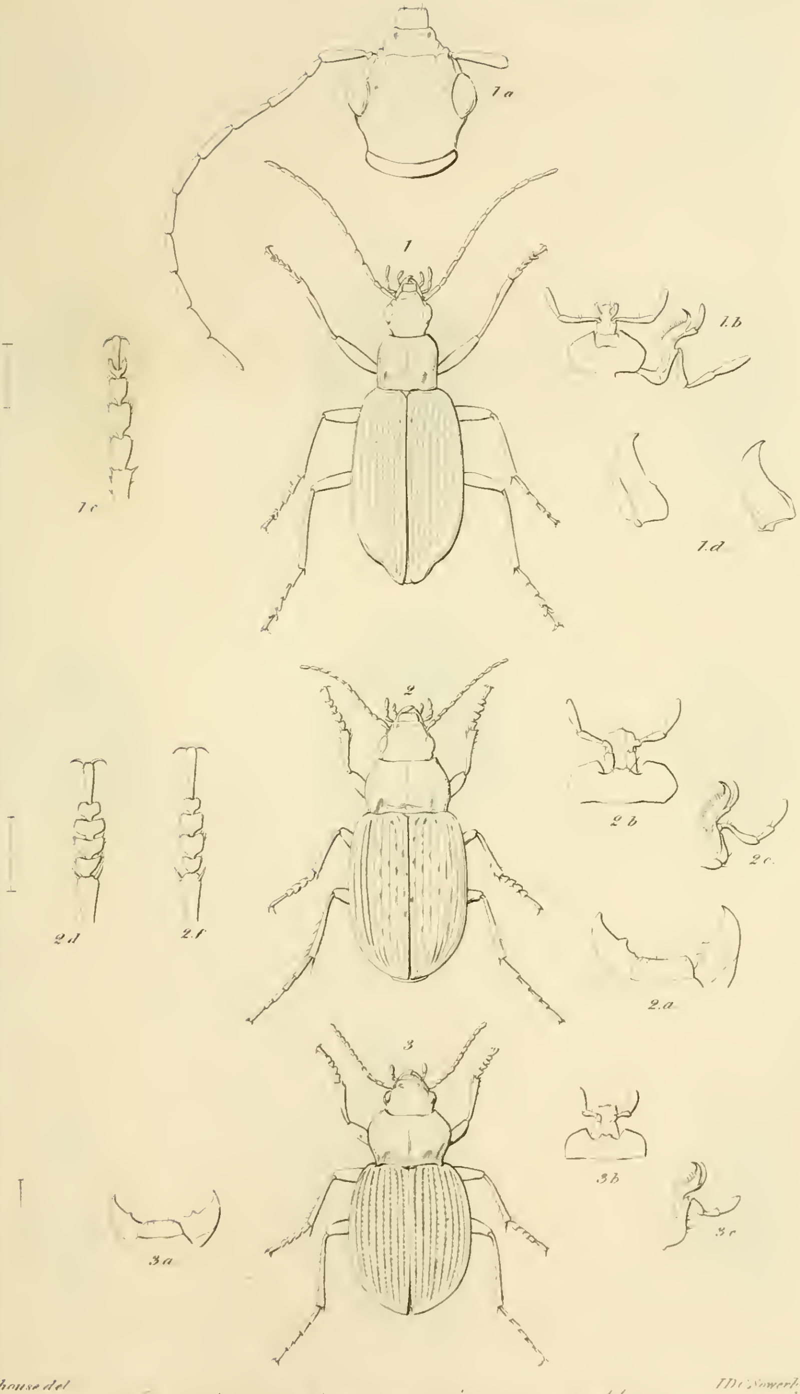

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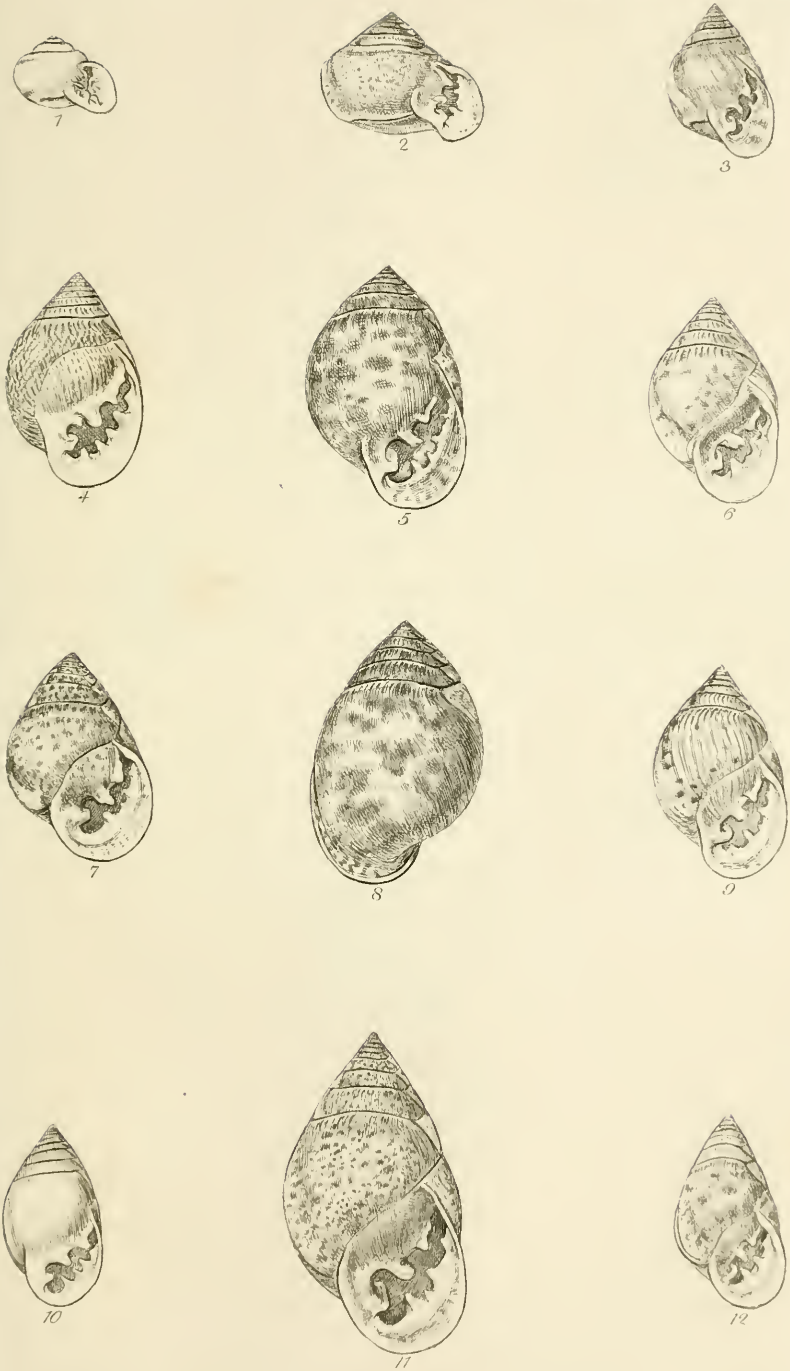

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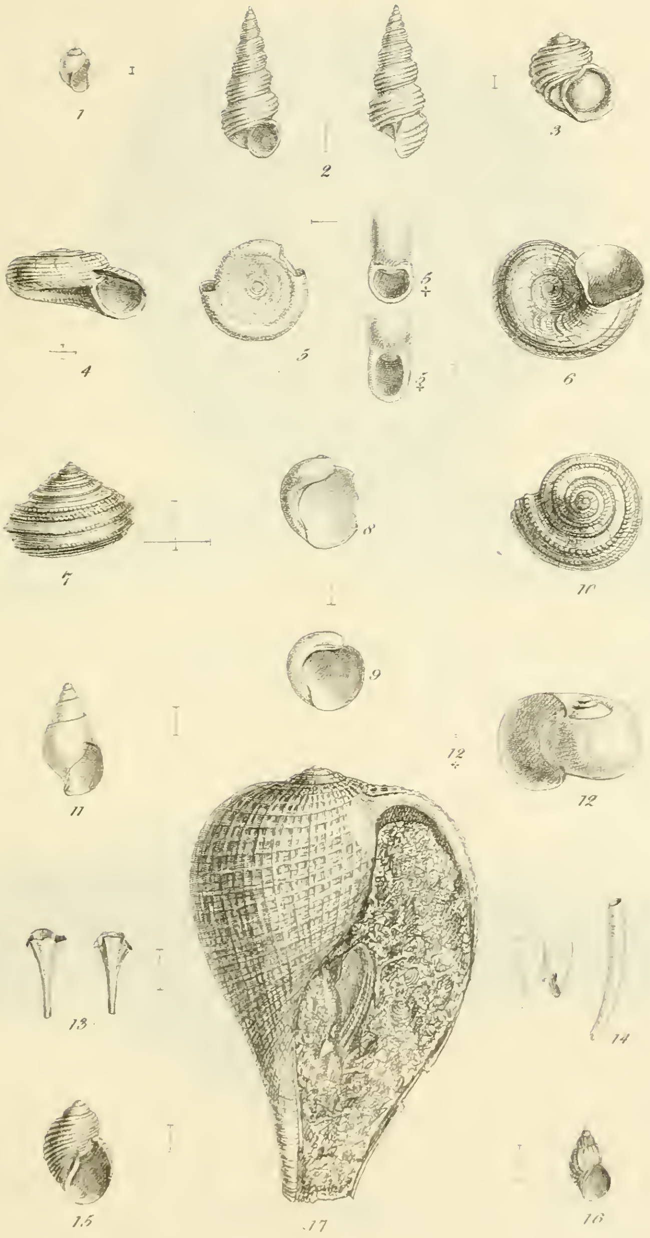
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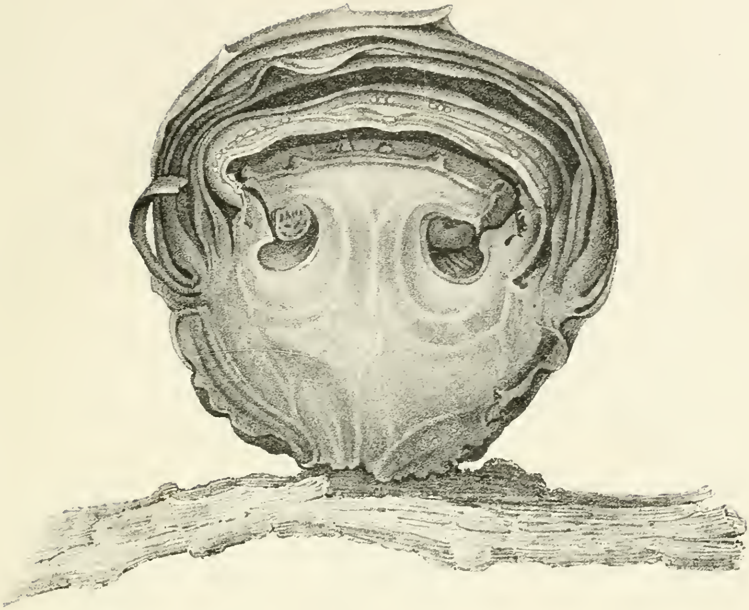

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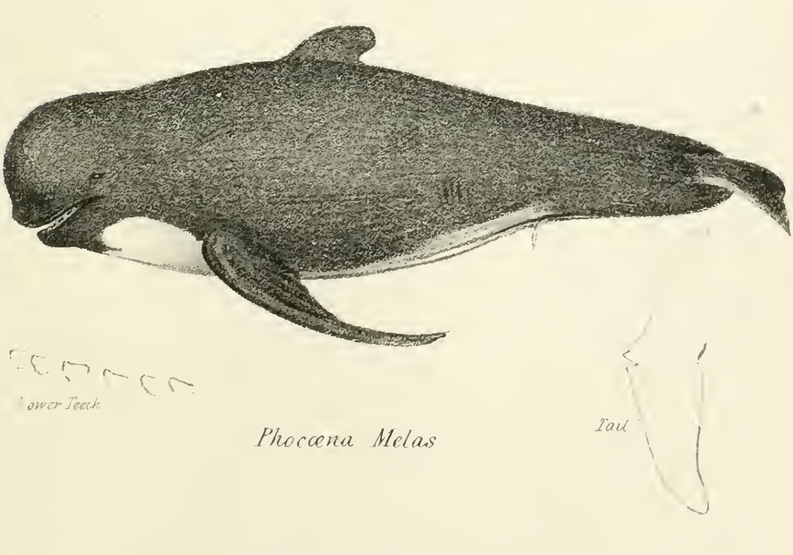
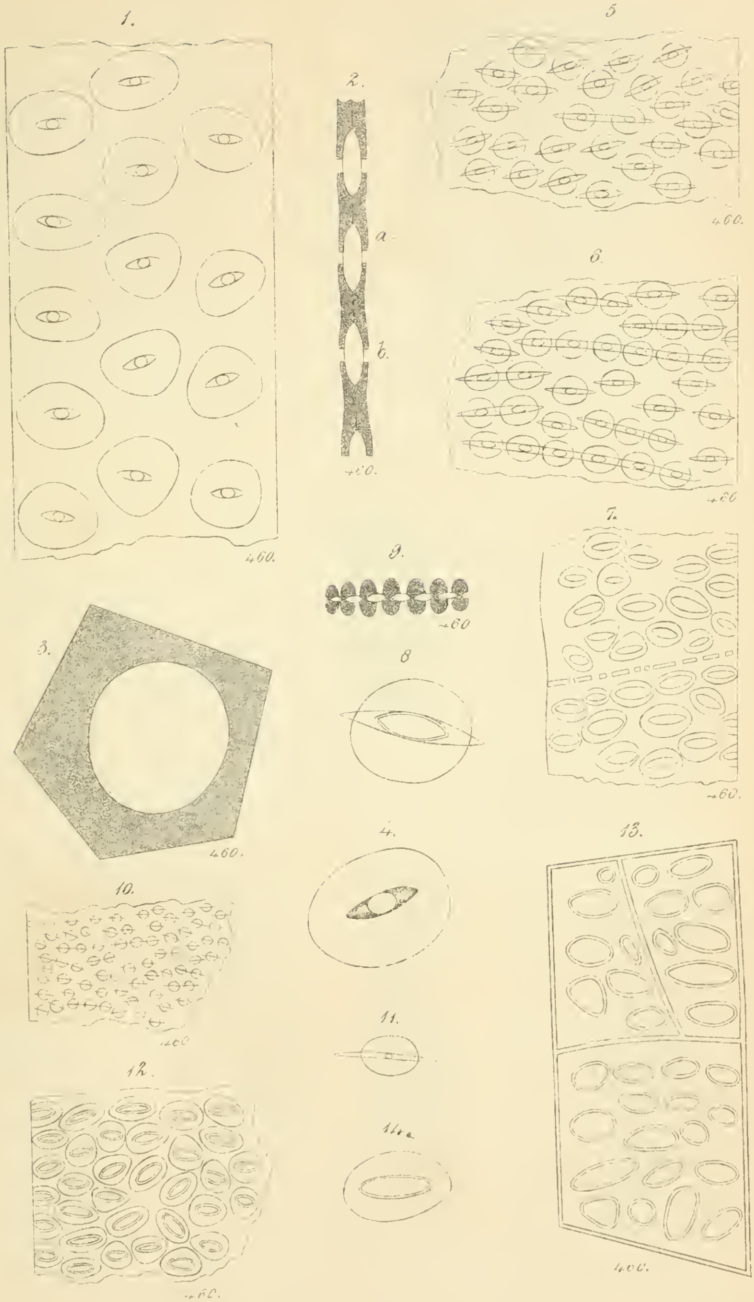


Phocœna Melas



J. Basire lith.

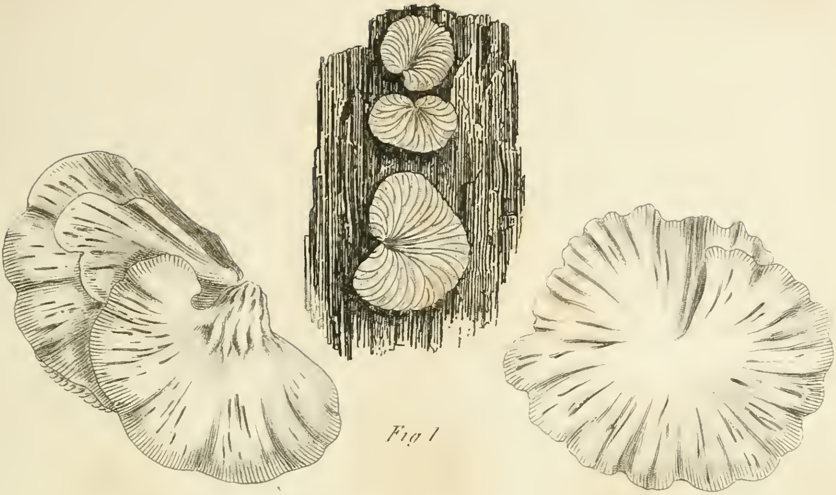


Fig 1

Agaricus salebrosus

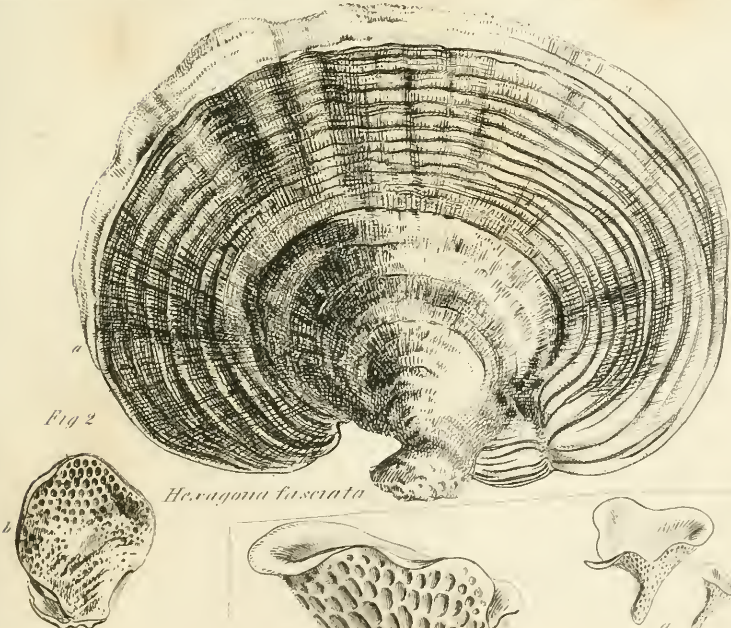


Fig 2

Hexagona fasciata

Fig 3

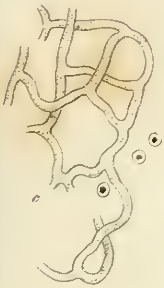
Laschia infundibuliformis

J. Berkeley del

a

b

Fig. 3.



c

Arcyria decipiens Berk.

a

Fig. 2

b

Phallus campanulatus Berk.

a

b

Fig. 1

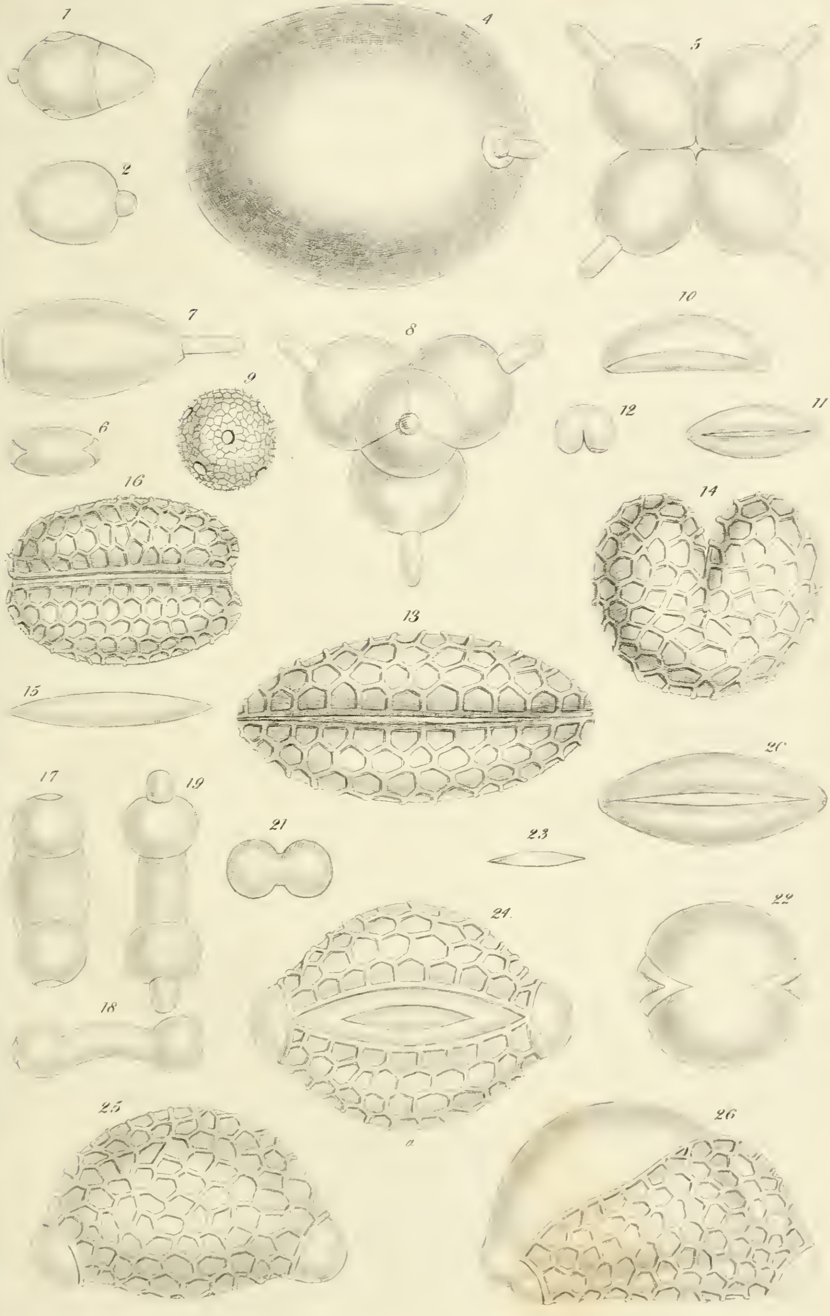
Radulum palmatum Berk.

M.J. Berkeley del.

M. J. Berkeley del. *Clathrus crispus*, Berk.

W. Willshire del.

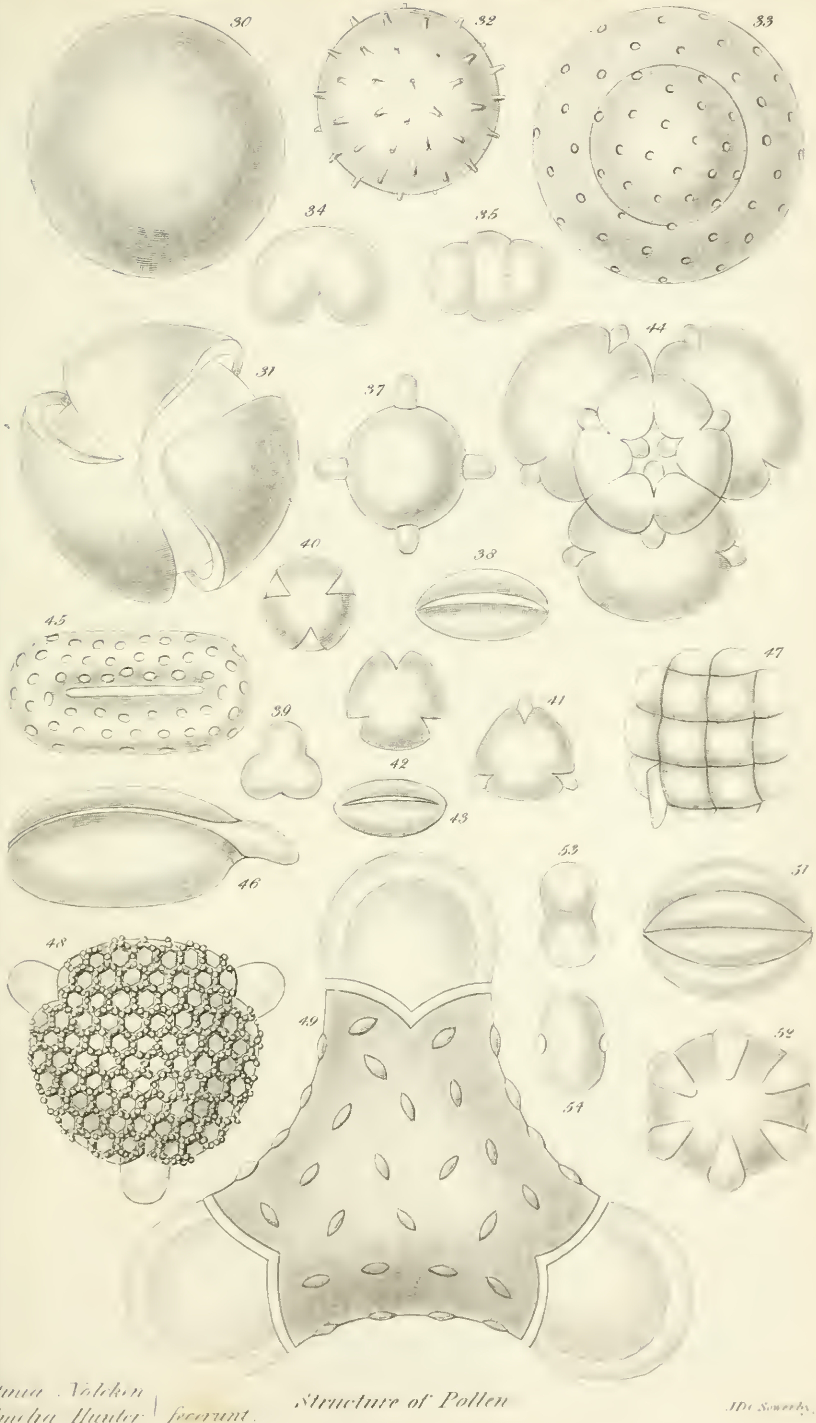
Basire lithog.



Emma Nelcken
Amelia Hunter
A. H. Hassall
fecerunt.

Structure of Pollen.

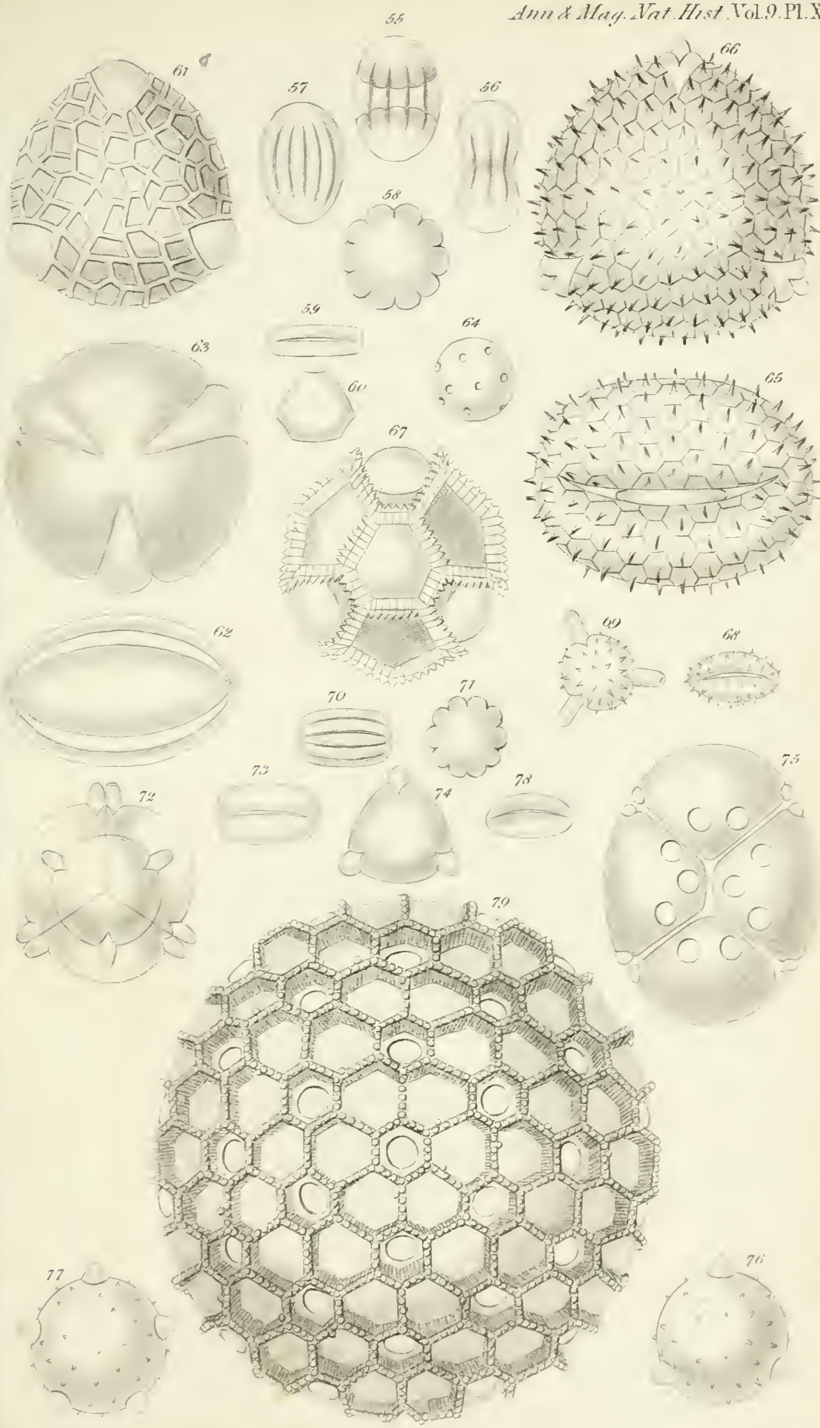
J. D. C. Sowerby, f.



Utina . Volcken
Amelia Hunter | fecerunt.
A H Hassall

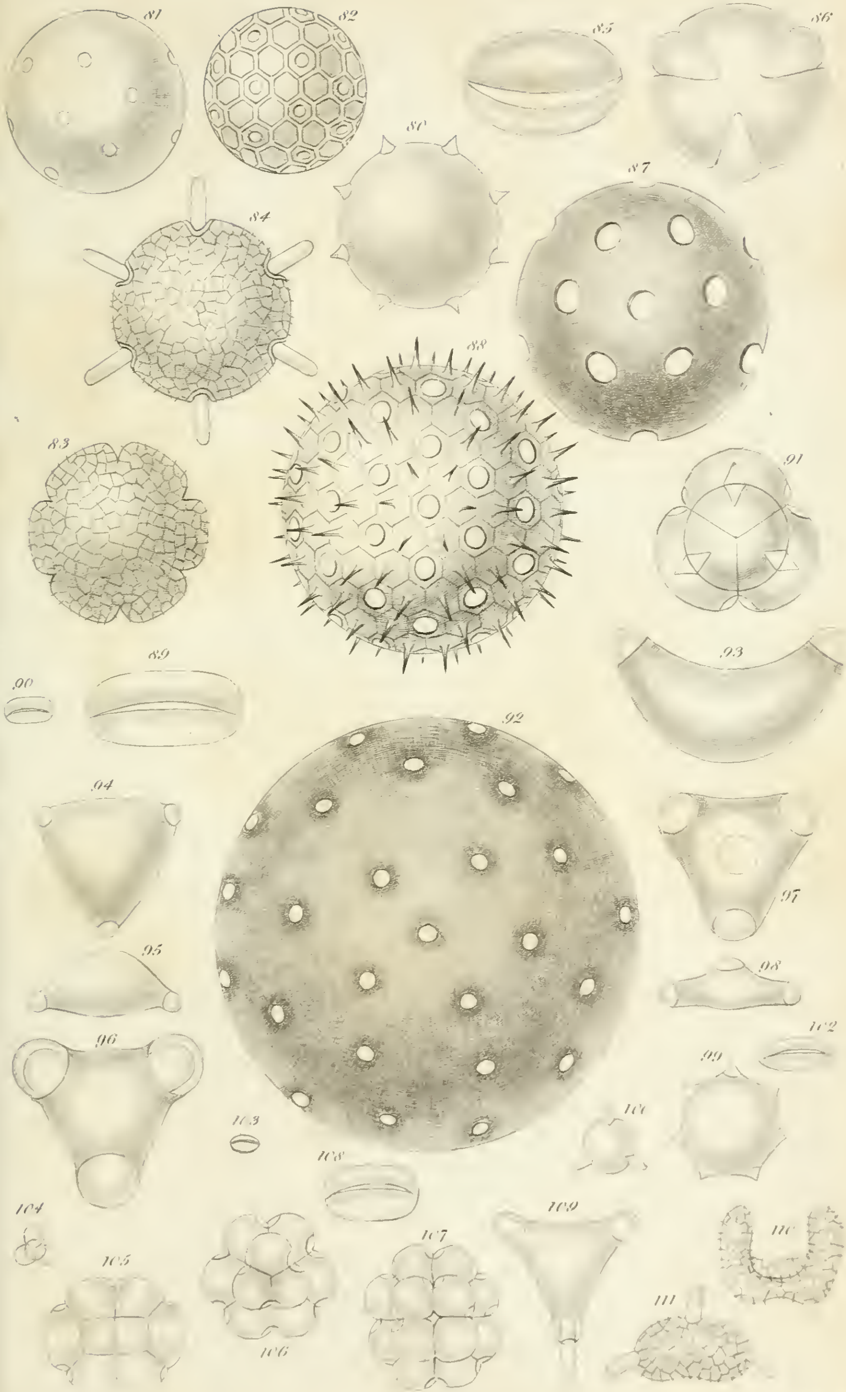
Structure of Pollen

J De C Sowerby, fc



Anna Nolcken
Amelia Hunter fecerunt.
A. H. Hassall

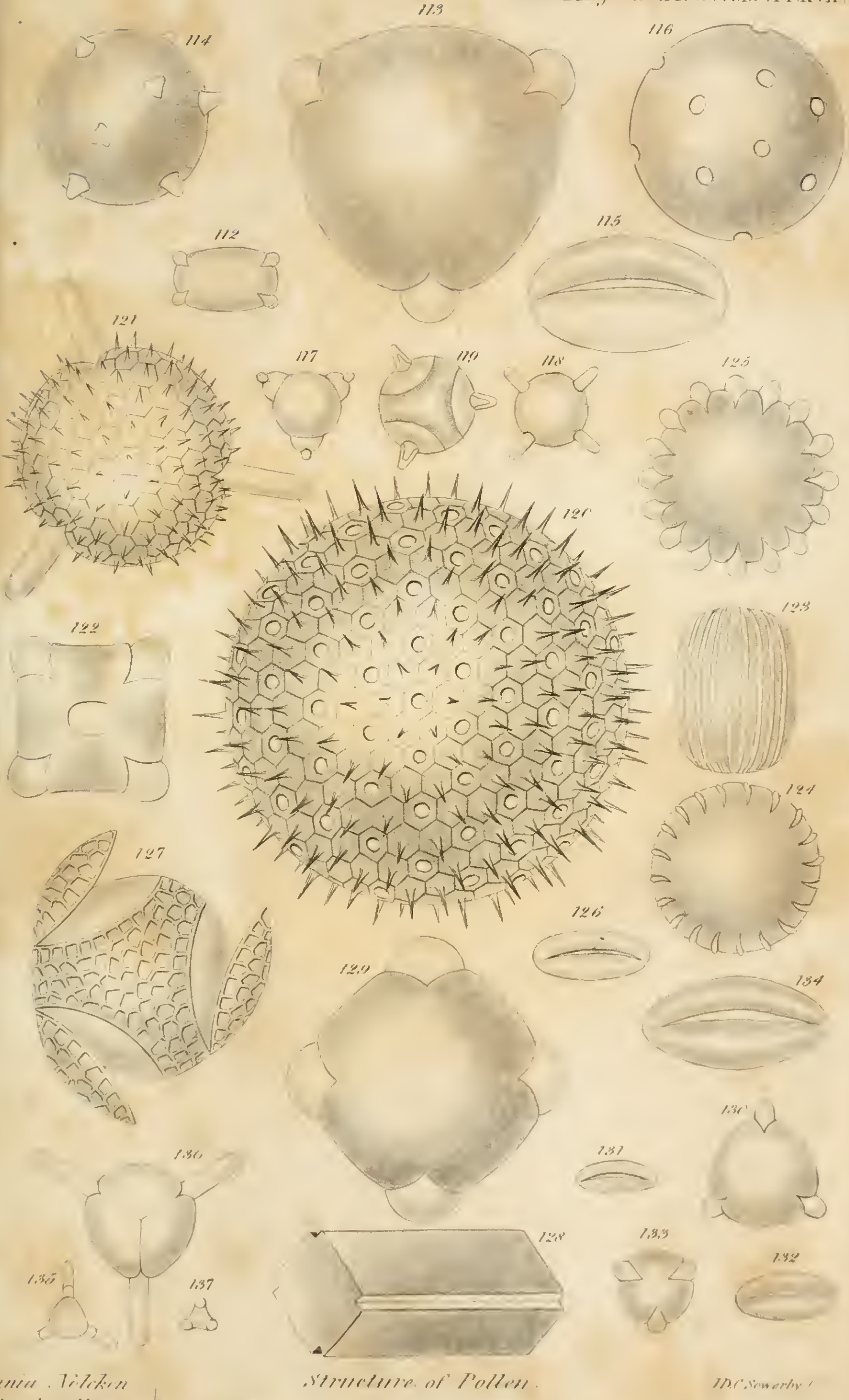
Structure of Pollen



Tinia Nolcken
Amelia Hunter fecerunt.
A. H. Hassall

Structure of Pollen.

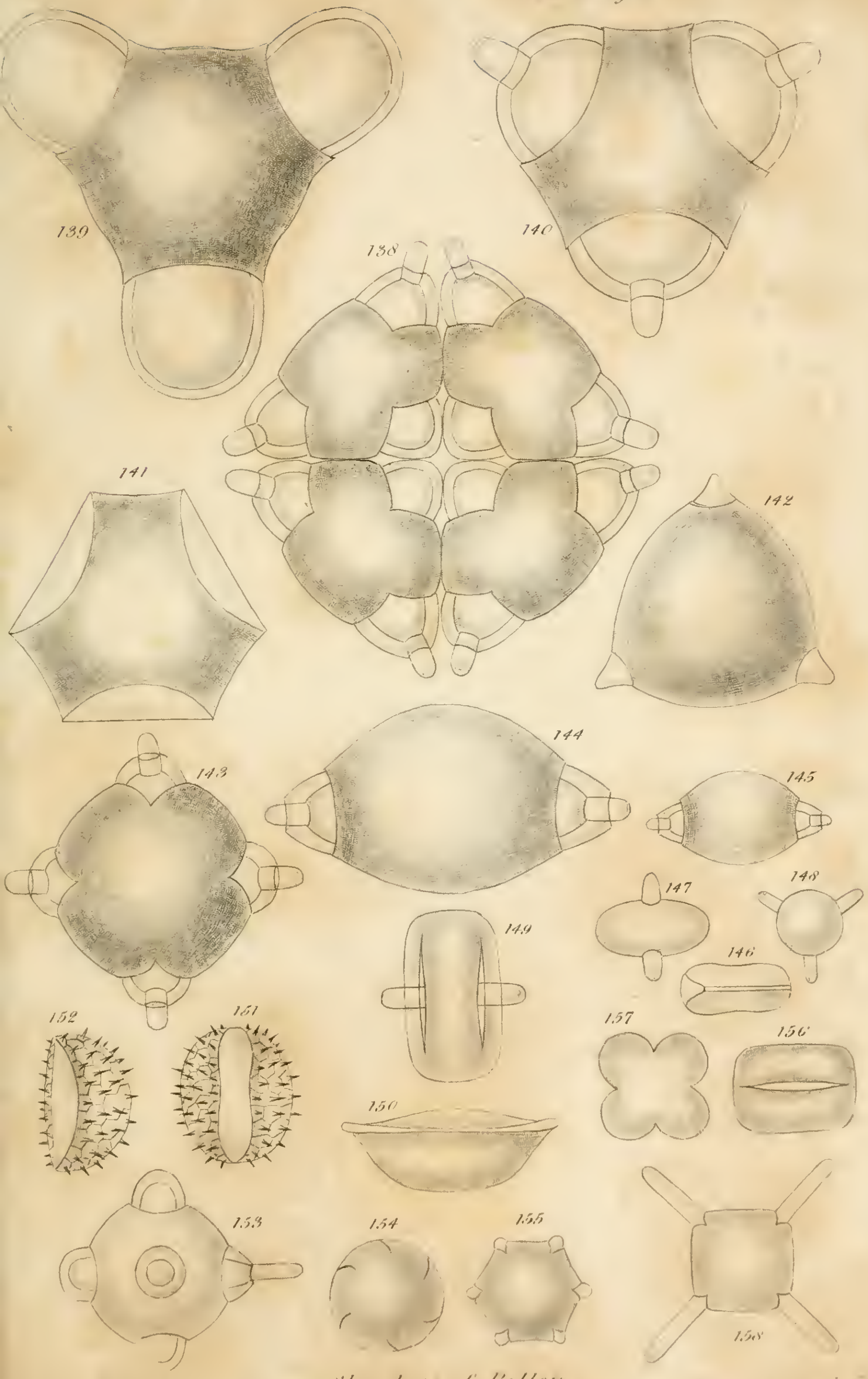
J. D. C. Sowerby sc.



Structure of Pollen.

...nia Nelcken
...melia Hunter
...H. Hassall
fecerunt.

H.C. Sowerby



Structure of Pollen

Ulnia Nolcken
Amelia Hunter
A. H. Hassall
fecerunt.

J.D.C. Sowerby, fc.