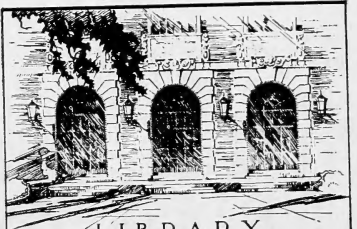


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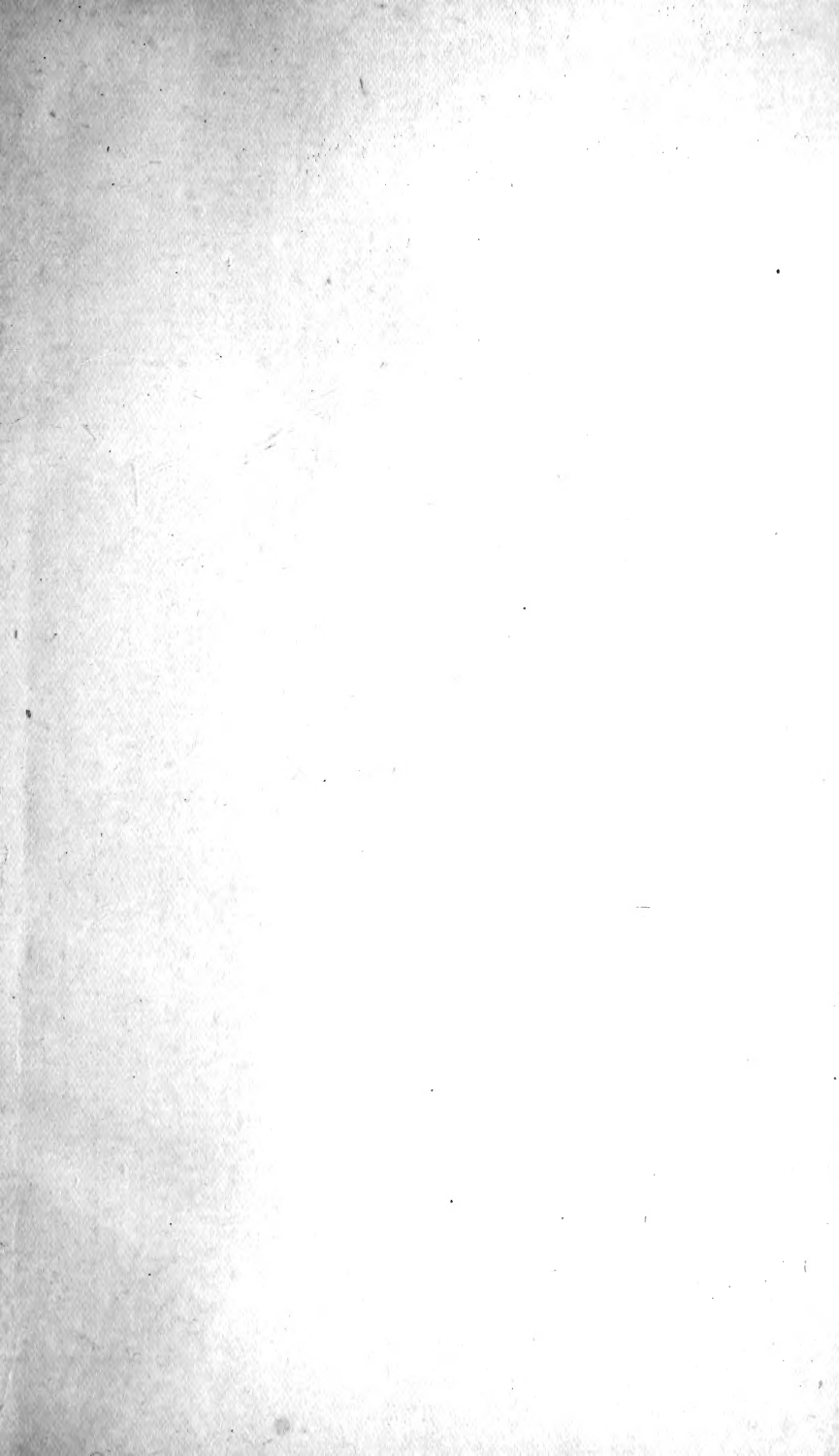
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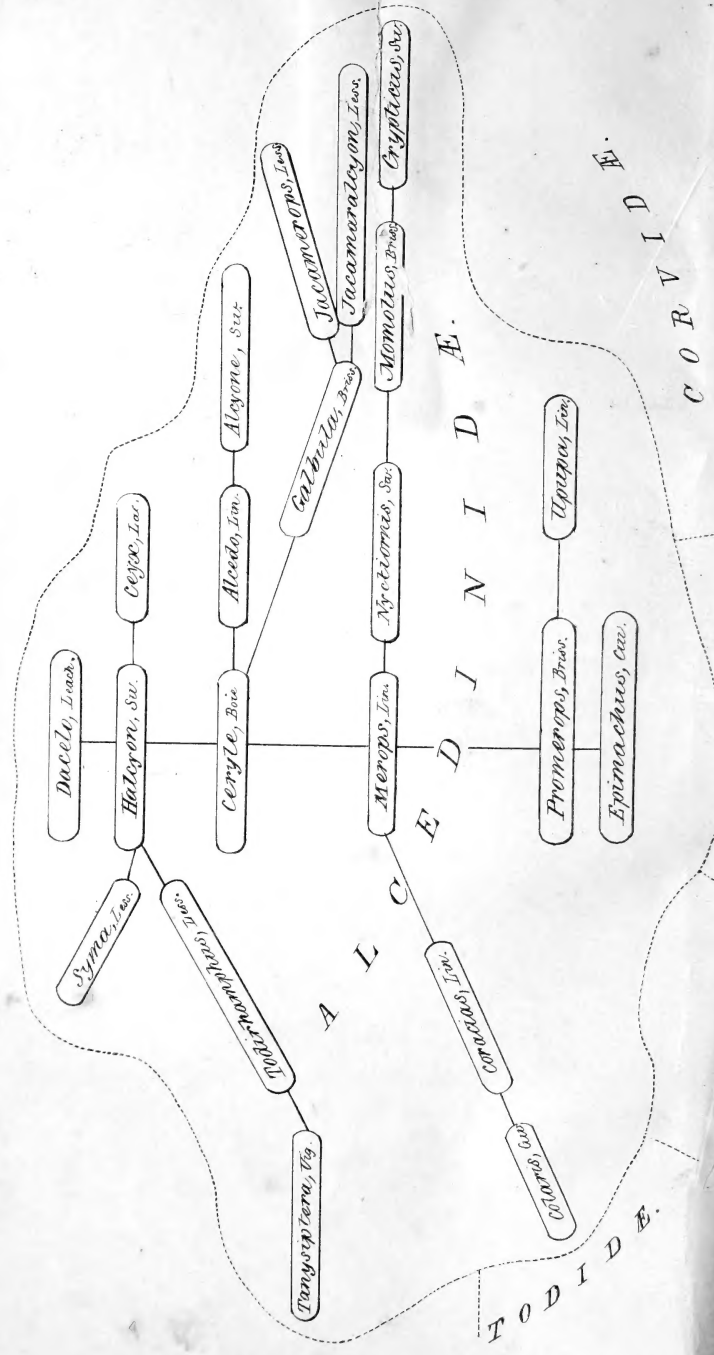


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Map of the Family Alcedinidæ.



Scale of Degrees of Generic Affinity.

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THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY,

INCLUDING

ZOOLOGY, BOTANY, AND GEOLOGY.

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

CONDUCTED BY

SIR W. JARDINE, BART.—P. J. SELBY, Esq.,

DR. JOHNSTON,

DAVID DON, Esq., PROF. BOT. KING'S COLL. LOND.,

AND

RICHARD TAYLOR, F.L.S.

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VOL. VI.  
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LONDON:

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“Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ: ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex æconomia in conservatione, proportionem, renovationem, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; a vere eruditibus et sapientibus semper exulta; male doctis et barbaris semper inimica fuit.”—
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ERRATA.

Page 19, <i>Vitrina</i> , last line but one, for this read which.
— 20, 16th line, for give read gain.
— 26, <i>Helix granulata</i> , for 1838 read 1834.
— 31, <i>Helix umbilicata</i> , for rock limestone read rock,—limestone,—
— 199, <i>Helix Pisana</i> should be in the 4th instead of the 2nd column.
— 199, <i>Vertigo edentula</i> should be in the last column but one, instead of the last.
— 200, <i>Ancylus fluviatilis</i> , add to La Bergerie column.
— 201, line 3, instead of which is, read which latter is.
— 202, line 19, for renders read render.
— 395, line 8 from bottom, for Rio Brema read Rio Branco.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

I.—*On early Contributions to the Flora of Ireland; with Remarks on Mr. Mackay's Flora Hibernica.* By the Rev. T. D. HINCKS, LL.D., M.R.I.A.

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

GENTLEMEN,

HAVING met with various remarks which seem to imply a peculiar negligence on the part of the Irish in respect of the Natural History of their country, and these remarks having been repeated without any effort to correct them, may I beg permission through your valuable work to make some statements on the subject? As I have for nearly fifty years taken an interest in the botany of Ireland, and as I have had opportunities of knowing many persons who interested themselves about it, I hope I may not be deemed unreasonable, especially as I have no claim of my own to bring forward or any wish to speak lightly of the exertions of late botanists, who I believe would not knowingly claim more than they are fairly entitled to. As these remarks were chiefly suggested by Mr. Mackay's *Flora Hibernica*, or the reviews of it, I beg to acknowledge my own obligation to him for that work, and to express the esteem and regard I have felt for him for more than thirty years that I have had the pleasure of being acquainted with him.

Different opinions are entertained by botanists as to what a local Flora should be. Remarks on the subject have been made by Prof. Henslow*, attention to which might be of much use; but I cannot blame Mr. Mackay, in the *Flora* of such an extensive district as Ireland, for having inserted the generic and specific characters, even though he may not have added to those of Sirs J. E. Smith and W. J. Hooker.

The *Flora* of a country should however do more, it should

* Magazine of Zoology and Botany, vol. i.

I conceive, as far as possible, discriminate between those plants which are really indigenous, and those which appear to have been introduced, whether at an early or a later period; it should mark the situation in which the plant is found and the different parts of the country; whether abundant or scarce; and on what kind of ground, as limestone, basalt, &c. It should be an object to record the *earliest* notice of each plant, and the name of the discoverer, if it can be ascertained, to which may be added remarks on its nature and uses. And in the case of a country like Ireland, which has its own peculiar language still used in many parts of it, the name given to the plant in that language should be recorded, when known, as well as the common names in English. The author of a local Flora should be a man well acquainted with the past as well as present state of the district, and should be able to make various branches of science contribute to the usefulness of his work. Finally, if like Dr. Johnston, in his *Flora of Berwick-on-Tweed*, he can render his work entertaining as well as instructive, he will have a stronger claim on the gratitude of those for whom he has been labouring. That my friend Mr. Mackay's work does not meet all these objects is no reason for censuring him, and with respect to the Irish names, unless he had it in his power to give *real* ones, it was much better to omit them altogether, than to do, what was done in another case, manufacture names for the occasion, which a native could hardly recognise.

Mr. Mackay's introduction begins with the remark, "It has been matter of complaint that the history of the natural productions of Ireland has hitherto been neglected," but he considers the censure as one of too great severity. The authoress of an "Irish Flora," published about three years before Mr. Mackay's, viz. in 1833, says, "it has been remarked, that when England and France had their provincial Floras, the botany of this island was as much unknown as that of an island in the Pacific; although its peasantry possessed a very considerable knowledge of plants, which is, &c.—but among its enlightened inhabitants it has remained almost a sealed book, while men of science have been occupied investigating other countries not possessing half its richness in vegetable productions." As a proof, the extraordinary deficiency of information in this science, to be met with in the surveys of counties in Ireland, is brought forward, with some exceptions; and be it remarked, that the works excepted were *published*, or at least some of them, before 1750; i. e. eighty years before the time of making the remark. A reviewer of Mr. Mackay's work in the *Dublin University Magazine*, in a very

interesting article, which proves the information and ability of the writer, except that he knew little of the past state of Ireland, renews the complaint of the *neglect* of the natural history of Ireland, speaks of everything relating to it as only just *beginning*, and compares this with the state of things in Bavaria and Sweden, and then with America. He speaks of the demand for general treatises and the publication of local Floras in England; adding, that "no local Flora has ever been *attempted* in Ireland." Speaking of the progress of the science, he adds, "the valuable result of all is had in England; and among the Scotch almost every town of any magnitude has its museum or botanic garden, or both, and it is but a few years since the only similar establishments in Ireland were those of Dublin—recently the spirited people of Belfast has established both a museum and botanic garden. When Cork or Limerick will choose to follow, where they did not know how to take the lead, we know not." There are not many who are able to detect the errors here fallen into, and which have been of late often repeated, because the greater part of the readers are, like the writer, ignorant of the past; and of what great consequence is it, some may think, if the efforts of earlier times be forgotten? Now as science is progressive, every succeeding period derives advantage from that going before. "No effort is lost," and it becomes those who are now making rapid advances, to acknowledge the advantages they derive from what their predecessors have done; and such is the *general* feeling, though we occasionally meet with departures from it, arising perhaps more from the ignorance of the writer than from any desire to deprive the dead of any credit to which they were entitled. According to the reviewer no previous publication existed from which Mr. Mackay could obtain any great amount of information respecting our indigenous plants. "The only original work to which he could refer was that of Threlkeld, published more than a century ago, and which is unfortunately merely a catalogue of the more common plants alphabetically arranged, with brief indication of their real or supposed medical virtues. The work of K'Eogh is scarcely deserving of notice, and with one or two exceptions no botanical information was to be obtained from the statistical surveys of the different counties. The task of ascertaining the habitats of rare plants and of discovering new ones, rested almost entirely with the author and his contemporaries." Now somewhat depends on the meaning annexed to contemporaries; and if it includes all who were living at the same time, even those who were going off the stage when Mr. M. came on it, it would include a great many whose principal services to bo-

tany were previous to Mr. Mackay's settlement in Ireland, and were in a great degree a cause of that settlement, to whom I shall afterwards refer. I am willing to take it in that extensive sense, and trust I shall make it appear that Mr. Mackay found much done by them before he saw Ireland. But does not Mr. Mackay in his preface tell us of Molyneux's catalogue of *rare* plants appended to Threlkeld? and previously of Heaton, and Llhwyd and Sherard? Are not some of our rarest plants recorded by Ray? Does not he tell us of Smith's Cork and Kerry? of Wade's *Flora Dublinensis* and *Plantæ Rariores*? Does he not refer to a catalogue of the plants of the county Cork by Jas. Drummond? These are mentioned by Mr. Mackay, but considered by his reviewer as absolutely nothing.

Having thus stated the charge brought, that the literary men of Ireland had been peculiarly negligent of her botanical treasures, I shall endeavour to show that it is in great measure not well-founded. It proceeds on the supposition that because a local *Flora* had not been published, therefore "the botany of Ireland was as much unknown as that of an island in the Pacific." Now we have seen that works were published early in the 18th century, and that references are made to botanists in the 17th century: may we not then look to the comparative state of botany elsewhere? It is well known that for a long period this science was cultivated merely as "the humble but engaging handmaid of surgery and medicine." All the catalogues had a reference to this, except those of timber trees and articles of food. It was not till the latter end of the 17th century, that botany began to make progress as a science, and notwithstanding the valuable labours of Ray and Tournefort, it was not till the establishment of the Linnæan System, about the middle of the 18th century, that there was any work "to enable a botanist by short determinate characters to discover the name of an unknown plant." It is useless then to lament that there was no *Irish* work of this kind, when none existed anywhere. Without urging our ignorance of what may be concealed in Irish MSS; without alleging the change that had so recently taken place in Ireland by the cutting down of woods and the formation of bogs; without dwelling on its wretched internal state, so adverse to all scientific inquiries; it is enough to state that there was a like ignorance of plants in other countries, and that the idea of distinct Floras as guides to students had not been conceived. The earliest works in Ireland, as in England, were chiefly intended to guide the medical practitioner, "the culler of simples," where to find what he wanted. It was not till 1762, when

Hudson published his *Flora Anglica*, that British botanists had a systematic manual, but are we therefore to regard the works of preceding botanists as useless? An improved edition appeared in 1778, and Lightfoot's *Flora Scotica*, the first respecting the peculiar botany of Scotland which I have yet traced, appeared in 1777, the work, be it recollected, of an Englishman, at the instigation and even the expense of a native of Wales, Mr. Pennant. From this time the progress of the science was rapid; in 1786 Dr. Withering published his "Botanical Arrangement" in English, and shortly before or soon after commenced Curtis's *Flora Londinensis* and *Botanical Magazine*, Smith and Sowerby's *English Botany* (including Scotland and Ireland), and the *Transactions of the Linnæan Society*. Previous to 1780 botany could have made little progress in Great Britain, except amongst scientific men, though the dawn of a brighter day of botanical science may be observed in the records of the period immediately preceding. My business however is with Ireland; and I shall first inquire what had been done towards a botanical knowledge of that country previous to 1780; and then whether it accompanied England in its advance, or by unaccountable and shameful neglect, left all to be done, and *by strangers*, within the last few years.

We have no records of the first discoverers, but we know that a Rev. Mr. Heaton communicated the names of plants he had found to How and Merret, and that, probably through him, those plants which at present constitute the most remarkable difference of the *Flora of this island* from that of Great Britain, were known and recorded long before the time of Threlkeld. In 1727 appeared the first list of Irish plants, except what may possibly exist in the Irish language. I will not repeat the slighting terms in which this work is spoken of, but by giving a fuller account of his work, show that the distinguished Robert Brown did not estimate the author of it too highly when he thought him deserving of a place amongst the promoters of botanical knowledge. I allude to the circumstance of his having called a genus of plants by his name, which he would hardly have done if he considered his work so useless as some regard it. The title was "*Synopsis Stirpium Hibernicarum, &c. &c.*", being a short treatise of native plants, especially such as grow spontaneously in the vicinity of Dublin, with their Latin, English, and Irish names, and an abridgement of their virtues, with several new discoveries; with an appendix of observations made upon plants by Dr. Molyneux, Physician to the State in Ireland." The modest motto prefixed is, "*Est quiddam prodire tenus si non detur*

ultra." The work was dedicated to Primate Boulter. Threlkeld was an Englishman, who settled in Dublin as a physician and dissenting minister. In his preface he speaks of having devoted attention to botanical studies in England as well as since he came to Ireland, and particularly mentions his having been in danger in 1707 (twenty years before the publication of this work) in the neighbourhood of Tynemouth Castle, from having been observed clambering on rocks instead of keeping the high road. He expressly says too, that he collected plants for twelve years, marking the place where they grew, and preserving them in a Hortus siccus, whereas the author of the article *THRELKELDIA* in Rees's Cyclopædia (did Sir J. E. Smith continue his contributions so long?) says, "that this catalogue was founded on the papers of Dr. Thos. Molyneux, or the communications of other people," and seems to question the propriety of Mr. Brown's notice of him. Rank in science he neither claimed himself, nor have others done it for him; but so far is the preceding charge from being just, that Dr. Molyneux's contributions, having come too late to be incorporated with the work, were printed as an Appendix, and he appears to have expressly noticed every plant that was inserted in his catalogue on the authority of others. Threlkeld speaks of his work as a *pocket-book, a small treatise, an abridgement*, by which he hopes to stir up others to contribute their quota "to wipe off the ugly character Pomponius Mela has fixed on the Irish inhabitants, *cultores ejus inconditos esse, et omnium virtutum ignaros magis quam alias gentes.*" Yet he himself in the same preface gives a fair excuse for the neglect of this branch of learning, when he observes, "that the wars and commotions have laid an embargo upon the pens of the learned, or discord among the petty subaltern princes has rendered perambulation perilous, least they should be treated as spies," when he mentions his own danger at Tynemouth in 1707. In the days of Threlkeld botany was little more than a branch of medicine, and in this light he chiefly regarded it. To detail the virtues of plants was his grand object, and he satisfies himself with the names by which they could be found in the works of Gerard, Caspar Bauhin and Ray, who appear to have been his authorities, though he sometimes expresses himself peevishly of the changes made by the last, which in his eyes were not improvements. To their Latin name he adds the English one and the Irish one, when he could attain it. These "Irish names," he says, "I copied from a manuscript which has great authority with me, and seems to have been written sometime before the civil wars in 1641, and probably by that Reverend

Irish Divine Mr. Heaton, who is quoted by Dr. How in the *Phytologia Britannica* for several plants, and also by Dr. Merret. He could find no living person acquainted with so many, and whether K'Eogh also made use of the same MS. or not, I have found their Irish names generally to agree. The number of species enumerated by Threlkeld (exclusive of all Cryptogamous plants, except the Fern tribe), was 473. Mackay's species in 1836 were 1054, and those of England 1436. When amongst those of Threlkeld we find *Arbutus Unedo*, *Dryas octopetala*, *Menziesia polifolia*, *Euphorbia Hiberna*, *Saxifraga umbrosa*, *Epipactis ensifolia*, *Osmunda regalis*, *Asplenium viride*, and other rare plants, some peculiar to Ireland, can we fairly say of such a country, that "its botany was as much unknown as that of an island in the Pacific"? May we not rather say that this collection made by Threlkeld, of plants observed by himself or by his predecessors, was a respectable foundation for future botanists to build upon? and that it should be estimated not by the knowledge of the present day, but by that of the period before the introduction of the Linnæan system? Amongst those whose discoveries were previous to Threlkeld's work, were Lhwyd and Sherard. Sherard's visit, as far as I can ascertain, was in 1695 or 1696, before he went abroad with Lord Howland afterwards Duke of Bedford; and he spent part of his time at Moira, not far from Lough Neagh, with Sir Arthur Rawdon. Amongst his discoveries were *Subularia aquatica*, *Epipactis grandiflora*, *Lithospermum maritimum*, *Drosera longifolia* (previously by Mr. Heaton), *Andromeda polifolia*, and probably others I have not noticed. The Murrough of Wicklow is given by Mr. Mackay as one of the habitats of *Lithospermum maritimum*, where it grows plentifully; and this is the habitat given by Sherard. Now is it not interesting to know, that nearly a century and a half before Mr. Mackay's work this habitat was known? True, the designations of the plants are not such as to lead a Linnæan botanist to recognise them without some labour; and the alphabetical arrangement is bad, though perhaps not much worse than if the author had adopted Gerard's, C. Bauhin's, or even Ray's arrangement; and I cannot help regretting that Mr. Mackay did not consider it an object to study Threlkeld's work, and make it the foundation of his labours. The appendix was supplied by Dr. Thomas Molyneux, the brother of Locke's distinguished friend, and a man more known for his exertions to promote science in Ireland than for the honour of a baronetage, still enjoyed by his descendant. This Appendix contains a more bare list of the plants found than Threlkeld's own, and a few are thus given

a second time and even under a different name; yet still it is a valuable record, and deserving the attention of the Irish botanist. Another old work often referred to, is the *Botanologia Universalis Hibernica*, or a "General Irish Herbal," by Mr. K'Eogh, published in 1735. This gentleman was a clergyman, chaplain to Lord Kingston, and seems to have resided near Mitchelstown, the seat of that nobleman in the county Cork, to plants in whose garden he often refers. The garden of that nobleman's descendant, the present Earl of Kingston, is perhaps the finest in Ireland; and there is attached to it, for the use of the gardeners, a library of valuable botanical works, many of them very expensive, under the superintendence of the head gardener. Mr. K'Eogh also often refers to the Barony of Burren, in the county Clare, from which, I think it probable that he was a native of that county. His names are nearly the same as those of Threlkeld, his publication having taken place within eight years after. To notice the medical virtues of plants was his great aim, and this is done with respect to cultivated plants as well as wild ones; but he states when got in gardens and when found wild, so that the work is not without its use in ascertaining the native plants then known. His botanical knowledge, however, may not have been such as to justify the insertion of plants merely on his authority, though it might direct attention to look for them in the district pointed out. *Galega officinalis*, *Asclepias* or *Swallowwort* (species not mentioned), *Palma Christi* or the *Greater Spurge*, and others, are said to be wild in Burren. It is so unlikely that this should be so, that it throws a doubt on his authority; but if the district were well examined, it might be found that other plants were taken for them, which an indifferent botanist in the then rude state of the science might mistake for them, as I have little doubt that the *Ruta sylvestris*, *wild rue*, also said to be found there, was a *Thalictrum*, as he has not noticed any of that genus; and *T. majus* and *minus* are said to be found in an adjoining county, and generally known as *Meadow-rue**. This was suggested to me by a remark of Mr. Templeton's, who, having seen it stated that savin grew wild on the Mourne Mountains, and having diligently searched for it in vain, thought that *Lycopodium alpinum*, *Savin-leaved Clubmoss*, which does grow there, and on other high mountains in Ireland, gave rise to the report. It is at once more candid and more probable to suppose that men mistake through

* My son, the Rev. W. Hincks, F.L.S., informs me that Cæsalpinus gave the names *Ruta sylvestris* and *Ruta sylvestris altera*, to *Thalictrum majus* and *minus*, which confirms my conjecture.

ignorance, than that they wantonly assert falsehoods. In judging of such works as those of Threlkeld and K'Eogh, we should consider them as abridgements of Gerard and his followers for medical purposes. No one now refers for descriptions to Parkinson, How, Merret, or even Ray, but these writers preserve to us the knowledge of their times, and for this purpose are referred to. In 1711 a Botanical Lectureship was established in Dublin College, to which a small physic garden was then or soon after annexed, in connexion with the medical school, but I have not traced any immediate benefit to the science derived from it. The Dublin Society, founded in 1731, by the attention it paid to agriculture and planting, both intimately connected with botany, indirectly contributed to its progress; but a society called the **PHYSICO-HISTORICAL**, about 1746, more directly contributed to our knowledge of the plants of Ireland by employing a botanist (name not recorded) to examine the county Down, the most important and interesting of the counties in Ulster, both on account of its varied surface and fertility, and its containing the Mourne Mountains. The list of plants collected by this person was submitted, I think, to Dr. Rutty of Dublin (esteemed a good naturalist for his time), and was published in the history of that county, attributed to Harris. The same Society sent Dr. Charles Smith to the south of Ireland, who published under their authority his histories of Waterford and Cork, and afterwards, the Society having terminated, that of Kerry, at his own risk. Mr. Mackay seems to have confounded these histories with the statistical accounts published under the auspices of the Dublin Society at a much later period; but he speaks of Dr. Smith's histories as possessing considerable accuracy with regard to the localities of plants, as he found during his botanical excursions through that part of the country. The next Irish publication on the subject was "Dr. Rutty's Natural History of the county of Dublin," in 1772, in which, though Mr. Lee had explained the Linnæan system in England in 1760, and Hudson had adopted it in the *Flora Anglica* in 1762, the old system was retained, which, considering the age of Dr. Rutty, and the length of time he had been collecting his materials amidst the avocations of a laborious profession, is not to be wondered at or censured. Whatever useful information it may contain, Rutty's work appeared to me less calculated to serve the purposes of an Irish Flora than that of Threlkeld. Previous to 1780, we had then lists of plants by Threlkeld, K'Eogh, and Rutty; of the rare plants of Down, by an unknown person, but under the direction of a

Society in Dublin; of the rare plants of Waterford, Cork, and Kerry, the three most southern counties, by Dr. Charles Smith, whose accuracy is admitted, and communications to the lists of How, Merret, and Ray, of the most remarkable plants that had yet been found in the country. We have now to inquire what progress was made in Ireland after 1780, and previous to Mr. Mackay's labours. In 1785, the Lectureship on Botany in the University was changed by Act of Parliament to a professorship, and annual courses of lectures were made imperative. Dr. Edward Hill, who had been lecturer, was the first professor, and continued to fill the chair till his death in 1801. I have not heard any character of his lectures, but it is reasonable to suppose that the increasing love of botany, which led to the change in the College, and to other circumstances, must have originated with him. Be this as it may, we find Dr. Robert Scott, who was afterwards his successor, Dr. Wade, Dr. Young, a fellow of Dublin College (afterwards bishop of Clonfert), an eminent promoter of science, Dr. Whitley Stokes, Fellow of Dublin College, and now Professor of Natural History in it, Mr. Blashford, a barrister, and others, adding every now and then new contributions to the Flora. At this time the late Mr. Templeton turned his attention to botany, and in 1793 had actually laid out that garden, known to all the botanists who have visited Belfast; that garden in which he made the interesting experiments on raising plants in the open air, previously found only in conservatories, communicated to the Royal Irish Academy in 1799; that garden which to this day is a monument of his zeal, his skill, and of that attachment to botany with which he inspired his family. In 1792, Dr. Brinkley came to Ireland as Professor of Astronomy, and he was an ardent botanist; Dr. Barker made out a list of the plants of his native county, Waterford, Mr. Tighe of those of Kilkenny; and the illustrious Robert Brown, being at Derry for some time previous to his going to New Holland, not only carefully examined that county, but extended his researches to the county of Donegal. All the gentlemen whose names I have mentioned were in communication with Mr. Templeton, and he was urged by most of them to undertake the Flora of Ireland, with a promise of assistance. In the meantime Dr. Wade published his Flora of the county Dublin in 1794. About the year 1800 the Dublin Society established a professorship of botany, which was filled by Dr. Wade, and began the Glasnevin garden, having Mr. Underwood for their first gardener. The parliamentary grant for this purpose was procured chiefly by the

exertions of the Right Hon. J. Foster, Speaker of the House of Commons, who had long been a zealous promoter of botany, and was considered to be well acquainted with it as a science. In 1801 Dr. Scott was elected professor in the College, and the board which has the direction of the College funds determined on having a suitable garden of their own, and engaged Mr. Mackay as curator, who came to Ireland about 1803 or 1804. In 1807 the proprietors of the Cork institution determined on having a garden, and engaged Mr. James Drummond as their curator. Previously to this, Mr. Templeton had a list of 815 species of phænogamous plants with their habitats, whilst his list of mosses, lichens, fuci, and fungi, was even more extensive in proportion. Thus early too, Miss Hutchins also had devoted herself to botanical pursuits, and had carefully examined the neighbourhood of Bantry Bay for phænogamous plants, though her chief discoveries were in the Algæ. The county surveys were at this time publishing under the auspices of the Dublin Society, in some of which lists of rare plants were given. It has been objected that the natural history part of these surveys is of little use, but it should be remembered that agriculture and statistics were the chief object, and we may surely ask whether the county surveys of England and Scotland displayed a more accurate knowledge of natural history? I date 1804 as the period from which Mr. Mackay's labours commenced, and I think I have a right to conclude, not only that the botany of Ireland was tolerably well known before he came, but also that if a considerable desire of promoting the science had not been previously formed, the parliament, the Dublin Society, and the heads of the university would not have incurred such a heavy expense as to establish two gardens, maintain two professors, and employ two able curators. It was not these gentlemen who first formed the taste, but their engagement was the result of its having been already formed. The Dublin Society not only had their garden, but they employed an under gardener in going through the country, and enabled their professor to travel in the west, publishing the result of his tour. In like manner the College employed Mr. Mackay in visiting the south and west, and the Cork institution sent Mr. Drummond into the west of their county and the county of Kerry. Mr. Mackay's catalogue of rare plants, printed in 1806, and Mr. Drummond's list of the plants of the county Cork, printed in 1810, both at the expense of the Dublin Society, show the result of these missions. It is no reflection on these gentlemen to observe, that having been employed for the purpose, they were able to do more than

those who could scarcely be expected to take long journeys at their own expense, merely for the sake of science. The same may be said of later discoveries, made under the Ordnance department. What has been done by such men as Messrs Mackay, Drummond, and Moore, (and no one can more cheerfully acknowledge that they have done much) is to their honour, but should never be brought forward to the disparagement of those who were mere voluntary labourers. I now leave it to the judgement of the reader, whether it was fair to attribute almost all to Mr. Mackay and his contemporaries, or to use language which might appear to a stranger to imply, that even in 1833 the botany of Ireland had remained amongst its enlightened inhabitants *almost a sealed book*.

[To be continued.]

II.—On Sphæronites and some other genera from which *Crinoidea* originate. By L. VON BUCH*.

PERHAPS there are few schemes of general structure sketched by Nature within whose circle so many and so variously modified forms have been unfolded as the beautiful Lilies of the Ocean, the *Encrinites* or *Crinoidea*. From their simple origin they diffuse themselves in every direction to the most wonderfully complex and numerous forms, and then suddenly return in the progress of creation to a proportionately small number; so much so, that of the numerous genera and species of the primitive age, only the solitary *Pentacrinus* has come down to our present period. But other forms have unfolded and diffused themselves in all oceans. The corolla of the lily has again closed, and perfectly enveloped *Asteriæ* and *Echini*, capable of greater movement and development, have taken the place of the *Crinoidea*.

No formation can produce a greater number of the most varied forms of these creatures of the primitive age, than the transition formation from the oldest strata to the carbonaceous series. Their chief character in this period is, that the parts which envelope the body have still greatly the superiority over the auxiliary members which are to convey the nutriment, the far-spread many-fingered arms. This body becomes smaller and smaller, and consists of fewer pieces in the Jura formation; the arms and fingers are on the contrary longer, more compound, and in greater number. With *Comatula* or the *Euryalæ*, the body separates entirely

* Read before the Royal Academy of Sciences of Berlin, March 16, 1840, and translated from the *Berichte der Akademie*.

from the petiole, and in *Echinus* and the allied genera there is no longer need of any corolla.

But before the ocean-lily had opened and expanded its arms, it moved on a short pedicel in the closed state in innumerable quantity, and only by frequent and highly varied attempts did this rupture and expansion succeed. These closed *Crinoidea* are still but little and imperfectly known; they deserve to be known, however, in every respect. For hitherto no *Encrinus* has been found in the lower beds, and from them there is formed an uninterrupted transition to the *Pentacrinus* of the existing ocean. Hitherto these forms have occurred almost exclusively in northern countries; in Sweden, in Norway, and in the hills which bound St. Petersburg on the south; and among them the *Sphæronites* are most frequently met with.

These are large round spheres, like oranges, with two poles at the extremities. Linnæus, in his journey through Oeland, called them crystal-apples. Gyllenhahl, in an able investigation and description (1772), was however the first to recognize their organic nature, and concluded that they might be placed near to *Echinus*, on which account Wahlenberg applied to them the name *Echinosphærites*, which Hisinger has exchanged for the better one of *Sphæronites*. These spheres are formed of numerous polyhedrous plates, generally hexagonal, perhaps of two hundred in one specimen. Above opens a mouth, which is covered by a number of very small moveable shields. Below, a petiole of thin pentagonal articulations fixes the body to the soil. The plates are all perforated. In *Sphæronites Aurantium* these small pores stand in a row from each angle of the polyhedron towards the centre, yet not quite up to the centre itself. Each of these pores is connected by a deep furrow with the adjacent plate, thus giving rise to *rhombs*, which always extend over two plates or *assulæ*; sometimes so prominently, that the rhombs themselves have been taken for *assulæ*, and a species erroneously named *Sphæronites Granatum*, because a similarity was found in these rhombs to the surfaces of a granite crystal. But Gyllenhahl had long before shown that the true polyhedrous *assulæ* bisect the rhombs in the shorter diagonal, and at right angles with their striping. Pander, however, proves what had escaped Gyllenhahl, that these stripes or grooves connect tentacular apertures, as two pores do in the ambulacra of the species of *Cidaris*. And therefore it is very probable that *Ischadites Koenigii* (Murch. Silur. Syst. Pl. 26. fig. 11.) is only *Sphæronites Aurantium*, upon which an outline has been given to the rhombs not belonging to them, and distorting the whole. This discovery of Pander of tentacular passages,

and consequently of tentacula, is important. They reappear on many *Encrinites*; for instance, on *Actocrinites*, on *Rhodocrinites*, and even on *Marsupites*. (Bronn, Lethæa, Pl. IV.) The rhombs are not evident on the surface of *Sphæronites Pomum*. Each plate bears a number of small systems, separated *inter se*. Two pores are always connected with one another, but these systems are scattered without arrangement over the entire surface. This species has hitherto only been found in Sweden.

In the upper half of the *Sphæronites*, but still a fourth of the sphere distant from the mouth, there is a large pentagonal aperture, which is closed by five triangular valves projecting in a flattened pyramid. Gyllenhahl and his successors call this aperture the mouth. But analogy with the allied forms requires the mouth to be above, and an aperture closing *exteriorly* appears little adapted for a nutriment-receiving mouth. Probably it is an oviduct. Above, quite close to the mouth, and *constantly to the right* of the valvated aperture, there is a third very small opening, penetrating deep into the interior, probably an anus. A similar small anal aperture is likewise evident between three laminae on *Apiocrinites*, where hitherto it has not been observed, resembling the anus of the living *Comatula*. Gyllenhahl expressly states, "I always found this *Sphæronites Pomum* in Westgothland, at a greater depth than *Sphæronites Aurantium*, and in far greater number." It is therefore surprising that it has not yet been met with in the neighbourhood of St. Petersburg.

Hemicosmites pyriformis.—By means of this beautiful and extremely elegant form, we approach a great step nearer to the true *Crinoidea*. Although still without arms and closed, there are already here but few plates or *assulæ*, in definite number and regularly combined. The *Hemicosmites* is reverse pear-shaped, and consists of three parts, of *pelvis*, *thorax*, and *vertex*. The pelvis on the slender pentagonal petiole is formed of *four pieces*, which are arranged in a hexagon. Two of them are pentagons, the two others lozenges (rhombs). Six *costals* in two different groups form the thorax. Three of these plates are narrower, and above, between those on the left, there is a *pentagonal aperture closed with valves* as in *Sphæronites*. The three other *assulæ* are broader, and the superior apex of the elongated hexagon is somewhat truncated. In accordance with this, the vertical plates arching over the whole also divide into two groups; on the side of the broader *assulæ* there is on each truncation of their apex a longitudinal piece, as it were, inserted, and there are therefore three such pieces; they are wanting on the side of the valvate aperture. The exceedingly small laminae which cover the mouth on the top

of the vertex, appear to terminate in three small processes or arms which are pierced, and might perhaps form distinct oval apertures. No anal aperture is evident. The great regularity of this arrangement is still more evident from the great elegance with which prominences are distributed in series over each assula of thorax and vertex. They proceed on the costals from the centre to the *upper* angle of the hexagon, none towards the lower. On the vertical assulæ, on the contrary, these series go towards the *lower* angles, none towards the upper. Only the halves of the surfaces are decorated in this remarkable manner. The vertical and lateral series thus combine to form a highly elegant wreath environing the whole figure. These warts or prominences are pierced in the centre, and appear to be points of adhesion for spines. The central series of each assula is double. On the other parts of the assular surface there are but few similar warts scattered without any order.

Cryptocrinites regularis and *C. Cerasus* (Pander, t. ii. f. 24. n. 26.).

The pelvis is that of a *Platycrinites*, the thorax that of a *Poteriocrinites*; but the vertex is still closed, and without arms. However, five ribs or rings extending from the lower extremity to the vertex are hidden beneath the assulæ, which are thus raised exactly in the form of a roof, just as may be observed in *Actocrinites* before the arms divide. The essential character of the *Crinoidea* exists, therefore, almost entirely in the *Cryptocrinites*, but it is yet hidden in the interior. The pelvis consists of *three plates*, which are united to form a pentagon, an arrangement which again occurs in *Platycrinites*, in *Rhodocrinites*, and in *Actocrinites*, but only in the older ones; in the later Jura *Crinoidea* it is no longer found. The thorax is surrounded by *five costals*, and the vertex likewise by *five plates*, which alternate with the costals. Minute plates surround the mouth, which is for the most part open. Between the vertex and costals there is again a large *aperture covered by five valves*. In *Cryptocrinites Cerasus*, intercostals are, moreover, situated on the original five of the thorax, thus somewhat disturbing the regularity of the upper half; and there are also probably more than five assulæ or plates on the vertex. The side on which the valvate aperture is situated is bulged out at all points; the effort of the hidden arms to break through the sides is here evident. The size of these animals seldom exceeds that of a pea; the petiole which bears it has the thickness of a pin. Hitherto they have occurred solely in the hills near St. Petersburg.

III.—*Catalogue of the Land and Freshwater Mollusca of Ireland.* By WM. THOMPSON, Vice-President of the Natural History Society of Belfast.

ON the subject of the Conchology of Ireland, three catalogues were published within a comparatively short period; Dr. Turton's in July 1816, in the 'Dublin Examiner, or Monthly Miscellany of Science, Literature and Art;' Capt. Brown's in the second volume of the Wernerian Memoirs in 1818*; and in this same year a third appeared in the Appendix to Walsh and Whitelaw's History of Dublin, from the pen of M. J. O'Kelly, Esq. of that city. The species of land and freshwater Mollusca enumerated in these three catalogues are much the same, and about fifty in number. In the subsequent works of Brown and Turton a few more species were added. To Bryce's 'Tables of Simple Minerals, Rocks and Shells,' found in three of the northern counties, published in 1831, Mr. Hyndman contributed two species hitherto unnoticed. In the London and Edinburgh Philosophical Magazine for 1834 (p. 300.), about thirty additional species were made known by myself; in a paper entitled 'Additions to the Fauna of Ireland,' published in the Annals for last March, I noticed a few more; and in the present communication there are two species previously unrecorded. I shall here, for the sake of brevity, avoid entering into detail respecting any of the species thus alluded to, but shall correct in its proper place in the following paper, in so far as my information extends, every error, either of others or of my own.

The order in which the genera and species appear in Mr. Gray's edition of Turton's 'Manual of the Land and Freshwater Shells of the British Islands,' is adopted.

Class 1. GASTEROPODA, *Cuv.*

Order I. PHYTOPHAGA.

Fam. 1. NERITIDÆ.

Gen. 1. NERITINA, *Lam.*

1. *N. fluviatilis*, *Lam.* Gray, *Man.* p. 83. pl. 10. f. 124.

Nerita fluviatilis, *Mont.* p. 470; *Drap.* p. 31. pl. 1. f. 1—4.

Is found in the east, west, and south of Ireland. The localities given by Capt. Brown are—"In a stream at Clonooney; in the Shannon and Bresna; and in some places of the canal adhering to stones," p. 532. In the vicinity of Dublin it occurs in the Grand

* This catalogue was dated from Naas Barracks, Ireland, 20th August, 1815, and read before the Wernerian Society of Edinburgh on the 16th of December in that year.

Canal; at Lough Derg and Limerick it is found in the Shannon; and in the county of Tipperary in some of the tributaries of this river; and about Cork in the river Lee. The specimens which I possess from the Shannon and Grand Canal are identical with the *N. fluviatilis* represented by Rossmassler, and as distinguished from the *N. Danubialis*, *N. strangulata** and *N. transversalis*. Icon. part. 2. p. 17, 18. pl. 7.

Fam. 2. PALUDINIDÆ.

PALUDINA, Lam.

1. *P. vivipara*, Lam. Gray, Man. p. 90. pl. 10. f. 118.
Cyclostoma viviparum, *Drap.* p. 34. pl. 1. f. 16, 17.
Helix vivipara, *Mont.* p. 386.

In his 'Irish Testacea,' p. 527, Capt. Brown notices this species under the last-quoted name as found "in a stream near Newtownards, county of Down; rare"—by a letter from this author I learn that he himself procured the shell in that locality. Mr. Gray (Man. p. 34.) incidentally notices *Paludina achatina* as an Irish species, but on inquiry from him he could not recollect from whom he had received the information. I have not seen undoubtedly native specimens either of *P. vivipara* or *P. achatina*.

2. *P. tentaculata*, Flem.

Helix tentaculata, *Linn., Mont.* p. 389.

Bithinia tentaculata, *Gray, Man.* p. 93. pl. 10. f. 120.

P. impura, *Lam., Turt. Man.* p. 134. f. 120.

Cyclostoma impurum, *Drap.* p. 36. pl. 1. f. 19, 20.

A common species throughout the island, generally approximating Draparnaud's var. f. 20. pl. 1. more nearly than his normal shell f. 19. I have on different occasions found the stomachs of Gillaroo Trout from Lough Neagh filled with this Paludina.

Fam. 3. VALVATADÆ.

VALVATA, Muller.

1. *V. piscinalis*, Lam. Gray, Man. p. 97. pl. 10. f. 114.
Cyclostoma obtusum, *Drap.* p. 33. pl. 1. f. 14.
Turbo fontinalis, *Mont.* p. 348. t. 22. f. 4.

Common, and generally distributed over Ireland. Many of my middle-sized specimens correspond with Pfeiffer's *V. depressa*, in so far as the figure and diagnostic description enable me to judge, Pfeiff. part 1. p. 100. t. 4. f. 33. See Gray, Man. p. 98. This species is very variable in the degree of elevation of its spire, and consequently in its diameter relatively to its height. I have been favoured by Edward Waller, Esq. with specimens of this *Valvata* collected at Finnoe, county Tipperary, the volutions of which appear angular from being spirally cut, as they occasionally are in various species of *Limneus*, and the angles are marked with a white line.

* Specimens from Carniola, named "*N. strangulata*, Menke," by M. Michaud, who favoured me with them, when compared with my *N. fluviatilis*, fully bear this out.

2. *V. cristata*, Mull., Gray, Man. p. 98. pl. 10. f. 115.

Helix cristata, Mont. p. 460. vign. 1. f. 7, 8.

Valvata spirorbis, Drap. p. 41. pl. 1. f. 32, 33.

This handsomely formed species is distributed over the island. The *Valv. Planorbis*, Drap., noticed as Irish in Lond. and Edin. Phil. Mag. 1834, p. 300, must be erased from the list.

Order II. PNEUMONBRANCHIATA.

Fam. 1. ARIONIDÆ.

ARION, Ferus.

1. *A. ater*, Gray, Man. p. 104.

Limax ater, Linn.

Arion empiricorum, Fer.

This species, the common "black snail," is abundant throughout Ireland. Its varieties, *A. rufus* (*Limax rufus*, Linn.), and *A. marginatus*, as remarked by Mr. Templeton, likewise occur. Under a coloured drawing of the latter made by this naturalist is the remark, "common in fields about Cremorne, county Monaghan, August 4, 1805." The yellow variety is likewise found in the north and south (Miss M. Ball). Under precisely the same circumstances of food and "habitation" I have met with the varieties above-mentioned. See Gray, Man. p. 105.

2. *A. hortensis*, Fer. Gray, Man. p. 107.

"Common at Cranmore (Belfast)," Templeton's MS. Coloured drawings of the variety of this or the preceding species, named *A. circumscriptus* by Dr. Johnston, were made by Mr. Templeton in 1808. To this I can only add, that the species is common throughout the north.

Fam. 2. HELICIDÆ.

1. LIMAX, Fer.

1. *L. maximus*, Linn. Gray, Man. p. 112.

L. cinereus, Drap.

This, the common "large grey slug," is equally abundant in north and south. In the stomach of the Song Thrush (*Turdus musicus*), I have frequently found the shell of this species, the *Limacella parma* of Turton's Manual, after the animal, of which it had been part, had been entirely dissolved. I have procured similarly the shells of the smaller *Limaces* from the Blackbird (*Turdus Merula*). Either this or the next species is accused by Miss M. Ball of making its way into pantries and eating holes in bread.

2. *L. flavus*, Linn. Gray, Man. p. 114.

L. variegatus, Fer. *Hist. de Moll.* p. 71. pl. 5. f. 1—6.

In Mr. R. Ball's collection are a number of these, which were brought by him from Youghal. In the north it has occurred to myself.

3. *L. agrestis*, Linn. Gray, Man. p. 117.

This, the small rough yellowish species, is very common throughout the north, and I believe in Ireland generally.

4. *Limax*

The Rev. B. J. Clarke, of Merrion Square, Dublin, has favoured me with a coloured drawing and a description of a *Limax* which he has taken at La Bergerie, Queen's county, and describes to be "blackish-grey on the back, lighter underneath, with a sharp keel down the back proceeding from the shield." It may be the *L. carinatus*, Leach, or *L. gagates*, Drap.; but not having seen any specimens, I abstain from naming it even with a mark of doubt.

2. VITRINA.

V. pellucida, Drap. p. 119. pl. 8. f. 36, 37. Gray, Man. p. 120. pl. 3. f. 21.

Is in suitable localities distributed over Ireland, and may be found under the first stones we meet with in going inland from the seashore, up to as great an altitude in the mountain glens as there are moss and leaves to shelter it. I have remarked the colour both of animal and shell to vary, and the latter to present some differences in form. See Jeffreys on *V. Mulleri* and *V. Draparnaldi* in Linneæan Transactions, vol. xvi. When thin and of an almost crystalline transparency, the shell is often more handsomely formed than when thicker and of a greenish colour, and is intermediate between the *V. pellucida* and *V. diaphana*, as represented by Draparnaud (pl. 8.) and Rossmassler (t. 1.); this state is equally common with the normal *V. pellucida*; of this, the animal is lighter in colour, and not so large compared with the shell as in the variety*.

3. TESTACELLA, Cuv.

Testacellus haliotideus, Fer. Gray, Man. p. 124. pl. 3. f. 19, 20.

Testacella haliotidea, Drap. p. 121. pl. 8. f. 44, 45.

This species was discovered many years ago by Mr. R. Ball in the town gardens at Youghal, where it has become much scarcer of late. The Irish specimens agree with English examples of the var. *V. scutulum*, with which I have been favoured by Mr. G. B. Sowerby. Mr. Gray (Man. p. 123, 124.) seems to consider this a naturalized species, but the circumstance of its being found at Youghal speaks more strongly in favour of the *T. haliotideus* being a true native than that of its being met with in some of the gardens around

* Most of the very numerous species of land mollusca which I find on the fallen leaves of trees are particularly partial to those of the Scotch elm (*Ulmus montana*); when the large and rough leaves of this tree are mingled with those of the common forest or ornamental kinds, I have observed that about twenty specimens may be found on them, for one on an equal proportion of any of the others. When the ground is saturated with moisture the cause of this preference is obvious, as the nerves of the leaves are so strongly developed, that when the under side is next the ground the membranous portion of the leaf between them remains quite dry.

London, to which it might much more readily have been introduced along with exotic plants. In a garden at Bandon, too, a *Testacellus* has been procured by Mr. G. J. Allman. The circumstance of this species, indigenous to France and to the island of Guernsey, being found only in the south of England and Ireland, seems to me strongly in favour of its being equally indigenous to these countries. Mr. Ball, in reply to some questions, observes, "I first became aware of this *Testacellus* preying on worms by putting some of them in spirits, when they disgorged more of these animals than I thought they could possibly have contained; each worm was cut (but not divided) at regular intervals. I afterwards caught them in the act of swallowing worms four and five times their own length. Some of these *Testacelli*, which I brought to Dublin and put in my fern house, produced young there."

Testacellus Maugei is noticed by Dr. Turton (Manual, p. 28.) as found "in Ireland," but I have been unable to give any information respecting it, and these two words seem to me insufficient to establish it either as an introduced species or otherwise.

4. HELIX.

1. *Helix aspersa*, Mull. Gray, Man. p. 128. pl. 4. f. 35; Drap. p. 89. pl. 5. f. 22.; Mont. p. 407.

Although distributed over the four quarters of the island, this *Helix* is less generally met with than several other common species. In a well-cultivated and moderately wooded district near Belfast, stretching along the base of the mountains where chalk chiefly prevails, presenting different soils, especially clay and alluvium, and rising to an elevation of 500 feet above the sea, it is never found. Mr. Edward Waller, who has successfully investigated the Mollusca about Annahoe, county Tyrone, states that the *H. aspersa* is unknown there. It seems partial to the vicinity of the sea; so much so, that about Ballantrae in Ayrshire, Scotland, I have remarked numbers of them on rocks, subjected to the spray of the waves, which had bleached the portion of the shell thus exposed as white as it usually becomes in the progress of decay, although the animal inhabitants were all in the highest vigour. In the crannies of the ruined castles, which, like Dunluce, are based upon the summits of some of the highest cliffs washed by the sea in the north of Ireland, the *H. aspersa* is abundant.

In one instance which may be mentioned, differences of rocks, soil, or shelter will not explain the absence of this species from particular localities. During a forenoon's walk on the marine sand-hills of Portrush and Macgilligan (county of Londonderry), which are only a few miles apart, and present in every respect precisely the same appearance, I found the *H. aspersa* abundant at the former, but at the latter wanting, and here the sand-hills are much more extensive than at Portrush. At the nearest sand-hills, again, on the coast to the east of the latter, and only a few miles distant, I did not during a short visit find the *H. aspersa*; and here *Helix virgata*, which is not found at the other two localities, appeared, and

took the place of *H. ericetorum*, which is common to them; here, too, and at Portrush, *Bulinus acutus* was present, though not so at Macgilligan. On the 8th of June I once observed the *H. aspersa* in coitu, and with the spicula adhering (see Montagu in Test. Brit.);—these are half an inch in length, hollow, and broaden considerably to the base.

In the Magazine of Natural History, vol. v. p. 490, Mr. Denson states that in severe winters the *H. aspersa* is in the old botanic garden at Bury St. Edmunds eaten in quantity by the Norway rat; a fact of which I some years ago had circumstantial evidence in the broken shells lying about the entrance to this animal's abode among heaps of stones in the Horticultural Society's garden at Chiswick, London*.

2. *Helix hortensis*, Lister. Gray, Man. p. 130. pl. 3. f. 24; Drap. p. 95. pl. 6. f. 6; Mont. p. 412.

Although apparently not numerous anywhere, it would seem to be widely distributed in Ireland. To myself it has occurred about Dublin, and at Portrush, along with *H. nemoralis* and *H. hybrida*; has been obtained in the county Donegal; at Moira and Newcastle, county Down; King's County; Kildare; Tipperary; and about the city of Cork. As some authors make the white lip and less size the only differences between this species and *H. nemoralis*, I was for some time in doubt whether it might not be a small variety of the latter, but was fully satisfied of its distinctness by finding both species plentifully in company at Dovedale (Derbyshire), when every individual in size, &c. maintained the respective characters of its species. The *H. hortensis* seems partial to limestone districts.

3. *Helix hybrida*, Poiret. Gray, Man. p. 132.

In July 1833 I obtained the handsome *Helix*, so designated by Mr. Gray, on the marine sand-hills at Portrush, near the Giant's Causeway, along with different varieties of *H. nemoralis* and a very

* *Helix Pomatia*, Linn. The following observations of W. H. Harvey, Esq., communicated in a letter to me in January 1834, include all that need be said of this shell. "Dr. Turton, in his Conchological Dictionary, states that this species is mentioned by Dr. Rutty in his 'Natural History of the county of Dublin,' as not uncommon in his time. On referring to Dr. Rutty's work I cannot find any such assertion. At p. 379. vol. i. he certainly admits it in the following terms: 'Cochlea duplex primo terrestris, the terrestrial snail, and particularly the house snail, which is thus distinguished by Lister; Cochlea cinerea maxima edulis, cujus os operculo crasso gypseo per hyemem clauditur:' and then goes on to tell of its uses as food, the manner of cooking it, &c., but not one word about its habitat."

The *H. Pomatia* has of late years been introduced from England to different localities in Ireland, as Dalkey island, off the Dublin coast, Youghal, &c. In the autumn of 1834 I turned out a few individuals of this species and of *Cyclostoma elegans* on the chalk in the neighbourhood of Belfast, but they have not increased; after a few months I could not find one of either species about the place. See Gray, Man. p. 35.

few individuals of *H. hortensis*. When shown to Mr. Gray in the following spring he considered the specimens to be *H. hybrida*. Judging from the shell alone, I should not be disposed to consider this *Helix* more than a variety of *H. nemoralis*.

4. *Helix nemoralis*, Linn. Gray, Man. p. 132. pl. 3. f. 23; Drap. p. 94. pl. 6. f. 3—5; Mont. p. 411.

This *Helix*, presenting its endless and beautiful varieties in colour and the number and breadth of bands, is more commonly distributed over Ireland than any other species. When on the extensive rabbit warren or marine sand-hills at Portrush on the 10th of July 1833, I remarked it, together with *H. aspersa*, *H. ericetorum*, and *H. Bulimus acutus*, to be not only abundant, but huddled together in heaps: the animals were alive in all, and of the *H. nemoralis* several had the apertures closed up. Among the individuals of this species some were of the white-lipped variety, which has not uncommonly been mistaken for *H. hortensis*; others had the lip of a rose colour, margined with white (*H. hybrida*): the specimens, which were so numerous, that every variety of shade in the lip, from white to the darkest brown, could be traced, seem to prove that the colour of the lip no more than that of the shell is of any specific value. The absence of the Thrush genus (not an individual belonging to it could be seen on this occasion), of which some species feed very much on these mollusca, may be one cause of their being permitted to increase and multiply to such an extent. Considerably the largest specimens of *H. nemoralis* that I have collected were obtained in the South Islands of Arran off the coast of Clare. This species is generally noticed as inhabiting "woods and hedges," but to myself it has never occurred so abundantly in the vicinity of either wood or hedge (about which its enemies "most do congregate"), as entirely remote from them; or among the debris of limestone or chalk cliffs and quarries, and on marine sand-hills.

The Rev. R. Sheppard has observed in Suffolk that the plain coloured, the single-banded, and the many-banded, do not mingle with each other in coitu, but that each is true to its banded or bandless mate. (Linn. Trans. vol. xiv. p. 163.) In Ireland those so differing have no such scruples; such as I have seen in connexion and displaying each other's spicula or love-darts, have been very dissimilar in colour and markings; they have so occurred to me from the middle of April to that of September. Mr. Hyndman once found a spiculum of this species stuck through the leaf of a dandelion (*Leontodon Taraxacum*); if there be but the one use in this missile, it would thus seem that the animal will occasionally miss its aim.

A *H. nemoralis* of ordinary size which I found near Belfast, exhibits a prominent tooth where the basal margin joins the whorl. I have in the month of May detected the blackbird preying on this *Helix*.

5. *Helix arbustorum*, Linn. Gray, Man. p. 137. pl. 3. f. 25; Drap. p. 88. pl. 5. f. 18; Mont. p. 413.

This delicate and handsome species was noticed by Capt. Brown and Dr. Turton as having been found about Dublin; at Killarney the Rev. Thomas Hincks of Cork informs me that it is met with; but the north seems to be its more favourite abode: in suitable localities throughout the county of Antrim it prevails, as it likewise does in Down, but more sparingly. Of 147 specimens collected at the same time in the neighbourhood of Larne in the former county, all were of the ordinary state, or marked with the dark band (see Pfeiffer, tab. 2. f. 7.), except 12, which were of the variety in which the band is wanting, the spotting much paler, and the colour generally much lighter. (Pfeiff. tab. 2. f. 8.) Having collected this species in England and Scotland as well as Ireland, I may observe that a certain degree of moisture and shelter have always seemed to be its desiderata. At Dovedale in Derbyshire, and at Knockdolian in Ayrshire*, it occurred plentifully about moist limestone cliffs, and in the latter locality with little more than ferns (especially *Cyrtia fragilis*) to shelter it. In the north of Ireland I have met with it in shady woods in the lower grounds, and likewise in young plantations at a considerable elevation in the mountains, and where there was no more shade or moisture than the *Luzula sylvatica* requires. From its shell being so easily broken this animal is a favourite food of the thrush genus. (See Magazine of Zoology and Botany †, vol. ii. p. 436.)

6. *Helix pulchella*, Mull. Gray, Man. p. 141. pl. 5. f. 49; Drap. p. 112. pl. 7. f. 30—34.

H. paludosa, Mont. p. 440. *H. crenella*, Mont. p. 441. pl. 13. f. 3.

This species may more literally than most others be stated to be distributed over Ireland, for it is the verge of the sea that marks its boundary. Although occurring throughout the inland parts of the country, it seems especially to delight in the short pastures in the vicinity of the sea around the entire coast; in some of the islets of Strangford Lough, too, I have in like manner observed it.

The var. *H. crenella*, Mont. has been considered by some naturalists peculiar to damp situations; but with this my observation does not accord, the beautiful ribbed variety being more frequent than the smooth state on the dry sea-banks of the North of Ireland. Mr. E. Waller writes to me, with reference to Finnoe, county

* At the Falls of Clyde Mr. Hyndman has collected specimens.

† *Helix lapicida*, Linn. Gray, Man. p. 140. pl. 5. f. 51. Capt. Brown inadvertently noticed this species as found in the neighbourhood of Belfast by Dr. M'Donnell, p. 523, by whom I am informed that the specimens seen by that gentleman in his collection were English. In his Catalogue of Irish Shells, Dr. Turton says of this species, "found by Mrs. Travers of Belgrove, on the stone steps of her mansion at Cove;"—rather a suspicious habitat. The species has not occurred in Ireland either to myself or to any correspondent; English specimens have in a living state been turned out in the neighbourhood of Limerick within the last year.

Tipperary, "I have found both varieties of *H. pulchella* in high and dry grounds as well as damp and low*."

7. *Helix fusca*, Mont. p. 424. t. 13. f. 1; Gray, Man. p. 147†. pl. 4. f. 36.

This handsome species was noticed by Turton as Irish, but merely in the words "woods in Dublin." (Conch. Dict. p. 61.) It is found in the north, east, west, and south, but in King's County and Tipperary has not been met with by my correspondents. As this species, though widely distributed, is by no means common, the following habitats may be enumerated. Glens in the Belfast mountains and Drumnasole, county Antrim; Florence Court, county Fermanagh, W. T. Altadawan, county Tyrone, Edward Waller, Esq.; Kilruddery demesne, county Wicklow, T. W. Warren, Esq.; Mornivea, county Galway, Rev. Benj. J. Clarke; "near Limerick once," W. H. Harvey, Esq.‡; Youngrove near Youghal, Miss Ball; Dunscombe Wood near Cork, Miss Hincks: in this locality the Rev. T. Hincks, who has supplied me with very fine specimens, remarks that it is abundant. The following notes are perhaps not irrelevantly introduced. Dec. 16, 1833.—Although several times before in Colin Glen near Belfast, in search of Mollusca, I today for the first time, in consequence of its somewhat peculiar haunts, obtained specimens of the *H. fusca*, and of them about two dozen. The ground was saturated with moisture, and they were all briskly traversing the rich green leaves of the *Luzula sylvatica*, and one or two other plants of similar foliage. The animal is much elongated, and moves about with considerably greater rapidity than any *Helix* I have seen; its colour is uniform, but in different individuals varying from "wine-yellow" to blackish-grey§; tentacula of the latter colour, the longer pair in the adult animal $2\frac{1}{2}$ lines in length; from their base a black line extends along the back for 3 lines. Dec. 10, 1837.—In Colin Glen today I obtained upwards of thirty of these *Helices*. The ground was wet, but there had been no rain in the preceding night, and consequently they were not found (with a very few exceptions) on the *Luzula*, but were instead lying sheltered and quiescent be-

* *Helix Cantiana*, Mont. p. 422. pl. 13. f. 1; Gray, Man. p. 144. pl. 3. f. 26.

Is in Turton's catalogue of Irish Shells stated to have been found in "hedges and box borders about Dublin," and in his Conchological Dictionary "Cork" is noticed as a habitat. I have not seen Irish specimens of this *Helix*, nor is it known to any naturalist with whom I have communicated to have been ever found about Cork, Dublin, or elsewhere in Ireland. From the two localities just named I have seen specimens of *H. virgata* without bands, and coloured similarly to *H. Cantiana*, and being much depressed, closely approaching it in form; they might thus possibly at a cursory view be passed over as immature individuals of this species.

† The two wood-cuts in this page are very characteristic.

‡ From Mr. Harvey I have specimens which he collected at the Falls of Clyde, Lanarkshire; near Ballantrae, Ayrshire, it has occurred to myself.

§ On extracting the animals the shells were found to be all of the same amber hue.

neath masses of the fallen leaves of forest trees contiguous to that plant. About three o'clock, when it began to grow dusky, they commenced stirring about on the green leaves of their favourite *Luzula sylvatica*, where in less than half an hour I procured a dozen of them. I have since occasionally seen this species on the stems of trees at a considerable height from the ground and in very dry weather.

8. *Helix fulva*, Mull. Gray, Man. p. 148. pl. 5. f. 47; Drap. p. 81. pl. 7. f. 12, 13.

H. trochiformis, Mont. p. 427. t. 11. f. 9.

Although not common, is generally distributed over the island, and found in woods among fallen leaves and timber; and under stones, &c. in various situations from the sea-side to the mountain. It seems rarely to occur in quantity, but once at Wolfhill near Belfast, I found thirty individuals congregated under one small stone.

The *H. Mortoni*, agreeing both in animal and shell with Mr. Jeffreys's description (Linn. Trans. vol. xvi. p. 332.) is obtained along with *H. fulva*, but has always seemed to me wanting in sufficient characters to render it a distinct species. That the animal of *H. Mortoni* is lighter coloured than that of *H. fulva*, is not of consequence, as the young of various *Helices* are lighter coloured than the adults.

9. *Helix aculeata*, Mull. Gray, Man. 149. pl. 4. f. 33; Drap. p. 82. pl. 7. f. 10, 11.

H. spinulosa, Mont. p. 429. t. 11. f. 10.

Although the individuals of this *Helix* are generally but few in number where they do occur, the species is distributed over Ireland, and is found in moss, on fallen timber, under stones, &c.—out of "woods" I have as frequently met with it as in them: high up the limestone mountain of Ben Bulbin (county Sligo) I have obtained it, but nowhere in Ireland have seen so many specimens together as in the limestone debris at Feltrim Hill near Dublin. From the marine sand-hills at Miltown Malbay, on the western coast, Mr. W. H. Harvey has supplied me with a few specimens, noting the species at the same time as "very rare." Mr. T. W. Warren of Dublin informs me that early last winter he procured sixty individuals of this species on one occasion near Portmarnock (county Dublin): some weeks previous to this time he found a few specimens at the place, and following the plan of the Rev. B. J. Clarke (see note to *Helix lucida*), he laid down sticks and stones that they might shelter under them, and with such success that he obtained this number. None of our Mollusca more than this requires the collector to be wide awake, else he may pass it by for a pellet of dirt or at least a seed. As one of the rarer species, it may be mentioned that out of Ireland I have found this shell at Dovedale, Derbyshire, the "dean" at Twizel House, Northumberland, and near Ballantrae in Ayrshire.

10. *Helix lamellata*, Jeffreys. Linn. Trans. vol. xvi. p. 333; Gray, Man. p. 150. pl. 5. f. 48.

H. scarburgensis, Bean. MS. Alder's Newc. Catal. p. 36; Turton, Man. p. 62.

This attractive species is widely distributed in Ireland, and is found on the decaying leaves and fallen branches of trees, in moss, and under stones in shady and generally moist situations. I first met with it in Sept. 1833, in the Glen at Holywood House, county Down, and soon afterwards in various localities throughout this county and Antrim; about O'Sullivan's cascade at the lower lake of Killarney, I had the gratification to find it in June 1834, and subsequently in the Glen of the Downs, county Wicklow. By the Rev. B. J. Clarke it has been obtained at La Bergerie, Queen's county, and by the Rev. T. Hincks of Cork, at Dunscombe Wood near that city, and likewise at Ballinhassig Glen between Cork and Bandon. Mr. Hincks remarks that the species appears to be far from uncommon in that district.

The following note relates to my most successful capture: April 30, 1837.—In Colin Glen (near Belfast) during an hour's patient search today, I collected from amongst a mass of the dead leaves of trees contained within the area of a square foot, twenty-one full-grown individuals of *Helix lamellata*, and about half this number of younger specimens; both shell and animals of these latter are lighter coloured than the old, indeed almost hyaline, and the lamellæ are apparent on the very youngest, which also exhibit the satin-like lustre of the adult. The mature animal is white beneath; the tentacula, back and sides greyish black; lower tentacula of moderate length, upper long and somewhat club-shaped.

In Auchairne Glen near Ballantrae, Ayrshire, I obtained this species in August 1839.

11. *Helix granulata*, Alder, Mag. Zool. and Bot. vol. ii. p. 107; Gray, Man. p. 151. pl. 3. f. 29.

H. hispida, Mont. p. 423. t. 23. f. 3.

This would seem to be a very local species with us. By Mr. W. H. Harvey I was in 1838 supplied with specimens, accompanied by a note, stating that the species had occurred to him in "moist places, and the rejectamenta of streams about Limerick and Ballitore, (county Kildare)." At the same time Mr. Humphreys, of Cork, reported it to me as found, but not commonly, at "Belgrove demesne, east of Cove."

12. *Helix sericea*, Muller*. Gray, Man. p. 153. pl. 11. f. 134.

In the rejectamenta of the river Lagan near Belfast, I have obtained specimens corresponding with those favoured me by Mr. Alder under this name. This shell is, in general form, size of umbilicus, &c. intermediate between *H. hispida* and *H. granulata*, but

* According to Ferussac: see Alder, Mag. Zool. and Bot. vol. ii. p. 107.

hardly differs more from the ordinary state of *H. hispida* than the specimens of it common to the North of Ireland do, and which are considered by Mr. Alder and M. Michaud only varieties of the species bearing this name. I cannot look upon it otherwise than as a var. of *H. hispida*.

13. *Helix hispida*, Mull. Gray, Man. p. 154.* pl. 4. f. 41; Turt. Man. p. 57. f. 41.

This species is generally distributed over Ireland. It is one of the most common land shells in the North, and may be found under stones, fallen trees, decaying leaves, &c. from the sea-shore to the most elevated chalk districts, and both in moist and very dry situations. It is most variable in colour; from beneath the same stone I have procured specimens varying from a crystalline transparency to dark reddish brown, and in these differences the animal participates with the shell; like *H. rufescens*, Mont. and some other species, it occasionally presents a white band on the last volution; in the very youngest state this species is hispid, and quite depressed or flat above. The internal rib, in what to distinguish it from *H. concinna*, may be called the normal state of *H. hispida*, which I find in the North is generally wanting; on supplying Mr. Alder with specimens of these in April 1836, he observed that they were the most strongly marked varieties he had seen; and about the same time, M. Michaud, in acknowledging specimens I had sent him, remarked upon them as a very fine variety of *H. hispida*. The shells thus alluded to are of the most common form in the North of Ireland; and are larger, more depressed, and with the umbilicus comparatively wider than in specimens which I have found in various parts of England and Scotland, and which are similar to those that under the name of *H. hispida* have been sent me from Newcastle by Mr. Alder and from Lorraine† by M. Michaud; specimens the same as the English and French are likewise to be met with in the North of Ireland, but are rare comparatively with the others.

NOTE.—Sept. 17, 1837. On looking to the animals of full-grown specimens of this *Helix* collected at Wolfhill near Belfast, I could not perceive any difference between the inhabitants of the very hispid shells wanting the internal rib, and those having the rib and displaying very few hairs—the animals are commonly pale grey above and whitish beneath; in the very hispid shells they varied from this colour to black.

14. *Helix concinna*, Jeff. Gray, Man. p. 154. pl. 12. f. 135.

The shell alluded to under this name is that described by Mr. Alder, as “stronger, and with the hairs more deciduous than the usual form [of *H. hispida*],” Mag. Zool. and Bot. vol. ii. 107, and which I would add is generally more convex, and has an internal rib,

* The four wood-cuts in this page are very characteristic.

† The specimens, eight in number, from this locality, want the internal rib.

which in *H. hispida*, at least as I find it in the North of Ireland, is more often wanting than present. It commonly in Ireland takes the place of *H. rufescens*, Mont. where this is not found, as it has been remarked by Mr. Alder to do in England. In the northern half of the island it prevails abundantly; and as the *H. rufescens* decreases northwards, so does the *H. concinna* southwards; from extreme east to west they both range: in the central parts of the country, where both occur, they retain their distinctive characters, the *H. concinna* being smaller, more convex, and darker in colour than its ally.

Specimens of *H. concinna* from the neighbourhood of Bristol, favoured me by Mr. Jeffreys, are, as he now considers, certainly nothing more than *H. hispida*, and in its ordinary depressed form; still the *typical* specimens of these two *Helices* are very distinct in appearance, but through their varieties would almost seem to unite.

“*Helix circinata*, Fer.”

I cannot perceive any difference between some of my North of Ireland specimens of *H. concinna*, when completely denuded of their hairs, and a shell so named, which I owe to the kindness of Mr. Alder.

15. *Helix rufescens*, “Penn.” Mont. p. 420. t. 23. f. 2; Gray, p. 156. pl. 3. f. 28.

H. glabella, *Drap.* p. 102. pl. 7. f. 6.

This species is common to the southern two-thirds of the island: as far north as Banbridge in the county of Down it has been found.

16. *Helix Pisana*, Mull. Gray, Man. p. 158. pl. 4. f. 30.

H. cingenda, *Mont.* p. 418. t. 24. f. 4.

H. rhodostoma, *Drap.* p. 86. pl. 5. f. 13—15.

This fine and local species was first noticed as Irish in Turton's Catalogue (p. 8.), from specimens collected at “Balbriggan Strand,” or as more correctly given by their discoverer M. J. O’Kelly, Esq. in the edition of Pennant's British Zoology, published in Dublin in 1818, “near Balbriggan, on the county Meath side of the stream that divides this county from Dublin,” vol. iv. p. 369. By Mr. O’Kelly and Mr. T. W. Warren I have been favoured with specimens of *H. Pisana* from this locality. My friend R. Callwell, Esq. of Dublin, informs me that this species has been found at another, though not far distant station, by Mr. Joseph Humphreys, on the north side of the river Boyne, three miles east of Drogheda, and ten north of Balbriggan.

17. *Helix virgata*, Mont. p. 415. t. 24. f. 1; Gray, Man. p. 160. pl. 4. f. 31.

H. variabilis, *Drap.* p. 84. pl. 5. f. 11. 12.

In the north, east and south this species is found, but in the west I am not aware of its presence. It is a local species, occurs on the marine sand-hills at Ballycastle, in the north of the county Antrim; Dundalk (county Louth); Dublin, Wicklow, Youghal, and Cork;

and at the inland localities of La Bergerie, near Portarlington and Ballitore (county Kildare). *H. virgata* is one of the species which seems to follow no rule in the choice of its abode or in that of its associates, or rather whose absence from or presence in particular districts cannot be accounted for; it will be abundant on sea-banks at one place, and for a hundred miles again will not appear in similar localities. Some authors have remarked, from their own accurate observation in particular localities, that it is never found with *H. ericetorum*; and Mr. W. H. Harvey, in supplying me with notes of four inland and marine stations in which he had observed it, remarked, "I have noticed that this species is never found mixed with *H. ericetorum*, nor is it generally in the same neighbourhood;" yet not very far distant from one of those alluded to, both species are found in company*, and on the same plant.

In the collection of T. W. Warren, Esq. of Dublin, is a very fine series from one locality, Portmarnock†, presenting every variety of colour and bands that I have seen described, from the hyaline and opake white to the darkest brown. *H. ericetorum* has in similar variety been procured by this excellent and indefatigable collector at the same place, and *H. Pisana*, likewise differing, he possesses from its not far distant station:—one of the most beautiful of these three species is opake white with hyaline bands. At La Bergerie, near Portarlington, Mrs. Patterson of Belfast obtained a specimen of *H. virgata*, which both in form and colour bears a rude resemblance to the *Helix elegans* of Brown.

18. *Helix caperata*, Mont. p. 430. t. 11. f. 11; Gray, Man. p. 162. pl. 4. f. 32.

H. striata, Drap. p. 106. pl. 6. f. 18—21.

In Brown's "Irish Testacea" this species was noticed to be "not uncommon at Naas on mud walls," p. 526; and "Bullock in Ireland," was given by Dr. Turton as a habitat. (Conch. Dict. p. 51.) The *H. caperata* is in Ireland a very local species, is found in the southern half of the island, and appears to be plentiful where it does occur. From W. H. Harvey, Esq. I had specimens in 1833, which were collected by him at Glanmire near Cork; on "dry banks at Kilkee Castle near Ballitore, county Kildare," he had likewise procured the species. At Kingstown near Dublin, contiguous to Dr. Turton's station, it has been collected by Mr. Warren. At La Bergerie (Queen's county) it was a few years ago obtained in abundance by Mrs. Patterson of Belfast. Among the specimens brought from this locality (and presenting gradations in colour from the ordinary state to that of being almost wholly of a deep reddish brown) was one shell entirely of a pale amber colour, and transparent, the fine and

* Montagu mentions their so occurring.

† In Mr. R. Ball's cabinet, and collected by him here off a single plant of *Beta maritima*, are specimens of a pure white colour, others of a uniform dark chocolate brown, in addition to the more common state, white with brown bands and the reverse.

regular striæ rendering it very beautiful. Here, in addition to this species, *H. ericetorum* and *H. virgata* were found by Mrs. Patterson, and were abundant on the same plant, the *H. caperata* being the most plentiful.

The distribution of *H. caperata* seems rather anomalous; it is unknown to me in the North of Ireland, but on the walls of the houses in Portpatrick, one of the nearest parts of Scotland to this country, I have remarked it; about Ballantrae in Ayrshire it has not occurred to me; at the base of the cliffs at Salisbury Craigs near Edinburgh, I in 1834 procured it in abundance.

19. *Helix ericetorum*, Mull. Mont. p. 437. t. 24. f. 2; Gray, Man. p. 163. pl. 4. f. 37.

H. cespitum, β . Drap. p. 109. pl. 6. f. 16, 17.

This *Helix* differs from its nearest British allies, *H. virgata*, *H. Pisana* and *H. caperata*, in being pretty generally diffused over Ireland and the adjacent islands; most of the marine sand-banks around the coast claim it, but *H. virgata* in some places appears to its exclusion; it likewise affects the most inland localities, from one of which, near Portarlington, I have specimens so large as 9 lines in diameter. An exception to the more ordinary places of its occurrence may be mentioned; the ruins of Dunluce Castle, situated on the summit of an insulated mass of rock, considerably elevated above the sea. In localities in the north, but a few miles distant, and in every respect presenting a similar appearance, I have remarked the specimens in the one to be without exception either uniform in colour or very faintly banded, and in the other not one to be of an uniform colour, but all banded, and almost every individual darkly so. Draparnaud's *H. cespitum*, β . pl. 6. f. 15, 17., and Pfeiffer's *H. cespitum*, taf. 2. f. 24. and β . f. 25., are all very characteristic figures of our *H. ericetorum*, as is Rossmassler's var. f. 516. This author's *H. ericetorum*, f. 517. *a.* and *b.* likewise represent it. My friend Mr. E. Forbes informs me that in the Museum at the Jardin des Plantes, Paris, he in 1838 saw a young shell of this species marked "*H. revelata*, Belfast," and as presented by M. Michaud; it is doubtless one of a series of specimens, which, considering them to be *H. ericetorum*, I had the pleasure of sending to this naturalist some time before.

Mr. O'Kelly of Dublin, to whom the shell belongs that was described and figured by Capt. Brown in the Wernerian Memoirs as *Helix elegans*, and in his "Illustrations," &c. as *Carocolla elegans*, always considered it as an extraordinary state only of *H. ericetorum*, and as such noticed it in the Dublin edition of Pennant's Brit. Zool. vol. iv. p. 368. ed. 1818. To the same specimen Dr. Turton applied the term *Helix disjuncta*, Conch. Dict. p. 61. f. 63.; in his Manual (p. 40.) this author places it under *H. virgata*. See also Gray, Man. p. 161.

20. *Helix rotundata*, Mull. Drap. p. 114. pl. 8. f. 4—7.

Zonites rotundatus, Gray, Man. p. 165. pl. 5. f. 44.

Helix radiata, Mont. p. 432. t. 24. f. 3.

This very distinct and handsome species, both in form and colour, is common and universally distributed in Ireland. It affects situations varying from very dry to very wet, and may be found on rocks, under stones, fallen leaves, &c., but seems rather to show a predilection for decaying wood. I have more than once detected the *H. rotundata* in company with *Limaces* banqueting on some of the larger *Fungi*.

Specimens presenting much convexity are unfrequent, but in Shane's Castle Park (county Antrim) a full-grown one has occurred to me, whose height was equal to its diameter. At Holywood House (county Down) I once obtained two specimens of the beautiful crystalline variety. The young of this species differ very much in form from the adult, in being quite flat above and very convex beneath. In the stomach of a Blackbird (*Turdus Merula*), I once found ten full-sized specimens of this shell, in addition to five of *Achatina lubrica*.

21. *Helix umbilicata*, Mont. p. 434. t. 13. f. 2.

Zonites umbilicatus, Gray, *Man.* p. 166. pl. 5. f. 45.

Helix rupestris, *Drap.* p. 82. pl. 7. f. 7—9; *Turt. Man.* p. 60. f. 45.

Is commonly distributed throughout the southern three-fourths of Ireland, more especially over the great limestone belt which traverses the country:—"at its eastern commencement near Dublin, and at its extreme western verge, where it dips into the ocean" in the South Islands of Arran, I have found it in equal abundance. This *Helix* attaches itself more to one kind of rock limestone than any species hitherto treated of. With reference to what Montagu says of its habits, it may be remarked that I have commonly collected specimens on limestone debris resting on the ground and on loose stone walls or dykes. I have not seen any Irish specimens agreeing with Draparnaud's figure in tapering to the apex*; but all were of his var. " β . testa subdepressa, umbilico latiore." Mr. Gray's figure, as above quoted, is characteristic of this form; in the 1st ed. of Turton's Manual the other form was given. It is *Drap.* var. β . only that Mr. Jeffreys quotes (*Linn. Trans.* vol. xvi. p. 343.), and it is this which Montagu describes; his figure does not well represent either form.

22. *Helix pygmæa*, *Drap.* p. 114. pl. 8. f. 8—10; *Turt. Man.* p. 61. f. 46.

Zonites pygmæus, Gray, *Man.* p. 167. pl. 5. f. 46.

This species, so interesting from its minuteness, is indigenous to the more northern two-thirds of Ireland from east to west, and doubtless will be found by him who searches properly for it in the south. It is partial to shade and moisture, under stones in pastures may be procured, but is most readily and frequently obtained on fallen leaves, &c. in plantations. Since the Mollusca first claimed my

* Draparnaud's figure is very characteristic of specimens sent me from France by M. Michaud.

attention in 1832, this *Helix* has occurred to me in very numerous localities throughout the counties of Down and Antrim, in the county of Londonderry, and in the glen of the Downs in Wicklow. By Mr. Harvey it was sparingly found several years ago on the marine sand-hills at Miltown Malbay (county Clare); more latterly by Mr. E. Waller of Dublin, at Annahoe (county Tyrone), and by the Rev. B. J. Clarke, near Portarlington (Queen's county). At Twizel House, Northumberland, and Ballantrae, Ayrshire, I have collected this species. Draparnaud's description and figure of *H. pygmaea* are most characteristic.

23. *Helix alliaria*, Miller. Turt. Man. p. 56. f. 39.

Zonites alliarius, Gray, Man. p. 168. pl. 4. f. 39.

Although not an abundant species anywhere, is generally distributed over Ireland and her islands. From under stones at the sea-side to a great elevation on the mountains,—as near the summit of Divis, the highest of the Belfast chain—of Altavanagh, one of the mountains of Mourne in Down, and of Ben Bulbin in Sligo, I have met with it—all situations, from the exposed sea-shore and mountain side to the umbrageous wood, seem alike to it. A greenish white variety, and the shell strong, is much more common in Ireland than the yellow, which is ranked the ordinary state: from under the same stone I have procured specimens of both colours. The animal is blackish. M. Michaud remarked, on acknowledging Irish specimens from me, that they were *H. nitida*, Drap., junior.

24. *Helix cellaria*, Mull.

Zonites cellarius, Gray, Man. p. 170. pl. 4. f. 40.

Helix nitida, Drap. p. 117. pl. 8. f. 23—25.

Is common, and distributed over Ireland. It has a predilection for wet situations, and even from the bottom of drains, partially covered with water, some of my largest specimens were procured in the north; the very largest Irish specimens— $7\frac{1}{2}$ lines in diameter—I have seen were found in drains within the city of Dublin, by Mr. T. W. Warren, to whom I am indebted for them. From the stomachs of the Blackbird and Starling I have taken perfect specimens of this shell.

25. *Helix pura*, Alder. Turt. Man. p. 59.

Zonites purus, Gray, Man. p. 171. pl. 4. f. 43.

Is distributed over Ireland; it is usually found in moss, under stones, &c., in sheltered situations, but on sea-side pastures likewise I have met with it. The yellowish horn-coloured variety has in all parts of the country occurred to me more commonly than the hyaline shell: the closely set, regular, and fine striæ render recent shells of this species very beautiful. M. Michaud, on acknowledging Irish specimens of *H. pura*, observed that they were *H. nitidula*, Drap.

26. *Helix nitidula*, Drap.*

Zonites nitidulus, Gray, Man. p. 172. pl. 12. f. 136.

* According to Mr. Alder.

This species, most characteristically described by Mr. Alder (Newc. Trans. v. 1. p. 38.), is common, and generally distributed over Ireland. In the north I have found it chiefly among mosses in glens and sheltered places. From two localities in this country I have seen *Helices* of crystalline transparency, and in form intermediate between *H. nitidula* and *H. alliaria*.

27. *Helix radiatula*, Alder.

Zonites radiatulus, Gray, *Man.* p. 173. pl. 12. f. 137*.

This polished and well-marked species at every age—for when very young the regular and strongly marked striæ serve to distinguish it—has since 1832 occurred to me in the county of Londonderry, in the neighbourhood of Dublin, and in very numerous localities throughout Down and Antrim. I have seen specimens which were collected at Annahoe (county Tyrone), by Edward Waller, Esq.; at La Bergerie (Queen's county), by Mrs. Patterson and the Rev. B. J. Clarke; and in the neighbourhood of Cork, by Miss Hincks. In the north of Ireland the transparent greenish white var. *H. vitrina*, Fer., as often occurs as the deep yellowish horn-coloured shell. That this *Helix* is more widely distributed in this country than would appear from the above notes, I have no doubt. At Dovedale in Derbyshire, and Ballantrae in Ayrshire, I have met with it, and by W. H. Harvey, Esq. have been favoured with specimens which he collected at the Falls of Clyde in 1832. In moist spots, in the wildest and bleakest localities, as well as in "woods," I have procured it. In the stomachs of four out of seven Starlings (*Sturnus vulgaris*) brought to a bird-preserver in Belfast at different periods during one winter, I found specimens of this shell, of which some were very fine and perfect. M. Michaud, when acknowledging specimens which I sent him, remarked that they were a var. of *H. nitidula*, Drap.

28. *Helix lucida*, Drap. p. 103. pl. 8. f. 11, 12.

Zonites lucidus, Gray, *Man.* p. 174. pl. 4. f. 38. and wood-cuts, p. 175†.

The *H. lucida*, described and figured by Draparnaud, and characterized by Mr. Alder in the Transactions of the Natural History Society of Newcastle (vol. i. part 1. p. 38), appears to be in Ireland, as in England, according to the latter author, "rare," and rather a local species. In the rejectamenta of the rivers Lagan and Blackwater, near Belfast, I in 1833 obtained a few individuals, and in Kilmegan bog (county Down) have since procured a series containing the living animal. I have seen specimens which were collected near Portarlington by the Rev. B. J. Clarke †, and at Finnoe, in the north of

* The form is well represented here.

† Figures are hardly sufficient to enable us to determine this and some of the closely allied species from each other; actual comparison of specimens is almost requisite to ensure certainty.

‡ In a letter dated November 24, 1838, Mr. Clarke observed, in sending me specimens of *H. lucida*, "It is only under one stone I ever got this shell: *Ann. & Mag. Nat. Hist.* Sept. 1840.

Tipperary, by E. Waller, Esq. Ours differ in no respect from English specimens supplied me by Mr. Alder, and are identical with specimens from Dauphiny, marked "*H. lucida*, Drap." by M. Michaud, to whom I am indebted for them.

29. *Helix excavata*, Bean, Alder.

Zonites excavatus, Gray, *Man.* p. 175.

Of this handsome shell I have yet seen but a single Irish specimen, which was obtained at Dunscombe Wood, near Cork, by Miss King of that city. On being shown to the Rev. T. Hincks, he at once identified it with *H. excavata*, and, with the kind permission of the owner, sent it to Belfast for my inspection; it in all respects agrees with English specimens of this *Helix* favoured me by Mr. Jeffreys and Mr. Alder.

30. *Helix crystallina*, Drap. p. 118. pl. 8. f. 13—18; Turt. Man. p. 58. f. 42.

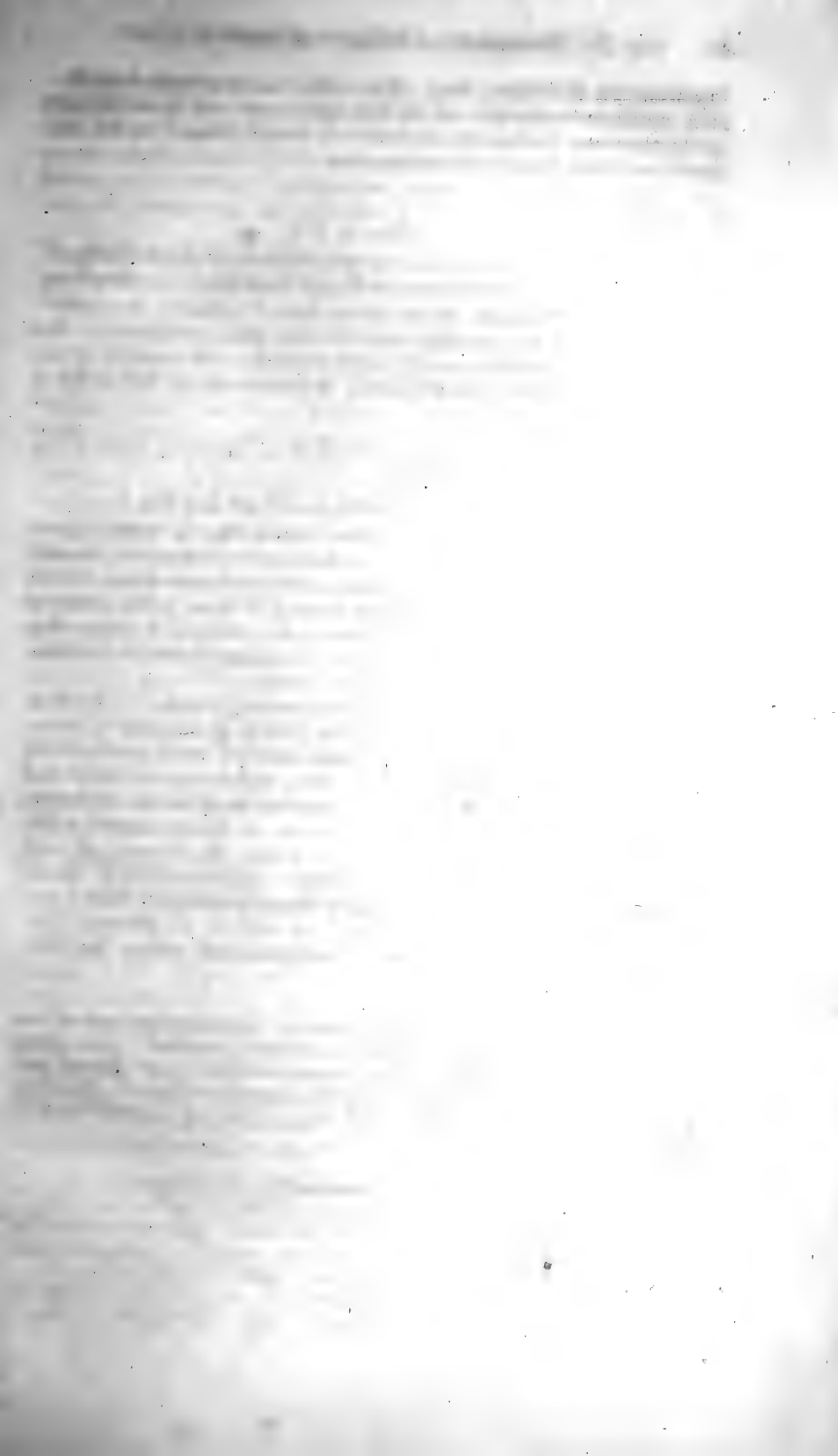
Zonites crystallinus, Gray, *Man.* p. 176. pl. 4. f. 42.

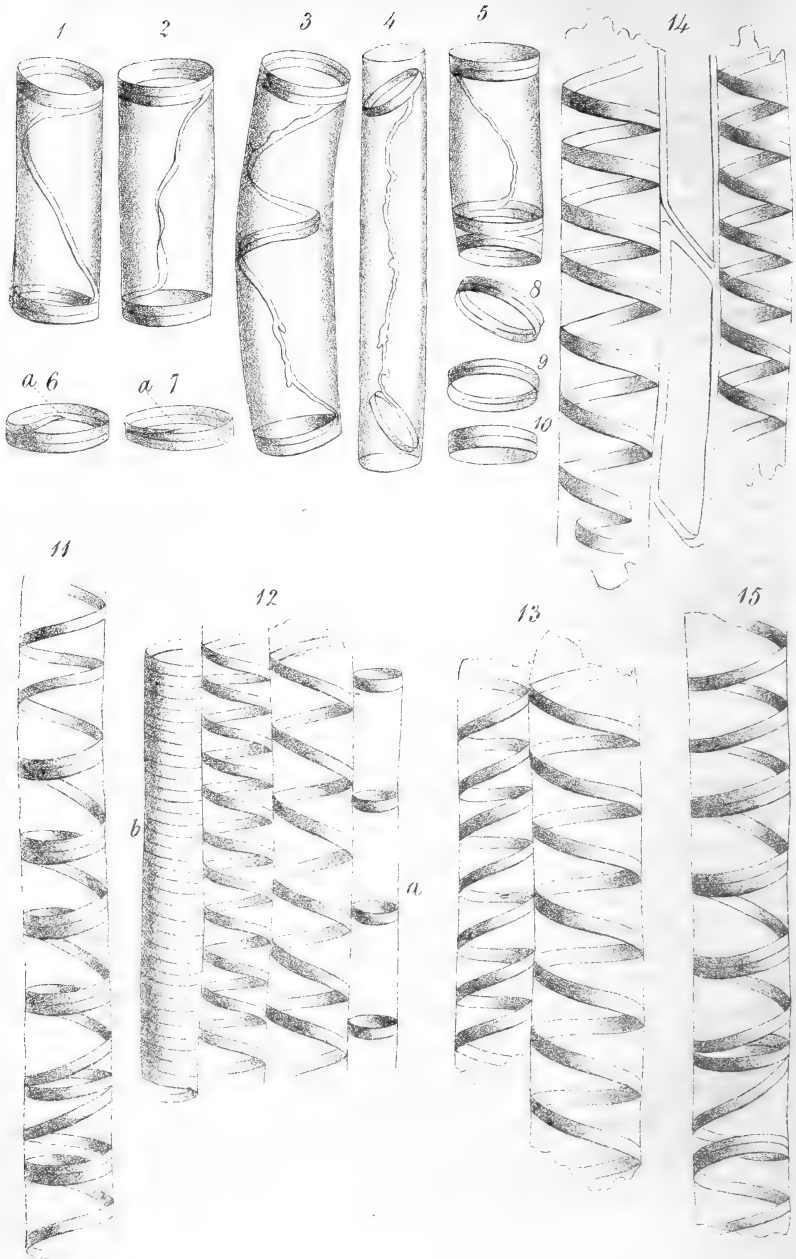
Is generally distributed in Ireland, occurring in moss, under stones, upon decaying wood, &c., in dry and wet situations, though in the latter more frequently. Some adult specimens which I have collected have had but $3\frac{1}{2}$ volutions instead of $4\frac{1}{2}$ or 5, the ordinary number. Extensively as I have collected this *Helix* in Ireland, none but dead specimens would come under Draparnaud's var. "*β eburnea subopaca*." The animal is of a white colour.

Mr. Alder's views in reference to the last eight species (*Hyalina*, Fer.), are here adopted; but even the British species and their varieties belonging to this division seem not yet to be satisfactorily cleared up. The application of the same name too, by British and continental authors to different species, adds much to the confusion. Ireland possesses all the British species as distinguished by Mr. Alder, viz. *H. cellaria*, *H. nitidula*, *H. lucida*, *H. excavata*, *H. alliaria*, *H. radiatula*, *H. pura*, *H. crystallina*. Rossmassler's *H. nitens*, f. 524 and 525, are very characteristic representations of shells I possess from different parts of Ireland, and with his *H. glabra*, f. 528, so far as a figure and diagnostic description will suffice for judgment, I have specimens identical.

on leaving it undisturbed for about a fortnight I generally find one or two specimens under it. The field is marshy; and here I also find *Vertigo palustris*, but only within the space of a few square yards of the most marshy part. A little higher up, in the same field, *Vertigo pygmæa* is obtained. On going my rounds about once a fortnight, I procure a fresh crop of specimens of all three species from each spot!"

[To be continued.]





Spiral Formations in Cells of Plants.

IV.—*Observations on Spiral Formations in the Cells of Plants.*

By DR. M. J. SCHLEIDEN, Professor of Botany in the University of Jena*.

[With a Plate.]

THE first discoverer of spiral vessels, it matters not whether Henshaw, Malpighi, or Grew, was without doubt astonished in the highest degree by their elegant tissue; and the more he became acquainted with them, the more varied the forms unfolded before the eyes of the ingenious observer, the more eagerly attention must have been directed to this apparently so remarkable formation. Thence it happened that, although not agreed respecting the kind and manner, a higher import with regard to vegetable life was generally assigned to these parts in opposition to the cellular tissue.

It was soon, however, found necessary to place the annular and porous vessels by the side of the spiral vessels; and not relying on the observation of actual facts, but chiefly induced by their representative occurrence in similar or analogous parts, and misled by a false explanation of that actually observed, Link assumed the metamorphosis of these formations into one another, without, however, at the time expressing decidedly whether an ideal or real metamorphosis was intended. How far, then, this was from a correct comprehension of the matter, is shown by his subsequent writings and annexed illustrations, in which he still explained the fibres as the thinner places, and the elongated pores as remains of the thicker fibres, a view which he still entertained in 1831, with the greatest confidence, for the porous vessels. A view differing much from Link's, but quite as erroneous, was supported by Kieser; and even Meyen, in his 'Phytotomie,' declared the pores to be the remains of torn spiral fibre.

What, on the other hand, is at present understood by the word metamorphosis of the spiral vessels, has nothing in common with the earlier views, except the name retained for convenience sake; and by this alone Meyen seems to be misled, when in his *Physiology* (p. 139) he ascribes to Link the merit of having first decidedly advanced this doctrine. This is the more evident, as Link himself, in his latest edition of the '*Philosophia Botanica*,' is still far from comprehending all the facts belonging to this subject, and comprising them under a correct point of view.

If we at present express the fundamental conception of this doctrine thus: "The thickening layers deposited on the

* Translated from the *Flora*, No. 21 and 22. June, 1839.

primary simple cellular membrane have, on their first appearance, everywhere as a foundation an arrangement in a spiral band (or fibre) which becomes more or less distinct in various ways; and from this fundamental form are variously evolved all the numerous modifications of the so-called vascular and cellular walls, without, however, the one being to be regarded as a transitory stage of the other;”—then we must undoubtedly ascribe to Valentin (*Repertorium*, Part I.) the merit of having first advanced this doctrine in all its generality.

For along with those theories, observation had pursued her quiet course, and had found the porous and spiral formations in the cellular tissue also, and had gradually extended her discoveries so far, that at present it would perhaps be difficult, at least in the *Phanerogamia*, to point out any considerable masses of completely *developed* cellular tissue which do not manifest distinct traces of these textures.

I will here give a brief view of this doctrine from inquiries of my own, in which I lay claim to nothing new, more than those acquainted with the subject will ascribe to me; but, on the other hand, I dispense with the trouble of everywhere enumerating my authorities.

The cells of plants, including the so-called vessels, but with the exclusion of the laticiferous vessels*, the reducing of which to cells is still not at all clear to me, allow of two periods being distinguished in their life. In the first, that of their origin and isolated independent development, the membrane forming them grows, in its entire substance, by true intussusception. But as soon as the cells have adhered to form the cellular tissue and constitute the mass of a certain plant or its parts, this mode of growth either ceases entirely, or recedes so far into the background, that, from my observations up to the present time, I cannot venture to maintain its continuance; but neither can I deny it on account of the frequently very considerable expansion of the cells after the appearance of the succeeding formations. But in every case at present a new and by far predominant momentum is added, viz. that a new layer is deposited on the inner surface of the cellular wall, and indeed everywhere, in the form of one or more spiral closely wound bands, so that the coils, without continuity *inter se*, still mostly exhibit the completest contiguity. From personal observations, which, however, are still too imperfect to be detailed here, I think I may venture to conclude that originally there are always at

* Moreover, the old milk vessels of the leafless *Euphorbiæ* exhibit a composition of layers and spiral stripes exactly as the cells of the liber in the *Apocynææ*.

least two such bands present*, whose extremities at the end of the cells pass into one another, and in most cases, even very early, cohere *inter se* to a single one.

Hence, then, proceed all the varied formations of the cells and vascular walls, according to the different influence of the following momenta.

A. The most essential circumstance, in my opinion, upon which is also founded the division of all these textures into two large principal groups, that of the Spiroidea (I borrow this expression, which is very useful, from Link), and that of the porous formations, is the following :

Either the cell has, at the time when the thickening of its wall by spiral deposition commences, already attained its complete expansion, or not.

I. Let us, in the first place, consider the latter case. Here, then, a second momentum becomes of importance ; it is the cohesion both of the fibre and the cellular wall, and of the coils of the fibre *inter se* ; at the same time, therefore, the number of fibres is likewise of value.

a. Simple fibre (double in the sense above stated). The cell still expands considerably from the instant of its origin ; some convolutions cohere early, others tear asunder : *annular vessels* (of which a more detailed description below). In this case the fibre is generally not at all, or but loosely united with the cellular membrane.

b. Simple or compound fibre, a still rather considerable expansion of the cell, slight, or no cohesion with the cellular membrane : *spiral vessels with broad convolutions, capable of unrolling*.

c. Simple or compound fibre, extremely slight expansion of the cellular membrane, generally intimate cohesion with it : *narrowly wound spiral vessels capable of unrolling, false tracheæ*, and in part the *striped* and *scalariform vessels* of older writers.

d. Compound fibre, moderate expansion of the cell, cohesion in some places of the convolutions *inter se*, generally also with the cellular membrane : the whole series of the forms of the so-called *ramified spiral vessels* to the *reticulate*. Hereto likewise belong a portion of the *striped* and *scalariform vessels* of the older writers.

In these last, as well as in all the preceding, the law, *that the more intimately the fibre coheres with the cellular membrane, the less this can expand*, appears to obtain.

* Corresponding to an ascending and descending current of the mucous formative substance.

II. But if the cell has, at the time when the spiral depositions have begun to form, already attained its complete expansion, a new and highly remarkable circumstance comes into action,—namely, that the formation of air-vesicles on the outer wall of the cell, between it and the adjacent ones, precedes the origin of the depositions; and the convolutions forming, closely lying one upon another, and in most cases rapidly cohering *inter se*, separate from one another cleft-wise at the place which internally corresponds to those air-vesicles. Since this process can be followed very far, and cannot, merely on account of the minuteness of the parts, be followed in several otherwise exactly similar formations, sound analogy advises us to extend it to all porous textures. This in general merely narrow slit, is often rounded by deposited formative substance, on which account the pore* appears the rounder the more the cell is developed; the longer, but more cleft-wise, the younger it is. Now to this division belong all *porous cells* and *vessels*, and likewise a portion of the earlier *striped* and *scalariform vessels*, which then only differ from those called porous by the length of the fissure of the pore.

B. A further momentum, which will here be but briefly noticed is, on the one hand, the form of the cell in the various intermediate stages between the two extremes of the small globular, and the much extended in length, in combination with an actual perforation of the primary membrane by absorption. To this head belong several formations, first indicated by Moldenhauer, and then correctly and fully described by Mohl, for instance, the leaf-cells of *Sphagnum*. But hereto more especially belong the difference between *cellular tissue* and so-called *vessels*, the latter being nothing more than cylindrical cells, generally situated in the same direction, with the terminal surfaces on one another, the septa of which are perforated in the most varied manner by absorption.

C. By far more important, however, is the following. Namely, in the vital process of the cell, spiral deposits are by no means at an end with the first layer; but they are repeated in many cases, almost as frequently as the volume of the cell permits. The rulè then is, that the successive strata arrange themselves entirely according to the first, be this modified by the above-mentioned influences as it may, so that the places of the cellular wall not covered by the first deposit likewise remain free from all the succeeding ones. In this class is com-

* We have here omitted a note, which relates merely to the employment of *Tüffel* for *Pore*.—EDIT.

prised the thickening of the annular and spiral fibres to such a degree that they appear as plates, which are placed with their narrow edge on the cellular wall; for instance, in the *Sphagnum*-cells, in the ligneous cells of the *Mammillariæ*, &c. Hereto also belong all the porous cells, with septa thickened in a stratified manner, for the knowledge of which we are chiefly indebted to Mohl.

But we are now already acquainted with some interesting exceptions to this rule, namely, that after the first spiral deposit has been altered by the expansion of the cell, a new layer is deposited on the entire inner surface, on fibre and on primary cellular membrane without distinction; but since this second layer stands in a different relation to the primary cellular membrane from the first, it also must, according to what has been above stated, adopt a different form, viz. the porous. These formations of distant fibres, between whose convolutions pores are found, are exhibited, in fact, by a number of dicotyledonous ligneous cells, especially of such plants as are subject to the strong antagonism of the period of vegetation and of winter sleep. Thus, for instance, *Taxus baccata*, *Tilia europæa*, *Prunus Padus*, &c. An allied phenomenon is also found in the epidermis of the pericarp of *Helleborus fœtidus*.

The most important of these views I had already expressed in my memoir, "Contributions to our Knowledge of Phyto-genesis," in 'Müller's Archiv. für Physiologie,' 1838*.

But recently have I been able to take in hand Mohl's "Memoir on the Structure of the Vegetable Cellular Membrane"†, (Tubingen, September, 1837); and I found, to my very great joy, that we entirely agree in two important points: first, in maintaining against Meyen, that every indication of a spiral, fibrous, or porous structure, is a certain proof that we have no longer to do with the original simple cellular membrane; and next, in his position: "Fibre and membrane differ merely by their size, and by the form in which they occur," which essentially agrees with my view that the spiral is only a secondary difference of form in the product of the vital force (in the fibre substance, or more correctly, the membrane substance). The slight chemical modification which I have demonstrated in it is, at least, far more inconsiderable, and consequently less essential, than the

* Translated in Taylor's Scientific Memoirs, Part VI.

† The paper here alluded to, and Meyen's opinion on the same subject, have been placed before the English reader in Mr. Francis's translation of Meyen's Report on Vegetable Physiology for 1837.—EDIT.

differences existing between the membrane of various plants and groups of plants *inter se*. Since Mohl and I have arrived at this result independently, and in part by a very different path, it is, in my opinion, a great presumption of its correctness. I gladly follow the steps of Mohl, whose memoir appeared some months earlier, as a confirmation only of a view already advanced; and would with joy always renounce in his favour all claim to priority, could I thereby for ever purchase an agreement of our convictions.

Scarcely more than in expression do Mohl and I differ in our views respecting the structure of the secondary deposits. If he admits an arrangement of the smallest parts in the direction of a spiral in the cases by far most frequent, and if I,—believing that I frequently have actually seen this arrangement even in cases where soon an apparent homogeneity occurs, and also as the changes produced by the expansion of the cells prove that the connexion of the molecules, in any other direction than that of the spiral, is in the younger stages almost nothing,—consider myself justified in speaking in all cases of a spiral striping or band, there is in this, with respect to the essential point, little discrepancy. I also believe that many differences of opinion, in subordinate points, will still disappear if Mohl keeps more accurately in view individual development, and especially pays more attention to the momentum of the expansion of the cells after the appearance of spiral deposits. Thus, for instance, in all my inquiries into the structure of the ligneous body, I have never contented myself with comparing the parts of different age of the same individual, but have constantly, as far as the material was at my disposal, at the same time pursued throughout a whole year the development of the same annular ring, by regularly repeated observations on the most varied parts of the plant. Highly instructive likewise is an accurate history of the development of the Spiroidea in the large Monocotyledonous vascular bundles, for instance, in *Arundo Donax*, where it must also be borne in mind not merely to compare on the same individual the younger with the older internodes, but to examine the homologous internodes on several individuals of different age. In this plant the spiroidea are situated in the perfectly developed fasciculus in a series radial from the axis to the periphery, arranged between the two large so-called porous vessels. The annular vessels, with the rings furthest from one another, are nearest to the axis of the internode, from thence towards the circumference the rings approach closer together, then pass

into broad threaded spiral vessels, and these lastly into narrow threaded spiral vessels*. Now if the history of the development of such a fascicle be investigated, it is found that those distant ringed vessels were first formed as spiral vessels; that then, during the gradual expansion of the internode to which the vascular bundle belongs, the formation gradually progresses towards the exterior, and the last spiral vessel remains a narrow threaded one, merely because the longitudinal expansion of the cells was already nearly at an end when the spiral deposition took place. The two so-called porous vessels, on both sides, are, during the whole of this formative process, cylindrical cells, filled with a grumose fluid, and placed on one another, their walls being perfectly simple; and only after the expansion in length is terminated, the pores originate on their parietes in the manner described, frequently only in the direction of cells in the interior of the vascular bundle. At the same time the perforation also of the septa takes place, according to the law which seems to me pretty generally valid, that the horizontal septa, or those slightly deviating from this position, are only perforated with a round aperture, the steeper ascending ones become ladder-like or reticulate; and lastly, the steepest are merely provided with usual pores.

I conceive it arises from not paying due regard to this history of development that Mohl has not yet recognised the true origin of the annular vessels. I will, therefore, briefly communicate here what I have observed on this point.

All that Mohl has objected in another place against the erroneousness of the common view likewise supported by Meyen, that a tearing of the spirals into single coils, and a cohesion of the torn ends to rings takes place, remains perfectly correct; and I was long convinced of the untenability of that view before I had ascertained the true origin. The difficulties of actual observation of the process lie in what follows:—Of all spiroidea the annular vessels originate exactly from those cells in which a spiral deposition is earliest formed, therefore at a time when they are infinitely small and delicate. This period occurs in the outermost internodes of the bud, and every anatomist is aware of the almost insurmountable difficulties which here oppose a more accurate examination. It is true, the delicate indications of the spirals have undoubtedly been recognised everywhere here as of the earliest forma-

* The same arrangement, with slight modifications, occurs in all vascular bundles of Mono- and Dicotyledons (fig. 12), only that often, in all Dicotyledons especially, porous formations succeed the narrowest spirals.

tion; but instead of observing their development into rings, many have only inferred that the annular vessels were of far later origin. Moreover, the formation usually proceeds, at the moment when the bud comes to development, so rapidly, that the observation of the intermediate stages is rendered almost impossible by it. For obtaining a successful result everything here depends on finding a plant in which all these difficulties exist in a slighter degree, and on which therefore the process may be accurately observed; if once a clear insight has been acquired in this way, it is easy to find oneself at home, even with the more difficult plants. I found for these inquiries the *Campelia Zanonica*, Rich. (frequent in most hot-houses), and the subterranean stem of *Equisetum arvense* most advantageous.

If the very youngest internodes of the buds of the first-mentioned plant be examined, a single extremely delicate and densely-wound spiral vessel is found in all the as yet scarcely limited vascular bundles. In older internodes the convolutions of this vessel are found further distant from one another, and near it exteriorly a new-formed narrow-threaded spiral vessel. But if we consider in this period the first formed vessel more accurately, Plate (fig. 11.), it will be seen that all convolutions are not separated in the same manner from one another, but that almost in regular alternation two entire coils adhere firmly together, and one convolution is drawn out. In still older internodes the extension is found to be so far advanced, that the free coil loosened from the cellular membrane frequently reaches as a mere band with a steep ascent from the one ring formed of two closed convolutions to the other. On still further developed vessels this elongated coil is seen corroded by the reabsorbing action of the cell, and all the stages of transition, as they are represented in the Plate (from fig. 1 to 5,) are frequently found in the continuity of a single vessel. Lastly, on still older vessels, the connecting coil is already perfectly dissolved; but there may still be observed on the isolated rings the extremities of the previous spiral fibre (fig. 6, 7, *a.*). Even on highly developed vessels, we still find on the perfectly closed and smoothed rings, their composition of two coils now and then indicated by single delicate dark lines (fig. 8—10.). Exactly the same process may likewise be easily followed in the subterranean stems of *Equisetum arvense*; and in particular we frequently find long streaks in vessels modified as is represented in fig. 11. as the first stage of transition to the formation of rings.

I must still mention another point respecting which I do not at present agree with M. Mohl; it relates to the succes-

sion of the three layers in the formations we meet with in the ligneous cells of *Taxus*, in the so-called vessels of the Lime, &c. Undoubtedly the primary simple cellular membrane here also constantly forms the outer layer, as to which I agree with Mohl, and no doubt can remain in the mind of the careful observer, that with regard to time the spiral fibres are earlier formed than the porous layer. But I am rather inclined to doubt Mohl's statement that this latter is developed between the primary cellular membrane and the spiral fibre layer. Mohl brings forward no reasons in support of it; and this whole hypothesis seems to me entirely unnecessary, and if only on that account to be rejected. There is no fact which requires such an admission for its explanation; but many, on the contrary, speak against it. Since the cellular membrane itself passes in forming, like all secondary depositions, in the same manner from a fluid through a semi-fluid state to a slighter or greater firmness, a period must necessarily occur in the process adopted by Mohl, during the origin of the porous layer, in which the spiral fibrous layer must be as good as entirely separated from the original cellular membrane, by the newly-formed still semi-fluid layer; or at least could be separated from it by the gentlest manipulation. But I have never been able to notice a trace of this in *Taxus*; and in *Tilia* exactly the contrary occurs, in so far as here in the cambial cells the spiral coils which then still lie densely together, are, it is true, to be unwound with difficulty; but as soon as the development of the cell begins, and long before the occurrence of pores, they are already firmly united with the membrane. The contrary likewise appears to me to result from an accurate investigation of the above-mentioned cells on the germen of *Helleborus fetidus*.

Also with regard to the porous cells of the *Coniferae*, I differ in some minor points from M. Mohl. It is true I concur in the main point with Mohl's exposition in refutation of Meyen's theory; but I must nevertheless confess that I think I have seen how in *Pinus sylvestris* the cells of the cambium, even in the latest annual rings, are constantly divided by delicate black lines into narrow spiral bands previous to the formation of pores, (as matter of course with perfect homogeneity of the primary cellular membrane,) and how these, which I regard as the boundaries of the adjacent convolutions, first disappear on the formation of pores; probably glued to one another in a similar manner as the cells themselves, whose boundary lines likewise frequently become invisible in more advanced age; for when I isolated the cells by boiling in caustic potash, even those from the outermost

layers of the oldest heart wood constantly exhibited more or less distinctly these delicate stripes, and the pores then again appear merely as narrow clefts between two separating spiral coils.

In consequence of this view of mine of the constant generality of the spiral arrangement of the secondary depositions, I am also inclined, for the sake of consistency, to deduce the reticulated figures on the cells of the liber of the *Apocynæ*, of the parenchymatous cells of numerous tropical *Orchideæ*, superposition *Dahlia* tubers, &c., rather from the adscumbency of two exceedingly delicate layers, formed of contrarily wound spirals, than to have recourse to quite a new mode of arrangement, which seems justified by no other peculiarity of the organ or of the occurrence. But I perceive it might be difficult here to bring direct observation in aid.

I may allow myself, in conclusion, some observations on the direction of the spiral coils. That all the reasons advanced by Meyen and Link respecting the difficulty of the determination do not at all affect the subject, is evident; for by reversion the relative position of two spirals is certainly not altered; but even the individual spirals remain wound right or left, in whatever way they are observed, of which Meyen may easily convince himself on a rod figured with a spiral. The being wound right or left of a spiral depends not merely on a different mode of viewing it, but on an internal difference in its mathematical construction. Moreover the sole actual difficulty mentioned by Mohl is not of such a nature that it cannot be overcome by a good microscope and some practice of the observer. In general I cannot agree with Mohl, that the spiral vessels principally occur wound to the right; I found some left-wound very frequently, and differences in various individuals of the same species. From my observations up to the present time, I have provisionally abstracted the following rule as at least very frequently valid. "In all spiral formations developing *cotemporaneously*, (comprising in the most general meaning all secondary depositions,) those which are situated *immediately* on one another in the direction of the radius are wound in the same direction; but those lying *immediately* on one another in the direction of the parallels to the periphery are wound in different directions. I will only mention here, as an instance, some spiroidea from *Cucurbita Pepo*; and I moreover appeal to the constant crossing of the pore fissures in contiguous parenchymatous and ligneous cells when observed on sections parallel to the medullary rays. But I must at once name, as a considerable exception, the peculiar short, thick, but delicate walled cells,

which in their interior contain plate-like rings and spirals raised on the narrow edge, which constitute nearly the entire mass of the wood of the *Mammillariæ*, *Echinocacti*, and *Melocacti*; and also occur in small quantity in the *Opuntia*, especially at the contractions of the joints, and which were first described by Meyen from *Opuntia cylindrica*.

EXPLANATION OF PLATE.

- Fig. 1.—10.* Stages of the formation of the annular vessels from *Campelia Zanonia*, Rich. Explanation in text, page 42.
Fig. 11. Commencement of the formation into a ring of a spiral from *Equisetum arvense*.
Fig. 12. Spiroidea on a section through the medulla perpendicular to the bark; *a.* the side towards the medulla, *b.* that toward the bark.
Fig. 13. Spiroidea on a section parallel to the bark.
Fig. 14. The same as in fig. 13, with an intermediate series of cells corresponding to a right wound spiral.
Fig. 12—14. From young stems of *Cucurbita Pepo*.

V.—*Characters of new Genera and Species of New Holland Cyperaceæ, Restiaceæ, and Juncaceæ.* By Prof. C. G. NEES VON ESENBECK.

[*Communicated by Professor Lindley.*]

A. GUNNIANÆ.

HELOTHRIX.

Locus inter *Cyperaceas Acrolepideas*.

GEN. CHAR. Spicula disticha, squamis duabus inferioribus minoribus sterilibus, duabus superioribus hermaphroditis. Stamina tria. Perigynii setæ 4 (an semper?) retrorsum scabræ. Stylus bifidus, a basi bulbosa deciduus. Caryopsis biconvexa, styli basi conica mucronata perigynioque stipata.

Inflorescentia : spiculæ axillares et terminales geminæ brevipedunculatæ.

Plantæ pusillæ habitu *Acrolepidis*, Schrad. aut *Eleogitonis*, in inundatis degentes, diffusæ. Culmus ramosus, flexuosus, foliosus.

*974. *Helothrix pusilla*. Culmi 2—4 poll. longi, flaccidi, geniculati, compressi. Vaginæ internodiis breviores, totæ herbaceæ, striatæ ore truncatæ. Folia linearia, angusta, obtusa, margine scabra, trinervia. Spiculæ vix lin. 1. longæ ex vaginis superioribus emergentes, pleræque geminæ, pedunculis inclusis, oblongæ, compressæ, virides cum purpura. Squamæ carinatæ, duæ inferiores triplo majores uninerves acutæ, duæ superiores ovato-lanceolatæ obtusæ trinerves, apice virides, basi pallidæ, deciduæ. Stylus bifidus, ramis longis tortis hirtis. Caryopsis candida,

* The numbers refer to the collections of dried plants given away by Mr. Gunn.

brevis, obovata, filamentis longis persistentibus, perigyniique setis antrorsum denticulatis albis æquilongis cincta.

An huc *Isolepis fluitans*, R. Br.?

956. *Cyperus sanguineo-fuscus*, N. ab E. umbella pluriradiata, radiis compositis spiciferis spicis sessilibus patentibus, spiculis subulatis patulis 4—8-floris, squamis alternis ovali-oblongis obtusiusculis septemnervibus fusco-purpureis nitidis margine tenuissime albido dorso basin versus quandoque virescente, involucri hexaphylli foliis planis scaberrimis ternis foliisque scabris longissimis, involucellis setaceis (paucis) spica brevioribus, culmo trigono brevi.

Cyperus lucidus, Rob. Br. Fl. Nov. Holl. p. 218. n. 40. ed. N. ab E. p. 74?

Cyperus sanguinalis, Schrad. Cyp. Bras.

Adnot. Hic verus esse videtur *Cyperus lucidus*, R. Br. alter, in Sieb. Agrostogr. n. 500 evulgatus, nisi nova sit species, ad *Cyperum venustum*, R. Br. est revocandus.

420. *Isolepis propinqua*, R. Br. var. culmo $\frac{1}{2}$ — $\frac{3}{4}$ ped. alto, spiculis 2—12 in glomerulo, squamis sanguineo-maculatis obtusissimis cum mucronulo. An distincta species?

976. *Isolepis margaritifera*, N. ab E., capitulo terminali oligostachyo laterali plus minusve cum terminali confluyente, spiculis compresso-trigonis, squamis ovato-lanceolatis obtusiusculis carinatis uninervibus carina viridi lateribus fusco-sanguineis, involucri diphyllo capitulo longiori foliisque canaliculatis setaceis margine scabris, vaginis arctis ore nudo, caryopsi globoso-trigona albo-nitida lateribus convexis costulata sulcis scrobiculatis.

Variat α . capitulis in unum confluentibus;

β . capitulo laterali remoto in pedunculos mono-distachyos soluto;

γ . spiculis in culmo singulis geminisve propter involucrum monophyllum erectum in speciem lateralibus.

Isolepis setacea, R. Br. Prodr. p. 222. n. 6.

421. *Isolepis cartilaginea*, R. Br. var. α . et β . Caryopsis trigona, tenuissime seriatim tuberculata.

573. *Eleocharis mucronulata*, N. ab E., culmis teretibus brevibus, vagina truncata cum mucronulo brevi herbacea, spica cylindracea densa multiflora, squama infima una et altera latis amplexantibus sterilibus reliquis ovato-oblongis obtusis dorso ferrugineo sanguineis, carina angusta viridula marginibus albo-membranaceis, stylo trifido, caryopsi obovata dorso gibbosa levissime tuberculata, styli basi pyramidalis pallida, hypogynii setis sex caryopsi longioribus.

β . minor, squamis totis fere fuscis.

Ab *Eleocharite acuta* R. Br. differt squamis spicæ ovato-oblongis obtusis nec lanceolatis acutis.

Ab *Eleocharite multicauli* differt culmis multo crassioribus, *Eleocharite palustri* magis accedentibus, et spica duplo majore densiore basi squama una binisve latis rotundatis sterilibus cincta. Vagina longa, recta truncata, viridis, mucronulo vix lin. longo subulato herbaceo.

1013. *Cladium glomeratum*, R. Br. (genus proprium.)

Isolepidi propinqua species, probabiliter proprii generis. Squamæ bi-trifariæ, carinatæ, membranaceæ, pleræque fertiles. Stamina tria. Stylus trifidus basi subincrassatus, caryopsi trigona nitida concretus, a basi deciduus.

Fructus est *Elynanthi*, structura spiculæ potius *Isoschæni*, habitus *Cladii*.

575. *Chætospora concava*, N. ab E., culmo ancipiti altero latere plano altero convexusculo marginibus lævibus, panicula elongata contracta decomposita.

Lepidosperma concavum, R. Br. Prodr. p. 234. (90.) n. 2 ?

GYMNOSCHÆNUS, N. ab E.

Spiculæ distichæ, bifloræ. Squamæ ventricosæ, læves, basi subtiliter nervoso-striatæ; inferiores quatuor minores steriles, quinta duplo major rigidior mascula involvens sextam hermaphroditam femineamve, extrema minor angustior sterilis inclusa. Setæ hypogynæ paucae 1—3, graciles, antrorsum scabræ, ovario longiores. Stamina tria, filamentis longis planis, antheris linearibus mucronatis late dehiscentibus et tum magis oblongis. Stylus trifidus, basi conico-dilatatus, pubescens, cum ovario obconico compresso-trigono articulatus. Fructum non vidi.

Inflorescentia: capitulum terminale, bracteis brevibus latis interstinctum basi que involucreatum. Culmi aphylli.

Observ. 1. Ab *Arthrostyli*, R. Br. differt spiculis bifloris, squamis haud carinatis setisque hypogynis.

Observ. 2. Ad hoc genus pertinere videntur *Chætospora sphaerocephala*, R. Br. et *anceps*, R. Br.

952. *Gymnoschænus adustus*.

G. culmo compresso lævissimo apice incrassato, vaginis . . . , spiculis tumidulis obtusis, squamis apice fuscis.

984. *Lepidosperma ensatum*, N. ab E., panicula densa pyramidalis brevi, ramis decompositis imbricato-spiculatis, culmo ancipiti medio utrinque convexo marginibus scabriusculis, spiculis 1-floris, squamis acutiusculis scabris.

983. *Lepidosperma squamatum*, Labill. Spiculæ subbifloræ, squama antepenultima mascula, penultima abortu feminea, terminalis abortiva.

Setulæ tres, retrorsum scabræ, inter stamina.

Igitur *Chætosporæ* potius generis quam *Lepidospermatidis*.

962. *Restio complanatus*, R. Br. Novum genus. Spicula undique imbricata squamis membranaceis setaceo-cuspidatis. Perianthium pedicellatum quadripartitum, laciniis lateralibus angustioribus. Stamina duo basi dilatata cartilaginea, lateribus ovarii adposita. Stylus bifidus. Utriculus compressus, retusus, sæpe obliquus, monospermus.

Culmus simplex, complanatus. Vaginæ membranaceæ, truncatæ, aphyllæ, limbo lacero. Spiculæ in panicula racemosa brevi angusta.

599. *Calorophus elongata*, Labill. ♀ Restio lateriflorus, N. ab E. in Sieb. Agrostoth. n. 29. et R. Br. Prodr. Culmi filiformes, longissimi. Vaginæ ore barbatae. Spiculæ laterales, distantes, bractea setacea basi vaginante ciliata cinctæ, sessiles. Squamæ propriæ tres, membranaceæ, ciliatæ, obtusæ. Sepala sex, tenuissime membranacea, subrotundo-ovalia, obtusa, æqualia, ciliata, nucem æquantia eidemque arcte adpressa. Nux trigona, lævis, stigmatibus tribus in spicas revolutis persistentibus coronata.

Hæc vera femina est *Calorophi elongatae*, Labill. Quam tamquam plantam femineam in eadem tabula pinxit Labillardière (fig. 2.), ad *Hypolænam exsulcam*, R. Br. aut aliam hujus generis speciem pertinere puto.

B. DRUMMONDIANÆ ; ad *Flumen Cygnorum lectæ*.

1. *Chorizandra multiarticulata*, N. ab E., capitulo globoso exserto, squamis obtusis imberbibus, culmi articulis profunde striatis diametro sua paulo longioribus. Culmus magis ac in *Ch. Cymbaria striatus*, articulisque duplo brevioribus vel statu sterili dignoscendus.
 2. *Isolepis cartilaginea*, R. Br. var. spiculis 1—8 pallidis, culmo semipedali, foliis plus minus elongatis. Culmus compresso-triqueter. Involucrum sub capitulo polystachyo diphylum.
 3. *Elynanthus bifidus*, N. ab E., culmo filiformi striato compressiusculo basi bulboso foliatoque, foliis canaliculato-filiformibus, spiculis solitariis binisve pedunculatis terminalibus bifloris, bulbo styli in caryopsi muricato-rugoso.
 4. *Elynanthus capitatus*, N. ab E., culmo obtuse trigono compressiusculo lævi basi bulboso foliatoque, foliis convoluto-caniculatis, vaginis margine membranaceis laceris, capitulo terminali polystachyo, spiculis unifloris squamis quatuor inferioribus cuspidatis.
 5. *Elynanthus australis*, N. ab E., culmis filiformibus lævibus foliosis, vaginis truncatis folio convoluto-filiformi basi rigide ciliolato multo brevioribus, ligula brevissima truncata, spiculis spicato-fasciculatis in panicula angusta ramis quinque singulisve bractea brevioribus dispositis lineari-lanceolatis unifloris, squamis sterilibus bracteolisque setaceo-cuspidatis.
- Affinis *Elynantho cuspidato* et *gracili*, at caractere suo distinctus.
6. ? *Elynanthus octandrus*, N. ab E., culmo compresso bulboso, foliis omnibus radicalibus linearibus planis, spiculis spicatis, spicis axillaribus solitariis, inferioribus remotis superioribus in spicam terminalem compositam coeuntibus, bracteis foliaceis culmi apicem superantibus, rostro fructus ovato crasso.
 7. *Schænus fascicularis*, N. ab E., culmo simplici compressiusculo exsulco lævi aphylo, vaginis baseos ore subbarbatis foliolo longioribus, spiculis fasciculatim confertis brevissime pedicellatis falcatis subtrifloris, squamis margine ciliatis.

Proximus *Schæno brevifolio*, a quo differt inflorescentia plerumque breviori, vix pollicari, ex paucis fasciculis approximatis conflata rarius iisdem paullo magis discretis, spiculis falcatis subsessilibus, et vaginæ foliiferæ ore, saltem in juventute, barbulo nec nudo. Structura spiculæ omnino ut apud Kunthium (En. II. p. 335.) sub *Sch. brevifolio* sed squamæ 4. inferiores vacuæ, 5, 6, et 7 fertiles.

ISOSCHÆNUS, N. ab E.

Spicula disticha, squamis æqualibus, inferioribus fertilibus, superioribus sterilibus. Rhachilla fructus curvato-sinuata. Perigynium nullum. Stamina tria, filamentis persistentibus peracta anthesi elongatis. Stylus basi æquali deciduus, trifidus. Caryopsis nucamentacea, sculpta, a flexuris rhachillæ diutius retenta.

Inflorescentia capitata aut per fasciculos axillares anguste paniculata. Culmi basi aut etiam superiora versus foliosi. Vaginæ ligulatae. Folia angusta, filiformia aut canaliculato-filiformia.

8. *Isoschænus Armeria*, N. ab E., spiculis capitatis, culmo lævi basi unifolio.

9. *Isoschænus acuminatus*, N. ab E., *Schœnus acuminatus*, R. Br. Prodr. p. 231, et N. ab E. (87.) n. 6.—spiculis fasciculato-ternis binisve lateralibus in panicula angusta dispositis, culmo foliato.

10. *Isoschænus flavus*, N. ab E., capitulo terminali, culmo rigido subangulato scabro basi foliato foliis filiformibus canaliculatis scabris breviori.

Culmus tripollicaris, quam pro altitudine crassior.

11. *Chætospora aurata*, N. ab E., culmo nudo compresso basi folioso, foliis subsetaceis canaliculatis incurvis, capitulo terminali globoso involucreo di-triphylo breviori, spiculis subbifloris squamis imberbibus carina scabris, perigynii laminis lineari-lanceolatis planis ciliatis.

Similis *Ch. curvifoliæ*, sed evidenti differt caractere.

Culmus spithamæus et ultra, compressus. Squamæ atro-sanguineæ, basi aureo-flavæ, omnes setaceo-cuspidatæ, carinatæ. Caryopsis (nux) obovata, obtusa, scabra, squamulis 7—8 æquilongis strigilosis appressis cincta. Stylus trifidus. Stamina 3.

12. *Chætospora cygnea*, N. ab E., culmo compressiusculo estriato basi foliato, vaginæ ore barbato, spiculis binis ternisve lateralibus sessilibus involucreo culmum continuante brevioribus, squamis trifariis enervibus interioribus margine puberulis, laminulis hypogynis fructu duplo brevioribus ciliatis, rhachilla fructus apice incurva.

Juncum filiformem gracilem refert.

13. *Caustis dioica*, R. Br. Est hermaphrodito-dioica pistillis plerisque sterilibus. Ad hujus formam sterilem spiculis in ramulis
Ann. & Mag. Nat. Hist. Sept. 1840.

recurvatis solitariis, nec vero ad *Caustin flexuosam*, spectat *Caustis recurvata* mihi (olim *Restionis* nomine a Siebero distributa); quod quomodo scribæ, nec mea culpa evenerit, ipse paulo post in eodem Diario botanico Ratisbonensi exposui. Sed Kunthius, qui omnia scit, ubi videor erravisse, ea sola nescire videtur, quæ ad avertendam erroris falsam speciem feci. Id quoque monendum est, *Melachnen Sieberi* non ad *Caustin flexuosam*, sed ad *Didymonema filiforme* Presl. pertinere, et igitur longe distare a Causti genere.

14. *Restio curvulus*, N. ab E., culmis apice ramosis fastigiatis, ramulis compressis curvatis apice spiciferis, spicis masculis approximatis (paucis) sessilibus oblongo-lanceolatis, squamis cuspidatis vaginisque nudis, his mucronatis, perianthiis (♂) 6-glumibus.
15. *Lepyrodia macra*, N. ab E., culmis simplicissimis flexuosis vaginis foliatis strictis, spica simplici pauciflora.
Culmi spithamæi, curvati, subspongiosi, graciles. Vaginæ herbaceæ, striatæ, truncatæ, ore membranaceo, foliolo subulato obtuso 3—4-lineari erecto. Vaginæ superiores basi solubiles ut in *Restionibus*, sed flores intra squamam bibracteolati. Spica tam mascula quam feminea 3—4-floræ. Bracteæ communes oblongæ, membranaceæ. Sepala æqualia. Flos masculus (defloratus) angustior.
16. *Lyginia imberbis*, R. Br. ♀ *Schœnodum* tenue, Labill. t. 229. f. 1. Ovarium, in stylum longum crassum apice solummodo trifidum attenuatum, monospermum videtur. Perianthium sexfidum, laciniis oblongo-lanceolatis muticis membranaceis æqualibus. Bracteæ late ovatæ, setaceo-mucronatæ, fuscæ. Spica terminalis solitaria. Reliqua ut in caractere naturali a cl. Brown tradito. Vaginæ aristato-cuspidatæ. Culmi lutei, læves, simplicissimi.
17. *Anarthria grandiflora*, N. ab E., culmis simplicibus teretibus foliisque compressiusculis striatis, racemo composito denso oblongo, floribus masculis nutantibus, bracteolis geminis, sepalis lanceolatis compresso-carinatis. Squamæ bracteales longæ, lanceolatæ, ♀ racemo minori contracto, ramis 2—3 minus divisus rigidis, floribus minoribus sepalis rigidis.
18. *Anarthria humilis*, N. ab E., culmis simplicibus teretibus filiformibus foliisque compressis striatis, racemo ditrifloro, bracteolis singulis, sepalis lanceolatis obtuse carinatis.
Culmus semipedalis. Sepala lanceolata, subulato-acuta, brunnea.
19. *Leptocarpus canus*, N. ab E., amentis in glomerulos distantes laterales dispositis, squamis acuminatis, rhachilla pilosa, perianthii glumis omnibus margine lanatis, culmo simplicissimo cano. Culmi 1—1½-pedales, teretes. Vaginæ fuscæ, mucronatæ. Spiculæ geminæ—quaternæ, a medio culmo in glomerulos distantes agglomeratæ, bractea setacea brevi-vaginata cinerea suffultæ. Flores bibracteolati.

20. *Leptocarpus spathaceus*, R. Br. Distinctum genus. Stylus trigonus, crassus; ovarium triangulare, in stylum decurrens. Flores fasciculati (quos dicunt) terni quaterni, capituliformes; spiculæ squamis suffulti. Sepala mucronata.
 21. *Desvauxia Drummondiana*, N. ab E., receptaculo subpaleaceo, stylis 6—7 basi connatis valvulis asperis infra apicem obtusum aristato-mucronatis mucrone valvula sua duplo breviori, foliis capillaribus scabris scapo glabro brevioribus.
- D. Billardieri*, R. Br. affinis.

VI.—On the Structure of the Stigma in *Mimulus* and *Diplacus*. By Mr. JOSEPH HENDERSON.

To Richard Taylor, Esq.

SIR,

I HAVE observed a very singular instance of irritability in the stigmata of some species of *Mimulus* and of one species of *Diplacus*, a genus recently separated by Nuttall from *Mimulus*. As I have nowhere seen any mention made of the existence of the phænomenon of irritability in any of these plants, you will perhaps favour me, should the fact not have been before observed, by inserting this notice in the Annals of Natural History*.

In making an experiment to ascertain if *Diplacus puniceus* would hybridize with *Mimulus cardinalis*, I found on applying the anther of the latter to the bilamellate stigma of the former, that the plates—which in their natural position are reflexed—immediately collapsed, and inclosing the mass of pollen grains that had fallen on them, pressed firmly against each other. The intimate connexion between the genus *Diplacus* and *Mimulus*, induced me to try if this unexpected property existed also in stigmata of the latter genus, and I found it to be present in *Mimulus cardinalis*, *roseus*, *luteus* and *moschatus*, all the species of *Mimulus* growing here. The movement in all these cases follows the touch as rapidly as in *Mimosa pudica*; the stigma, however, is more active when the flower is first opened. If the stigma is touched with a pin or any other instrument, the plates, after collapsing, will revert to their natural position, generally in less than two hours; but if pollen is interposed between the plates, they remain closed a much longer time.

In the 27th Number of the Annals of Natural History there is a note on the movement of the style of *Goldfussia anisophylla* by Professor Morren of Liege, in which he refers the

* The excitable property of the stigma of *Mimulus* and *Diplacus* is a fact well known, but the peculiar structure of that organ has not been before observed.—ED.

cause of the movement to excitable globules contained in the fluid of what he calls the cylindrenchyme of the stigma; this fluid being carried to the extremities of the cylindrenchyme, these extremities are dilated, which causes the stigma to bend in one direction; but when the stigma is touched, the globules and the liquid flow back to the bottom of the cylinders, and in this case, this side becoming the longest, the style erects or bends in an opposite direction: M. Morren therefore refers the cause to the excitability of a vital fluid.

In examining the stigmata of *Diplacus puniceus* and the different species of *Mimulus*, in order to ascertain if they contained any analogous structure to that described by M. Morren, I found the inner surfaces of the stigmata in all composed of elongated cylindrical cells, the ends of which are free and prolonged into tapering jointed glandular hairs: these hairs, which thickly clothe the surface of the stigma*, are dilated at the extremities, and at the base where they arise each one forms a thickened elbow, with the cell of which it is the termination.

When the plates of the stigma are in their natural position these hairs are erect, but on examining them after the plates had collapsed, I found them gathered together into bundles of a dozen or more with their points drawn closely together, and in some cases twisted spirally round one another: in the stigma of *Mimulus roseus* each hair was recurved over its own cell. It is easy to conceive that such a movement of the hairs, forming as they do the extremities of the cylindrical cells, would cause the stigma to incline inwards, and it is probable that the natural cause of their movement is, as M. Morren asserts, the reaction of an excitable fluid.

I am, Sir, your obedient Servant,
JOSEPH HENDERSON.

Milton, near Peterborough, July 13, 1840.

VII.—*A Note upon the Genus Decaisnia, Ad. Brong.* By
Professor LINDLEY.

THIS genus, founded upon a Brazilian plant from the Island of St. Catharine's, was published by M. Adolphe Brongniart in the Botanical part of Duperrey's Voyage. It was admitted into the *Neottideous* tribe of Orchidaceæ in my Natural System of Botany, and by Endlicher has been equally adopted as a genus of the *Arethuseous* tribe.

* In the stigma of *Goldfussia anisophylla* these hairs are shorter, more thickly crowded together, and less dilated at the points than in stigmata of *Mimulus* and *Diplacus*.

In examining critically the genera of *Neottideæ*, I have been surprised to find that this *Decaisnia* is identical with *Prescottia*; a circumstance easily overlooked, since the species is somewhat different in habit from any of the *Prescottias* hitherto published, and is moreover so represented in the figure that accompanies M. Brongniart's memoirs as not to call to mind the peculiar cucullate fleshy lip and revolute floral envelopes of *Prescottia*. I find, however, that both these characters really exist in *Decaisnia*.

M. Brongniart relies upon the adhesion of the lateral sepals and labellum into a pouch, two pollen masses, and a pair of auricles to the anther-bed, as characteristic features of *Decaisnia*; but the first is equally the attribute of all *Prescottias*, and the others are of little moment. I am not able to ascertain whether the granular pollen masses are simple or two-lobed, although I possess an excellent specimen of *D. densiflora*, through the liberality of M. Ad. Brongniart, so very difficult is the examination of the minute fructification of these plants: but even if the pollen be as is represented in the figure in Duperrey's Voyage, it would not constitute, *per se*, a generic difference from *Prescottia*; and with regard to the auricles of the anther-bed, they occur in *P. plantaginea* itself, and in *P. stachyodes* form a still more striking feature in that part.

Although the name *Decaisnia* must therefore be abolished, I do not think it desirable to restore it to those Indian *Neottideæ*, originally so called by me, and afterwards, at the request of M. Brongniart, altered to *Cnemidia*, for this would be to increase the confusion of names. It will, I think, be better that some new genus should be taken to commemorate the distinguished merits of M. Decaisne.

VIII.—On a new British Species of Colymbetes. By CHARLES C. BABINGTON, Esq., M.A., F.L.S., F.G.S., &c.

THE water Coleoptera of South Britain have now been so carefully studied, that it is far from probable that any new species should yet remain to be discovered amongst the larger forms; it is therefore with the greater satisfaction that I now introduce to the entomological readers of the Annals of Natural History a new species of *Colymbetes*, discovered by the Rev. J. L. Brown in Horning marshes, Norfolk, in the month of March, 1839, and again found in the same place in March 1840. This insect appears referable to the section *Agabus* of Erichson, in which the labial palpi have the third joint a very little shorter than the second, the claws being equal and

moveable, and the three basal joints of the anterior tarsi in the males being dilated with small acetabuli; and to the fourth division of it, where the four basal joints of the posterior tarsi are ciliated beneath in the males.

COLYMBETES (AGABUS, §. 4.) *rectus*, (Bab.). Lineari-oblongus, subconvexus, fusco-niger, subtilissime longitudinaliter strigosus, antennis pedibusque ferrugineis, elytris apice punctato et strigis tribus irregularibus punctorum impressis.

(Long. corp. $3\frac{1}{2}$; lat. $1\frac{3}{4}$ lin.)

Oval oblong, with the sides nearly parallel and straight, slightly broader behind the middle of the elytra, rather convex, fuscous black above and beneath, head nearly smooth, with two large deep punctures in front and two small deep foveæ before and rather above the eyes, which have a narrow rugose line along their upper margin, crown with two round red spots. Thorax covered with minute anastomosing longitudinal striæ, which are much stronger near to the lateral margins, a shallow depression next to each of the hinder angles, from each of which an irregular line of punctures extends along the hinder margin half-way to the scutellum. There is also a line of irregular impressions along the whole of the anterior margin, and a faint trace of a dorsal channel. Scutellum smooth. Elytra having their sides in continuity with the thorax, covered throughout with minute longitudinal anastomosing striæ, and having three irregular rows of punctures upon each, with distant scattered dots between them, which become more numerous towards the apex; also an irregular row of numerous punctures on the outer margin. Mouth, antennæ, and palpi ferruginous; the labial palpi with the second joint rather longer than the third. Legs ferruginous, with the thighs darker; tarsi of the male with the three basal joints of the anterior dilated, and the four of the posterior ciliated beneath; claws of equal length upon each tarsus, but those of the posterior very minute.

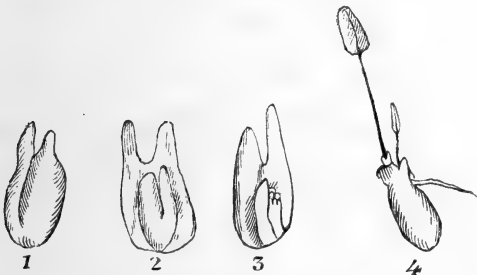
Inhabits Horning marshes, Norfolk, and was found by the Rev. J. L. Brown in March, 1839 and 1840.

Closely resembling *C. branchiatus* (Bab.) in form, but belonging to a different subdivision of the section, and in that the colour is blueish black, the upper surface almost smooth, the legs, antennæ, and palpi are much darker, and there is also a faint trace of a transparent line upon each of the elytra.

St. John's Coll. Cambridge, July 14, 1840.

IX.—*Additional Observations on the Gemmæ of Polygonum viviparum.* By GEORGE DICKIE, Esq., A.L.S., Lecturer on Botany in the University and King's College, Aberdeen.

A DESCRIPTION of the *Gemmæ* of *Polygonum viviparum* having been already given in the 32nd Number of the Annals, the following account of their original development, and of their manner of growth, will serve to complete the history of these remarkable bodies. Having procured in the early part of the season, from a locality in this neighbourhood, very young flower stems, both flowers and gemmæ were carefully dissected; the former (which invariably occupy the summit of the flower stems) were much more advanced than the latter. Fig. 1. represents one of these magnified. Two nearly conical processes are seen placed side by side; on separating these, two similar bodies are seen in the interior alternating with the former; by tearing asunder these last, two others are seen similarly inclosed (figs. 2. and 3.); the difference in length



and breadth of the two innermost is now more conspicuous than in the two outer. Each of these concentric bodies may be considered, the one as a young leaf and the other a bud in its axil. They are all of a very delicate texture and pale colour; at this period the mass of cellular tissue enclosing starch grains is not developed, neither have the pink cells alluded to in the former paper yet appeared. The bud at the apex of each body is therefore first formed, and afterwards a quantity of fecula is stored up at its base.

A considerable number of perfectly formed gemmæ, shortly after being gathered from the mature flower stem, were planted in a pot of mould, the apex of each alone protruding from the soil; they were daily supplied with water. A few days after being planted, a young leaf appeared at the summit of each, the petioles made rapid progress, and some reached nearly the length of an inch a week after the first appearance of the

leaf (fig. 4.). Up to this period no roots are protruded; the young leaf is nourished solely by imbibition and by the fecula stored up at its base. It generally happens that no root is protruded until a second leaf has appeared; I have, however, seen a few cases in which a radicle appeared while only one leaf was yet visible. In most instances, shortly after the appearance of a second leaf, a root is protruded from the gem and always at one side near its neck (fig. 4.). This root is conical, at first entirely cellular and covered with minute fibrils; it constitutes the root of the plant, and the fibres on its surface are spongioles. A perpendicular section shows that this root has an organic connexion with the youngest of the leaves when two are produced previous to its appearance. May it not be admitted that these remarkable bodies present a miniature illustration of Professor Morren's investigations regarding the functions of the Pith in Plants? See Annals, No. 22, vol. iv. pp. 73-87.

X.—On *Lychnis diurna* and *vespertina* of Sibthorp. By CHARLES C. BABINGTON, Esq., M.A., F.L.S., F.G.S., &c.

THINKING it right to bring before the public as early as is consistent with accuracy, any information that I may obtain concerning what may be denominated the contested parts of British descriptive botany, I make no apology for publishing specific characters for the two species of *Lychnis* which have been usually included under the name of *L. dioica*.

In both of them I find a tendency to change in the colour of the flowers; those of *L. diurna*, although most commonly red, may yet be sometimes found of so light a pink as to be called white; and those of *L. vespertina*, which are usually white, vary occasionally to pink. In both the flowers are usually diœcious, but plants of each of them are at times found with perfect stamens and pistils in the same flowers. For this reason I propose to drop the name of *dioica* and to adopt those conferred by Sibthorp.

I have not found any tendency to variation in the characters drawn from the forms of the calyx-teeth and the capsule, and the direction of the teeth of the latter.

I make no claim to originality in these characters, all of which have, I believe, long been detected and employed upon the continent; but only wish to bring them before our younger British botanists, to whom I suspect that they are totally unknown.

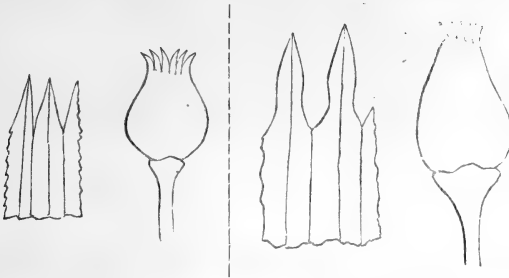
1. *L. diurna* (Sibth.). Petals half bifid crowned, stem, leaves, peduncles and calyces villose, leaves ovate-acute, flowers dichotomously paniced diœcious, teeth of the calyx triangular short, capsule nearly globular with reflexed teeth.

L. dioica, α . *Linn. Sp. Pl.* 626. *Sm. Eng. Fl.* 2. 328. *Eng. Bot.* t. 1579.

L. diurna. *Sibth. Oxon.* 145. *Koch. Syn.* 107.

L. sylvestris, "Hoppe" *DeCand. Prod.* 1. 386.

Flowering in May and June. Flowers usually red; rarely nearly white. The length of the teeth of the calyx is variable, but I believe the form to be constant.



L. diurna, *Sibth.*

L. vespertina, *Sibth.*

2. *L. vespertina* (Sibth.). Petals half bifid crowned, leaves, peduncles and calyces hairy, leaves ovate-lanceolate, flowers dichotomously paniced diœcious, teeth of the calyx linear-lanceolate elongated, capsule conical with erect teeth.

L. dioica, β . *Linn.* 626. *Sm.* 328. *Eng. Bot.* 1580.

L. vespertina. *Sibth.* 146. *Koch.* 107.

L. dioica. *DeCand.* 386.

Flowering from June to September; not commencing so soon, and continuing in flower much longer than the last. Flowers usually white, but rarely reddish. In the figure in *Eng. Bot.* the teeth of the calyx of the female flower appear to me to be those of *L. diurna*, although the rest of the figure agrees with *L. vespertina*.

St. John's Coll. Cambridge, July 29, 1840.

XI.—*Some Observations on the Origin and Direction of the Woody Fibre of the Stems of Palms.* By GEORGE GARDNER, Esq., Surgeon*.

THE hidden remains of former worlds which the exertions of geologists are daily bringing to light, are no less subjects of wonder to the unlearned, than objects which give rise to spe-

* In a Letter addressed to J. E. Bowman, Esq.

culations of the most interesting nature in the mind of the philosopher, and enable him by induction to give a definite and harmonious idea of the former condition of the globe. It was only from the intimate knowledge which the immortal Cuvier possessed of the anatomical structure of the living animals which now people the earth, that he derived the power of giving all but life to a host of its former inhabitants, whose existence and real characters were before totally unknown. If such knowledge is requisite for throwing light on the remains of animals, it must be obvious that the relics which survive of the extinct vegetation of the earth can only be successfully investigated by those who have attentively studied the anatomical structure of that which now covers its surface. To the geologist, knowledge of this kind must be of the utmost value, since we now know that many tribes of plants are as readily distinguished by the structure of their stems, as by the characters which are given to them by their organs of fructification. Thus all the individuals of the natural order *Coniferæ* are immediately recognized by there being scarcely any mixture of vascular tissue among the woody fibre of their stems, as well as by their ligneous tissue being marked with circular discs, which are supposed by Kieser and several other vegetable physiologists to be pores, but which, from apparently good reasons, Dr. Lindley considers to be semitransparent granules. *Cycadeæ* are recognized by the same want of vascular tissue as in *Coniferæ*, and by their wood being marked in the same manner; but the zones of wood are separated by a layer of cellular substance resembling that of the pith, and often as thick as the zones themselves. The shrubs which constitute the natural order *Calycantheæ* have square stems, with four woody imperfect axes, surrounding the usual central one; and the investigations of those who are now devoting themselves to such inquiries may probably lead to the discovery of distinguishing characters in the stems of other well-marked tribes of the vegetable kingdom.

These remarks have been occasioned from reading the account of the anatomical structure of *endogenous plants* given by Dr. Lindley in his 'Introduction to Botany.' After stating the general plan on which the stems of these plants are formed, the following paragraph occurs at page 82 of the second edition of that work: "The investigations of Mohl appear to show that this view of the structure of *endogens* requires some modification. According to this observer, every one of the woody bundles of a palm-stem originates in the leaves, and is at first directed towards the centre; arrived there, it follows

the course of the stem for some distance, and then turns outward again, finally losing itself in the cortical integument. In the course of their downward descent the woody bundles gradually separate into threads, till at last the vascular system, which for a long time formed an essential part of each of them, disappears, and there is nothing left but woody tissue. In this view of the growth of *endogens*, the trunk of such plants must consist of a series of arcs directed from above inwards, and then from within outwards; and consequently the woody fibres of such plants, instead of being parallel with each other, must be interlaced in infinite intermixture. There are, however, some difficulties in the way of this theory, which we do not find adverted to by its author. If Mohl's view of the structure of *endogens* be correct, they must after a time lose the power of growing, in consequence of the whole of the lower part of their stems being choked up by the multitude of descending woody bundles. Is this the case? The lower part of their bark, too, must be much harder, that is, much more filled with woody bundles than the upper. Is that the fact? The hardness of the exterior of palm-stems cannot be owing to the pressure of new matter from within outwards, but to some cause analogous to the formation of heart-wood in exogens. Is there any proof that such a cause is in operation? I mention these things," continues Dr. Lindley, "not so much from distrust of Mohl's views, as from a desire to see the difficulties which seem to lie in the way of an ingenious theory satisfactorily removed."

At the time of reading this I was prosecuting my botanical researches on the Organ Mountains of Brazil; and having ample opportunity for making observations on the subject, from the great number of individuals of the palm tribe which are found on this range, of all sizes, from the tall species that inhabit the plains, to the dwarf ones which are met with at an elevation of upwards of 5000 feet, I determined to ascertain whether or not the views of Mohl, as stated by Dr. Lindley, were correct.

The first individual I examined was a large low-growing species, called by the Brazilians *Coqueiro*. The stem measured $4\frac{1}{2}$ feet in circumference, and the leaves were inserted at the distance of 3 inches from each other. Having caused a longitudinal section of the stem to be made, both through the portion destitute of leaves, and that to which the leaves were attached, the bundles of woody fibre were distinctly seen passing from the scars and the bottoms of the leaves downwards and inwards to the middle of the stem at an angle of 18° . The individual fibres being large in this species, I was

able to trace their course with great ease. I found that after entering the stem they made a gentle curve downwards and inwards till they reached nearly the centre of the column; then, changing their direction, they turned downwards and outwards, with a greater degree of obliquity than before, till they reached within a little of the external surface of the stem, after which they continued to descend in a line parallel with its axis, ultimately becoming so much ramified that I was unable to trace them. The chord of the arc, or the distance from the place where the fibres entered the stem, to the point where they finished their curve, was $2\frac{1}{2}$ feet. I was not only able to trace the fibres as above described, but could also trace them from the interior of the stem for a considerable distance up into the substance of the leaf itself.

Longitudinal sections of the stems and leaves of the cabbage-palm (*Euterpe edulis*, Mart.), of a very tall species, called by the Brazilians *Patí*, and of a small one which they call *Oricana*, all exhibited precisely the same structure, the length of the curve of the fibres only differing according to the thickness of the stems of the different individuals and the distance between the insertion of the leaves.

The stems of all the species split with difficulty, owing to the great mesh-work of interlaced fibres.

Having thus shown that the views of Mohl regarding the origin and direction of the woody fibre of the stems of palms are quite in accordance with what I have myself observed, I shall now make a few remarks on the objections, or rather doubts, which Dr. Lindley has expressed concerning them. In the first place, he says, "if Mohl's view of the structure of *endogens* be correct, they must after a time lose the power of growing in consequence of the whole of the lower part of their stems being choked up by the multitude of descending woody bundles. Is this the case?" In none of the oldest palm-trees which I have seen cut down did it seem that this would ever be the case, the stem always exhibiting a like thickness of external hard, and internal soft portions, from the root to a height of many feet; and that this ought to be the case, is obvious from their structure. As the bundles of woody fibre originate from the leaves, and as they are placed the one above the other on the stem, it follows that the fibres of the upper leaves will not descend so far as those of the lower, and that, consequently, as the stem increases in height so will the density of its sides increase upwards also. In the second place, he says, "the lower part of their bark, too, must be much harder, that is, much more filled with woody bundles than the upper. Is that the fact?" Every one who has been in the

habit of seeing old palms cut down knows this to be the fact. When the axe is laid to the bottom of some of these old stems, it rebounds from them as if it were striking a piece of iron, while the upper part can be cut through with the greatest facility. Every Brazilian is aware of this fact. So durable is the wood of the large species of palm which they call *Patí*, that they prefer it to most other wood for supports to their houses, which in the country are generally built of wood, but it is only the lower, never the upper portion of the stem that they choose. The explanation given above will also account for this fact. In the third place, he says, "The hardness of the exterior of palm-stems cannot be owing to the pressure of new matter from within outwards, but to some cause analogous to the formation of heart-wood in *exogens*. Is there any proof that such a cause is in operation?" Before replying to this, I may observe, that the opinions of vegetable physiologists are still unsettled regarding the formation of wood in exogenous stems; Lindley, and others, maintaining the opinion of Du Petit Thouars, that the wood of a plant is formed by the multitude of leaf-buds by which it is covered, each of which may be considered a fixed embryo, having an independent life and action—that by its elongation upwards it forms new branches, and by its elongation downwards it forms wood and bark;—whilst DeCandolle, and most of the French physiologists, explain its formation by the hypothesis, that new layers are developed by pre-existing layers, which are nourished by the descending juices formed in the leaves. In palms, a longitudinal section of their stems, with the leaves still attached to them, only requires to be seen to convince the most sceptical that the ligneous substance of them is formed by the leaves, and this affords another proof, at least an analogical one, to the many which have already been given, that the wood of *exogens* originates in the leaves. The only difference between the formation of these two kinds of stems seems to be, that in the exogenous tribes the woody fibre always remains between the bark and the last-formed layer of wood; while in the stems of palms the bundles of woody tissue pass downwards and *inwards* to the interior of the stem, then gradually downwards and *outwards*, and finally descend parallel with the axis of the stem, through the previously formed tissue of the same nature.

Organ Mountains, Brazil, May 28, 1837.

XII.—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. 2. On the mode of Growth of the Ophioglosseæ. By ALEX. BRAUN. (Ann. des Sc. Nat. n. s. xiii. p. 63.)

THE cellular body from which, in the genus *Ophioglossum*, the leaves arise, is not a sheathing leaf, nor of the nature of a stipule or a ligule; but is, in reality, a cellular body enveloping the centre of development, on the exterior of which centre the leaves are arranged in a regular spiral order, and in which situation they continue until their expansion, which, in *Ophioglossum vulgatum*, takes place in the fourth year. In this body each leaf occupies its own particular cellule, which, enlarging with the growth of the leaf, is in succession elevated into a conical form and becomes finally ruptured like a sheath. The spike in *Ophioglossum* is axillary, and is the solitary leaf of a bud developed in the axil of the sterile leaf, to the stalk of which that of the spike is agglutinated. In the genus *Botrychium*, at least in the advanced state in which alone it has been hitherto examined, this enveloping cellular body does not exist, but the leaves ensheath each other. M. Braun considers the cellular body in *Ophioglossum* as a thalloid formation remaining during the entire life of the plant, and correspondent to the cellular organ through which the primary leaves of germinating ferns penetrate, and to which the name of *proembryo* has been given. As in the Phanerogamæ the first commencement of a plant gives birth to a leaf developing itself in the interior of a cellular organ (the *sac embryonaire*), so it would appear that throughout the whole vegetable kingdom the formation of a thallus precedes the formation of leaves.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

December 4, 1839.—A paper was first read, entitled “A Description of the Soft Parts and of the shape of the Hind Fin of the Ichthyosaurus, as when recent,” by Richard Owen, Esq., F.R.S., F.G.S.

The osseous frame-work of the fin of the Ichthyosaurus, Mr. Owen observes, having alone been the subject of direct examination, the exact shape and the nature of the soft parts had been matters of conjecture. A very striking deviation from the reptilian and mammalian types had, indeed, been recognised, and resemblance also to

the fins of fishes had been admitted in the digits of the fin exceeding five, in their being sometimes bifurcated, and in consisting of an extraordinary number of ossicles; yet owing to the form of the digital ossicles, their breadth and flatness, and their large size, as compared with the joints of the fin-rays of fishes, it had been generally supposed that the locomotive organs of the Ichthyosaurus were enveloped, while living, in a smooth integument, which, like that of the turtle and porpoise, had no other support than was afforded by the bones and ligaments within.

Sir Philip Grey Egerton in a recent examination of Ichthyosaurian remains in the possession of Mr. Lee of Barrow-on-Soar, detected, with the penetration which has enabled him to bring to light many other obscure points in the structure of the Ichthyosaurus, traces of the soft parts of the fin in a slab of lias containing a mutilated paddle; and having submitted the specimen to the examination of Mr. Owen, a detailed account of its character forms the subject of this memoir.

Mr. Owen considers the specimen to be a posterior fin of the *Ichthyosaurus communis*. It presents impressions and fractured portions of six digits, with the impression,—and a thin layer, most distinctly preserved,—of the dark carbonized integument of the terminal half of the fin, the contour of which is thus most beautifully defined.

The anterior margin is formed by a smooth unbroken well-marked line, apparently a duplication of the integument; but the whole of the posterior margin exhibits the remains and impressions of a series of rays by which the fold of the integument was supported. Immediately posterior to the digital ossicles, is a band of carbonaceous matter of a distinctly fibrous structure, varying from two to four lines in breadth, and extending in an obtusely-pointed form for an inch and a half beyond the digital ossicles. This band Mr. Owen believes to be the remains of the dense ligamentous matter which immediately invested the bones of the paddle, and connected them with the enveloping skin. The rays, above-mentioned, are continued from the posterior edge of this carbonized ligamentous matter, in which their bases appear to have been implanted, to the edge of the tegumentary impression; the upper rays being directed transversely, but the others gradually lying more in the direction of the axis of the fin, as they approach its termination. The most interesting feature in these rays, Mr. Owen says, is their bifurcating as they approach the edge of the fin.

From the rarity of their preservation, their appearance and co-existence in the present instance with remains of the integument, he states, it is evident they were not osseous, but probably either cartilaginous, or of that albuminous horn-like tissue, of which the marginal rays consist in the fins of the sharks and other plagiostomous fishes. Besides the impression of the posterior marginal rays, the specimen presents a series of fine, raised, transverse lines, which cross the whole fin, and probably indicate a division of the rigid integument into scutiform compartments, analogous to those

on the paddle of the Turtle and webbed foot of the Crocodile; but they differ in the absence of subdivision by secondary longitudinal impressions. The structure of the integument of the fin agrees, therefore, with the known reptilian characters of the skeleton of the Ichthyosaurus; and, as the skin with its appendages gives a character to the great primary groups of vertebrata, it might be expected that the skin of the Ichthyosaurus would exhibit some of the characters of the integument of existing reptiles.

In conclusion, Mr. Owen remarks, that the other new facts presented by the specimen, accord with the indications of the natural affinities of the Ichthyosauri afforded by their less perishable remains; and that all the deviations from the reptilian structure of the skeleton tend to the type of fishes and not to that of cetaceous remains.

Dec. 18, 1839.—A paper was first read, entitled “Description of the fossil remains of a mammal, a bird, and a serpent, from the London clay,” by Richard Owen, Esq., F.R.S., F.G.S.

The author commences by observing, that only a few months had elapsed since the highest organic animal remains known to exist in the London clay were those of reptiles and fishes; and that the danger of founding conclusions in Palæontology from negative evidence was perhaps never more strikingly illustrated than by the fact, that the first scientifically determined relic of a warm-blooded animal from that formation proved to belong to the highest order of that class, if man be excepted; and that besides those quadrumanous remains, there have since been discovered in the London clay underlying the coralline crag, near Kyson, in Suffolk, teeth of cheiroptera, and of a species probably belonging to the marsupial order*.

Mr. Owen then proceeds to describe the fossils, the immediate objects of the communication.

1. The portion of the mammal was discovered by Mr. Richardson in the cliffs of Studd Hill, near Herne Bay, and belongs to a new and extinct genus of Pachydermata. It consists of a small mutilated cranium about the size of that of a hare, containing the molar teeth of the upper jaw nearly perfect, and the sockets of the canines. The molars are seven in number on each side, and resemble more nearly those of the Chæropotamus than of any other known genus of existing or extinct mammalia. They present three distinct modifications of the grinding surface, and increase in complexity from before backwards. The first and second spurious molars have simple sub-compressed crowns, surmounted by a single median conical cusp, with a small anterior and posterior tubercle at the outer side, and a ridge along the inner side of its base. They are separated by an interspace nearly equal to the antero-posterior diameter of the first molar. The second and remaining molars are in close juxtaposition. The third and fourth molars form the principal difference between the dentition of the present genus and that of the Chæropotamus, being larger and more complex in the grinding surface. They

* See Annals of Nat. Hist. vol. iv. p. 189.

present a sudden increase in size and change of form. The plane of the crown is triangular, with the base outwards, and the posterior and inner side convex: it supports three principal cusps, two on the outer, and one on the inner side; there are also two smaller elevations with a depression on the summit of each, situated in the middle of the crown, and the whole is surrounded with a ridge which is developed into a small cusp at the anterior and external angle of the tooth. The three true molars closely correspond with those of the *Chæropotamus*. The sockets of the canines indicate that these teeth were relatively as large as in the peccari.

The bones of the head are separately described: the palatal processes of the maxillary bones are shown to be rugous, as in the peccari; the eye to have been full and large, as indicated by the size of the optic foramen and the capacity of the orbit, equalling an inch in vertical diameter: the general form of the skull is described as partaking of a character intermediate between that of the hog and the hyrax, though the large size of the eye must have given to the physiognomy of the living animal a resemblance to that of the *Rodentia*.

These indications, Mr. Owen says, scanty though they be, of the form of a species nearly allied to the *Chæropotamus*, are extremely interesting, on account of the absence of similar information regarding that genus. The resemblance of the molar division of the dental system in the new genus, for which the name of *Hyracotherium* is proposed, and the *Chæropotamus*, is sufficiently close to warrant the conclusion, that the canines and incisors if not similar would differ only in form and proportion; and that hence it may be ventured to solve analogically some of the doubts entertained by Cuvier respecting the dental characters of the *Chæropotamus*, and to affirm confidently that it had canines in the upper as well as the lower jaw. The incisor teeth with the *ossa intermaxillaria* are wanting in the specimen of the *Hyracotherium*, and have not been found in any fragment of the *Chæropotamus*.

2. The remains of birds described in the paper consist of a sternum, with other bones, and a sacrum, the former belonging to the collection of the late John Hunter, in the Royal College of Surgeons, and the latter to the cabinet of Mr. Bowerbank. Both the specimens were obtained from Sheppey. The Hunterian fossil includes the sternum nearly entire, the proximal ends of the coracoid bones, a dorsal vertebra, the distal end of the left femur, the proximal end of the corresponding tibia, and a few fragments of ribs. Mr. Owen first shows, in approximating to which of the three great groups of birds, terrestrial, aerial, or aquatic, the *Ornitholite* belonged, that from the length of the sternum and the remains of the primary intermuscular crest or keel, it could not have been a strictly terrestrial bird, though these characters do not prove that it was a bird of flight, as they occur in the Penguins or other *Brachyptera*, which have need of muscular forces to work their wings as paddles under water. In the present fossil, however, from the lateral extent and convexity of the sternal plate, the presence and course of

the secondary intermuscular ridges, the commencement of the keel a little way behind the anterior margin of the sternum, Mr. Owen says there is no affinity with the brachypterous family. The coracoid bones or posterior clavicles, he also shows are less available in determining the habits of the Ornitholite, as they relate much more closely to the respiratory actions than to the movements of the wings, and are strongly developed even in the Apteryx. There remained consequently for comparison the ordinary birds of flight; and of these, the native species, which resemble the fossil in size, first claimed Mr. Owen's attention. Though the sternum is not complete, yet sufficient remains to have enabled him to set aside the Gallinaceous, and those Grallatorial and Passerine birds which have deeply incised sternums, and to restrict the field of comparison to such species as have the sternum either entire, or with shallow posterior emarginations. After a rigid comparison of the minor structural details and pursuing it from the sea gulls and other aquatic birds upwards through the Grallatorial and Passerine orders, omitting few British species, and no genus, he at length found the greatest number of correspondences in the skeleton of the accipitrine species. The resemblance, however, was not sufficiently close to admit of the fossil being referred to any native genus of Raptores: the breadth of the proximal end of the coracoid removes it from the owls (*Strigidæ*), the shaft of the same bone is too slender for the Falconidæ; and the femur and tibia are relatively weaker than in many of the British Hawks or Buzzards. It is with the Vultures that Mr. Owen has found the closest agreement; but he says the fossil indicates a smaller species than any known to exist in the present day, and is probably a distinct subgenus.

The professed ornithologist, Mr. Owen remarks, may receive with reasonable hesitation a determination of family affinities arrived at, in the absence of the usual characters deduced from the beak and feet; but in the course of a long series of close comparisons, he says, he has met with so many more characters, both appreciable and available in the present problem, than he anticipated, that he confidently expects, in the event of the mandibles, the bones of the feet, or the entire sternum of the bird in question being found, they will establish his present conclusion, that the Sheppey ornitholite is referrible to a member of the group of Accipitrine Scavengers, so abundant in the warmer latitudes of the present world.

The Ornitholite in Mr. Bowerbank's museum consists of ten sacral vertebræ anchylosed together, as is usual in birds with a continuous keel-like spinal ridge. Four of the vertebræ are analogous to the lumbar vertebræ in the mammalia, and they are succeeded by five others, in which, as in the Vultures, the inferior transverse processes are not developed. This character, however, Mr. Owen says, is not peculiar to the Vulturidæ. Though the part of the fossil preserved is eminently characteristic of the class of birds, yet it is not calculated to throw light on the closer affinities of the species to which it belongs: nevertheless it supports rather than affects the determination of the Hunterian specimen. For the apparently ex-

inct bird indicated by these fossils, the name of *Lithornis vulturinus* is provisionally proposed.

3. Mr. Owen commences his description of the remains of an extinct species of Serpent found at Sheppey, by pointing out the essential characters by which the vertebræ of an Ophidian Reptile are distinguished.

Vertebræ joined enarthrodially by a deep anterior transversely oblong cup and a corresponding prominent posterior ball, and further articulated by projecting posterior oblique processes, wedged like the carpenter's tenon into a mortice, excavated in the anterior oblique processes of the succeeding vertebra, supporting moreover on each side of the fore part of the body an oblong convexity for the moveable articulation of the rib, can belong, Mr. Owen observes, to no other than a reptile of the Ophidian order.

One of the specimens described in this portion of the memoir, consists of about 30 vertebræ possessing the above characters; also of a number of long slender ribs, having expanded concave vertebral extremities cemented irregularly together by a mass of indurated clay, and it forms part of the Hunterian collection of fossils; another specimen, consisting of 28 vertebræ, and some others of less magnitude, belong to Mr. Bowerbank's collection. All the specimens, Mr. Owen considers, are referrible to the same species, and they were all found at Sheppey.

The vertebræ in each specimen present the same conformation, and nearly the same size, being equal in this respect to those of a Boa Constrictor 10 feet long. They belong to the ordinary dorsal or costal series, and differ from those of the Boa and Python in their superior length as compared to their breadth and height. The ridge continued from the anterior to the posterior oblique processes on each side is less developed: the oblique processes themselves do not extend so far outwards; and the spinous process is narrower in its antero-posterior extent but longer. In the first two of these differences, the fossil agrees with the Linnæan Coluber and its subgenera, but differs from the Crotalus; and in the remaining points it differs from Crotalus, Coluber, Naja and Trigonoccephalus. The long and comparatively narrow spine, the outward prolongation of the upper angle of the posterior oblique processes, the uniform convexity of the costal protuberance, the uneven or finely wrinkled external surface of the superior arch of the vertebra, are characters which distinguish these Ophidian vertebræ from those of any other genus of the order with which Mr. Owen has been able to compare them. He therefore proposes to call the species provisionally *Palæophis To-liapicus*.

The ribs are hollow as in all land serpents.

From the agreement in the configuration of the under surface of the body of the vertebræ of the fossil with that in the vertebræ of the Boæ and Pythons more nearly than with the Colubri, and in none of the differences above noticed indicating any obstacle to the entrapping and destroying a living struggling prey, as well as from the length (11 feet) which it may be inferred the creature attained,

Mr. Owen concludes it was not provided with poisonous fangs. Serpents of similar dimensions exist in the present day only in tropical regions, and their food consists principally of the warm-blooded animals. Mr. Owen therefore in conclusion states, that had no evidence been obtained of birds or mammals in the London clay, he would have felt persuaded that they must have coexisted with the *Palaeophis Toliapicus*.

ZOOLOGICAL SOCIETY.

December 10, 1839.—William H. Lloyd, Esq., in the Chair.

A letter from Dr. Weissenborn, dated Weimar, October 6, 1839, was read. It accompanied a present of two specimens (male and female) of the black variety of the common Hamster (*Cricetus vulgaris*), and a head, preserved so as to display the cheek-pouches of that animal. The writer of the letter states that he possesses a common Pigeon, just fledged, in which no vestiges of the organs of vision can be traced. "The orbits are tolerably well developed, and lined with a sort of half-mucous membrane, and therefore destitute of feathers. I have never heard of a similar defect in any animal; and in one where the incubation is extra-uterine it appears doubly wonderful or anomalous. The bird is quite healthy, and presents in its habits several curious anomalies, which may be traced to its monstrosity."

Professor Owen communicated his notes on the Anatomy of the Biscacha (*Lagostomus trichodactylus*, Brookes).

"The individual dissected," says Mr. Owen, "was a female, full-grown, weighing 8 pounds 2 ounces, avoirdupois: the weight of the brain was 5 drachms, avoirdupois, the proportion of the brain to the body being as 1 to 416. This is the smallest relative size of the brain that has yet been recorded in the Rodent order, in some of the species of which order, as the Mouse, the brain approaches that of Man, the relation of its mass to that of the body being as 1 to 46; that of the human subject is as 1 to 30. The brain presented the usual broad depressed form and simple unconvoluted surface characteristic of the Rodent order: its length was 1 inch 8 lines, its breadth 1 inch 5 lines, and the length of the cerebral portion 1 inch 3 lines. The proportion of the cerebellum to the cerebrum was as 1 to 5. The breadth of the *medulla oblongata* was to that of the *cerebrum* as 1 to 6. The upper surface of each lobe of the cerebrum is marked with two slightly curved fissures, each between 3 and 4 lines in length, and one a little in advance of, and exterior to the other: a single anfractuosity defines the external convex prominence of the cerebrum. On the under surface a fissure is continued from the posterior part of the cerebral hemisphere forwards, along the middle of the natiform protuberance, to the outer boundary of the root of the large olfactory nerve.

"On laying open the abdomen an immense accumulation of adipose membrane concealed the viscera; the bag of the great omentum

formed, however, a small part of this covering, as after extending down over half the abdomen it was reflected upwards, in front of the liver. The lower half of the abdominal cavity was overlapped by broad and thick adipose processes, continued from the lower convolutions of the colon, without being connected with the great omentum, and from the fundus of the urinary bladder. The *appendices epiploicæ* of the human colon may be regarded as rudimentary conditions of the adipose folds here so enormously developed. The stomach corresponded in form and relative size with that of the *Chinchilla* (see Trans. Zool. Soc., vol. i. p. 51. pl. V.). The left blind extremity projected about an inch beyond the cardia; the pyloric end became suddenly contracted: the cuticular lining of the œsophagus terminated at the cardia in five pointed processes, radiating from the cardia.

“The duodenum was dilated, as in many other phytophagous Rodents, at its commencement; it descends with a slight sigmoid flexure to the right lumbar region, then crosses over to the left side, being freely suspended in a broad duodenal mesentery, which contracts as the gut perforates the base of the meso-colon to become the jejunum. The small intestines presented the usual disposition: the cæcum is of moderate length, viz. four inches, with a diameter of two and a half inches, thus corresponding in general form with that of the *Chinchilla*. The colon first crosses obliquely the lower part of the abdomen, and returns, forming a fold of about four inches in extent; it then describes a second much larger and narrower fold, of ten inches in length: it is at the bend of this fold that the fæces begin to be separated into pellets, and it is from these loops that the omental processes are continued: the colon then bends over the root of the mesentery, passing below the stomach to the left side of the abdomen, where it describes a series of convolutions before ending in the rectum. No omental process is continued from these folds, but the meso-colon, to which they are suspended, is of great breadth, and was loaded with fat.

	Feet.	Inches.
Length of the small intestines	14	9
————— large ditto	7	5

“The anal, vaginal, and urethral outlets are separate from one another.

“The liver consists of a left lobe, a cystic lobe, and two small right lobes, with a spigelian appendage. The cystic lobe is fissured, and the left division is perforated on its free convex surface to receive a process of the suspensory ligament.

“The gall-bladder was of very small size.

“The spleen is triangular, with the upper or anterior angle most produced.

“The kidneys and suprarenal glands as usual in Rodents. The heart presented the usual form; two superior venæ cavæ, the left joining the inferior cava, and receiving the coronary vein. The

right lung presented three lobes and the median lobule; the left lung three lobes.

“There was nothing remarkable in the ovaria or fallopian tubes. The two uteri terminate by distinct valvular orifices; they are long and narrow: in each mesometry there is a plexus of transversely disposed vessels, principally veins, which runs parallel with the uterus, and seems to represent the remains of the wolffian body. The most interesting feature in the generative organs was a longitudinal septum, dividing the vagina into two canals for upwards of an inch beyond the *ora tinca*. This septum terminated by a thin concave edge, directed towards the outlet of the vagina. There was no constriction or valvular fold between the divided and the undivided portions of the vagina; the former were somewhat more vascular, and slightly plaited longitudinally. The whole length of the vagina was four inches. The clitoris was perforated by the urethral canal, and was nine lines in length.

“No other placental quadruped has hitherto presented so near an approach to the marsupial type of the female organs as the *Lagostomus*. Rudiments of a vaginal septum occur in the young or virgin state of several genera; but it is only in the *Lagostomus* that a continuation of the median separation of the genital tubes has been continued beyond the uterine portion along so great an extent of the vagina, and as a permanent structure.”

Professor Owen also communicated the following paper, entitled “Observations on the Generative System of some of the lower Animals,” by Professor Rudolph Wagner, M.D.

“Among a variety of observations which I undertook on the coast of Nice in August and September 1839, for the purpose of obtaining a more intimate knowledge of the anatomy and physiology of marine animals, there are several which perhaps afford some more general interest for the natural history of animals.

“Many of my own earlier observations had produced the conviction, that a disjunction of the sexes is much more universal than has been hitherto admitted. Cuvier, in his ‘*Règne Animal*,’ and after him the most of those who have entered upon Zoological Classification, still assume that among the so-called lower animals many are no more than females, and others without sex.

“Thus, to begin with the *Mollusca*, and judging from assertion, the *Cyclobranchiata* up to the present time are known only as females. I succeeded as well in *Patella* as in *Chiton* in finding some individuals that were males, and others that were females. The males have a white testis, with active spermatozoa, resembling those of muscles; the females have all the elements of the primitive ovum. The *Ascidia* also appear to be of disjoined sex. I found, however, in several species merely ova, but ova that presented the germinal vesicle and germinal spot.

“Among the *Radiata* I had hitherto found only females, as well in the Starfish as in the Sea-urchin and the *Holothurie*. The pear-

shaped vesicles which open into the efferent duct of the ovary in *Holothuria tubulosa*, and which Delle Chiaje regards as testes, positively showed no spermatozoa in three individuals, in which the pale rose-red ovary was otherwise much developed, and presented the most beautiful ova, with germinal vesicle and germinal spot. But in the first individual which my friend Professor Valentin opened, the organ corresponding and very similar to the ovary immediately presented a difference (from the ovary) in its white contents. We also saw indeed in those contents the most beautiful spermatozoa, much resembling those of osseous fishes. Numerous other individuals constantly presented themselves, either as males or females.

“Regarding the *Medusæ*, Von Siebold of Dantzic had already mentioned that he had found male individuals with spermatozoa in *Medusa aurita*. In Nice I convinced myself with the greatest certainty in *Pelagia*, *Aurelia*, *Cassiopeia*, and a fourth genus, that these *Medusidæ* are always of disjoined sex. The males, with their spermatozoa actively moving (even within the capsules of the testes), are at the first glance to be distinguished from the females, whose ovaria always contain ova in different stages of development*.

“It is of especial interest to find that a disjunction of sex admits of demonstration, even in the *Polyps*. One of my companions, Dr. Erdl, (?) of Munich, found in *Veretillum* only female individuals in one *Polypary*, and in others only males. He writes me that he has afresh convinced himself of the same relation in *Alcyonium*, though the specimen had been preserved in spirit; and that among the *Mollusca* he has found similar sexual differences in *Halyotis*; thus in the *Aspidobranchia* of Cuvier.

“I must here remark, that my earlier statements on the spermatozoa of the *Actiniæ* are erroneous, since I regarded entirely peculiar and remarkable capsules with long threads (situated even on the prehensile arms) as spermatozoa.

“My researches on the spermatozoa of cartilaginous fishes have shown the remarkable fact that the individual genera of the Rays and Sharks are distinguishable by the form of their spermatozoa. These spermatozoa are for the most part spirally wound, as in birds of song. Very remarkable is the structure of the testis; which is constantly connected with a largely developed and winding *vas deferens*. That which Johann Müller has described in the Rays as a peculiar gland is nothing else than this *vas deferens*. The relations in form of the male genital organs alternate much, as I shall show in a special and more comprehensive work.

“The facts here reported were not witnessed by myself alone, but also by Professor Valentin of Bern, Dr. Peters of Berlin, and five young zootomists, pupils of mine, who were all in Nice at the same time as myself, and took a part in my observations.”

* I shall state these sexual relations in a special and detailed work on the whole anatomy and physiology of the *Medusæ*.

MISCELLANEOUS.

ON A WHITE VARIETY OF THE HYACINTH AND COLUMBINE.

Pontypool, July 16, 1840.

SIR,—I have to apologize for having so long delayed the remainder of my communication upon spontaneous generation, but having been rather fully engaged since the first part of it was inserted, I have not been able to transcribe it: I hope to be able to send it in about a week or ten days, so that I am afraid it will be too late for the next Number.

In addition to the white varieties of plants mentioned by Mr. Adams in the last Number, I have observed in this neighbourhood white varieties of the common Hyacinth and Columbine (*Aquilegia*): the whole plant of the latter varies very much in colour from the proper plant, being wholly of a light green, and possessing none of the purplish-brown shade on the stems, so conspicuous in its normal state, so that they may easily be known when not in flower. I have seen large bushes of it growing within a few yards of the other variety.

I remain, yours most respectfully,

JAMES BLADON.

P.S. The species of Crane Fly alluded to is a species of *Trichocera*, according to Mr. Westwood, from whom I have received a letter to that effect; he has also mentioned it in his "Introduction."

ON A SPECIES OF BALÆNOPTERA STRANDED ON CHARMOUTH BEACH.

Charmouth, Dorset, 9th July, 1840.

SIR,—My communication to Mr. Charlesworth respecting a species of Balænoptera stranded on Charmouth beach, which appears in your Magazine of Natural History of the 1st of July, should have been corrected by my second letter to him on the same subject previously to its being published. In my second communication I requested that the paragraph stating "that two small bones representing the pelvis in quadrupeds were attached (one on each side) to the first caudal vertebra," should be omitted, *as no such bones exist*; my second letter also contained several particulars respecting the sternum, os hyoides, bones of the spine, &c., which should have been incorporated with the first account, as it would have rendered it more complete and correct.

I gave as my chief reason for believing "that our species differed from those previously described," the circumstance of its possessing only *sixty vertebrae*, the others having sixty-two; a more particular and careful investigation has convinced me that *two* of the small caudal bones have been lost, making the whole number sixty-two, and I am now convinced that it is nothing more or less than a small specimen of the species stranded at Ostend some years ago, and exhibited in London, viz. the Rorqual "Balænoptera hoops."

Yours, &c.,

R. H. SWEETING, Surgeon.

ON HYBRID PHEASANTS.

Farnham, July 11th.

DEAR SIR,—I have lately mounted a brace of hybrid Pheasants, and have been requested to forward a memorandum to you; if it is any way interesting, you are welcome to make use of it. I believe there is not an instance mentioned as having occurred in a wild state, at least I have been so informed.

The keeper of Henry Halsey, Esq., of Henley Park, two years ago hatched a hen Golden Pheasant with a brood of common Pheasants, and allowed her to take to the woods with the others; the result has been two beautiful hybrids, with the characters of the two species so beautifully combined, that the most casual observer would not fail to perceive it at first sight: they have not the bright markings of the common Pheasant, nor the gorgeous colours of the Golden Pheasant; but they present the more sombre tints of the two.

They were shot by Henry Halsey, Esq. at the latter end of January, and are now in his possession.

Yours respectfully,
JAMES LOWCOCK.

ON A SPECIMEN OF THE SHEARWATER PETREL, KITE, &C.

Chipping Norton, Oxon, July 9th, 1840.

SIR,—A fine specimen of the Roller (*Coracias Garrula*) has lately come under my notice, which was shot in the end of June, 1839, by the gamekeeper, on the Guiting estate, Gloucestershire; and in September last a specimen of the Shearwater Petrel (*Puffinus Anglorum*) was taken within this parish. The bird rose from the ground, but being unable to fly far, was soon captured and brought to me alive; I endeavoured to feed it, but after nearly two days, during which it appeared to have taken no food, I killed and stuffed it. The bird made good use of its bill and wings in self defence, making at the same time a loud breathing or hissing noise.

The Kite (*Milvus regalis*) is become a rare bird. I have recently obtained a specimen shot on December 29, 1838, about eight miles from hence, in the vicinity of Stow. The bird had frequented the neighbourhood several days, and shots were fired at it, but to no purpose, till at last it was seen by a boy to fly into a plantation at the bottom of Stow Hill; he hastened up to the town and informed the parties who had previously been in pursuit, and on their arrival at the place it was shot whilst perched at roost.

The third volume of Mr. Macgillivray's 'History of British Birds' has just reached me; it is a most excellent work, and I would recommend every ornithological student to procure a copy. There are other prettily and beautifully illustrated works, but this, in my opinion, for the accuracy and minuteness of its detailed descriptions, is scarcely to be excelled; the "Lessons," too, of this practical ornithologist, together with the author's account of his rambles "o'er moor and mountain," in company and alone, with other valuable

features, are highly entertaining and instructive. I sincerely hope the publishers will let us have the remaining portion of the work—the Water birds—with as little delay as possible, for the author's valuable experience with this tribe, advantageously located as he is, must prove exceedingly useful.

Wild Geese (I cannot say what species) were seen in this neighbourhood on June 16; thirteen appeared in the flight. This appears unusually early, supposing them to be a brood of the present year.

THOMAS GOATLEY.

NOTES ON BRITISH BIRDS.

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

THE GOSHAWK.—Of this handsome bird I kept three specimens in the year 1837: two were females, and at least one-third larger and stronger than the male. The young Hawk for some time after birth is covered with a thick white down in place of feathers, and, upon the whole, much resembles a young Turkey. Until four or five months old it does not stand erect, but holds the head low, rounding the back like a Guinea-fowl. The cry, which is easily excited, resembles a quick shrill repetition of the letter P, pe-pe-pe-pe-pe. Whilst the bird is young its fæces are ejected with surprising force, even to the distance of eight or nine feet.

When a bird was placed near the bars of the cage in which they were confined, one of the Hawks would rush up to it, and dashing into it a claw, drag it to one corner of the cage, extending his wings round it to prevent the approach of the others. This, however, was somewhat difficult; and often, when the devourer least expected it, his *bonne bouche* was snatched from him by another, who had perhaps relinquished his own piece for the purpose. Howbeit the loser never appeared incensed at the theft.

When presented with a living bird, the Hawk invariably seizes it round the neck with his talons, and begins devouring the head, regardless of the cries and struggles of its victim. The pressure on the neck and blows on the skull quickly cause death, and the Hawk begins feeding with such hearty good will, that in a few minutes nothing remains but a few feathers.

FRAGILITAS OSSIUM (?) in the KESTREL.—In the year 1837 I purchased a young Kestrel of a boy from Wilcot. I was at the time surprised at the peculiarity of its shape, and the difficulty it experienced in walking. Its appetite was voracious, and it was exceedingly tame. When fully fledged, it was suddenly seized with violent spasms; the leg being thrown over the back, and the wings drawn forwards over the breast. It appeared in great pain, but was very hungry. It continued in this state two days, when I killed it.

On examining the body I found nearly every bone dislocated or fractured, and rather softer than usual, containing less earthy matter. One femur had been broken in *five* places, the tibia in *four*; indeed, there were upwards of twenty recent or partially united

fractures in the long bones ; the legs were greatly distorted and the spine crooked.

I am unable to account for the origin of the disease in this bird ; it had been reared with several other young Hawks, and had lived chiefly on young unfledged birds, mice, &c. &c.

The KINGFISHER.—Of this beautiful, but stupid bird, I have had nine living specimens ; seven young and two adult.

On April 14, 1837, a boy brought me a living female Kingfisher, which he had taken on the nest in the act of laying an egg, which I found on dissection covered with the shell and ready for expulsion. I immediately proceeded with him to the spot where the nest was found, for the purpose of examining its structure. It was formed in a hole about a foot in depth, which had been excavated in a bank overhanging a narrow brook. It was concealed from view by a tuft of long grass ; but as the male bird was constantly sitting on a branch near the nest, the accumulation of fæces led to the discovery of the place of its concealment.

The nest itself was large and of peculiar structure, being composed exclusively of the exuviae of the small fish it had devoured, mixed with fins, scales, &c., and the skins and legs of a little insect somewhat resembling a shrimp, which adheres to stones, &c. in running water.

Of this substance there was about sufficient to fill a pint cup. I preserved it, and possess some at the present time. The interior cavity is small : the eggs, of which I have four, are white, round, of moderate size, and six or seven in number.

In the spring of 1837, a boy brought me four young Kingfishers, half-fledged, which he had just taken from a nest near the same spot. I kept them two months, feeding them exclusively on fish, and washing them in lukewarm water daily. Under this treatment they thrived in a remarkable manner, and the plumage became as clear and brilliant as in a state of nature. They were indeed generally admired, but I was at length compelled to give them away on account of the great care and time I was obliged to devote to them.

The young Kingfisher is a very stupid and inactive bird. It will stand in the same posture one or two hours without moving a muscle, and its enjoyments seem concentrated in the narrow circle of eating and sleeping. On touching the extremity of the bill it opens its mouth, and after swallowing the morsel gravely closes it again, and looks round with laughable slowness for a second mouthful. It will swallow without inconvenience a minnow or loach half its own weight, and in the course of the day will devour ten or twelve such. It is very tame, readily standing on the finger to be fed. It casts up the bones and fins of the fishes in the form of a pellet like the Owl and Hawk, and of these pellets its nest is formed. The adult Kingfisher is very intractable, and refuses to eat when in captivity. On the whole, the Kingfisher is only tolerable on account of the beauty of its plumage.

CHARLES COWARD.

Devizes, July 8, 1840.

ON THE DISCOVERY OF *HYPERICUM LINEARIFOLIUM* IN ENGLAND.

Hypericum linearifolium was found by the Rev. Thomas Hincks of Cork, among granite rocks near the banks of the Teign, Devon, in the summer of 1838. Specimens are in his own collection and in that of the Rev. William Hincks, F.L.S. of London, who lately ascertained the species in looking over that part of his herbarium.

The same plant is amongst Mr. Babington's acquisitions in Jersey (see *Annals*, vol. ii. p. 348.), but it is interesting to know that it is also found in England, and it is somewhat curious that so conspicuous a plant has been so long overlooked.

TEMPERATURE OF VEGETABLES.

I have to thank M. Van Beck for the eagerness with which he has repeated my experiments on the peculiar heat of vegetables. His verification of the existence of this heat and of its diurnal period places these facts in the number of those which may take a definitive place in science, which, generally speaking, admits only that which has been seen by more than one observer.

M. Van Beck differs from me relative to a single fact of very little importance. I mentioned, that upon placing in the open air as a comparative experiment, part of a living vegetable and a similar part dead, the latter always appeared colder than the former: M. Van Beck constantly obtained an opposite result. This opposition in the results of our observations is perhaps caused by a difference in the mode in which our experiments were prepared. M. Van Beck plunged, as I did, the portion of vegetable which he meant to deprive of life into very hot water; perhaps he then let it grow cold in the open air, and thus lose by evaporation a part of the water which moistened its surface; whereas I cooled it by immersion in cold water, and it was thus completely soaked with water when I made the experiment.

It will be seen that there must be more evaporation from it than the less moist living vegetable portion, and that consequently, it would necessarily be colder, whilst an opposite result might be obtained when the vegetable portion, killed by the hot water, had been able to evaporate the excess of water, which it had gained by remaining some time in the open air. Perhaps, also, the peculiar nature of the vegetable parts may have an influence upon the difference of the results in question.—*Note of M. Dutrochet on M. Van Beck's observations on the Temperature of Plants, Comptes Rendus*, Jan. 13.

MICROGRAPHY—NEW OBSERVATIONS ON THE INFUSORIA OF ROCK SALT.

In the 'Comptes Rendus' mention is made of a note received by the Academy of Sciences from M. Marcel de Serres relative to the observations which he is making on this subject along with M. Joly.

In the specimens of rock salt of a tolerably decided greenish colour brought from Cardona (Spain), the infusoria appear more rare, smaller, and less distinct than in the specimens of a red colour before examined.

This, says M. Marcel de Serres, finds an explanation in M. Joly's

previous observations on the change of tint which the infusoria that colour our salt marshes undergo by age. These animalcules, which are white at their birth, become green in their middle age, and do not till their adult age take the purple tint which makes them so remarkable. In general the green infusoria are not so often seen as the red in salt marshes, which seems to indicate that these monads remain but a short time in their middle state.

We have found the same infusoria in the argilo-calcareous marls which are found at Cardona beneath the rock salt. There they have their beautiful purple tint, but they are in too small numbers to communicate it to the mass of marl which has remained grayish. This fact also proves, that in the ancient world, as in the present one, the animalcules were precipitated after their death to the bottom of the waters in which they previously lived.—*Comptes Rendus*, Mar. 16.

ON THE GENUS *PUPINA*. BY JOHN EDW. GRAY, ESQ.

The shell of this very curious and interesting genus has been placed by different authors in very different parts of the system, some persisting that it should be arranged with the marine genera on account of the grooves on the left side of the mouth. From a specimen which Mr. Powis has very kindly given to me, I have no doubt in my own mind that it is a very distinct genus of *Cyclostomidæ*, for this specimen has a horny orbicular many-whorled operculum as large as the mouth of the shell, exactly resembling the opercula of some of the genera of that family. The polished surface of the shell and the form of the notch is very unlike any that I have hitherto observed among the shells of marine mollusca. The latter is peculiar, as being funnel-shaped, wider outwards, and narrowed into a slit within, and only appears as a narrow simple groove on the outer surface of the peristome.

I am acquainted with two species of this genus; one *Pupina fusca*, small, pale brown, with a yellowish white peristome; and the other, *Pupina grandis*, twice the size of the former, more ventricose, and of a bright yelk yellow colour; there is a fine specimen of the latter species in the cabinet of Mr. Stainforth. I suspected that this genus should be referred to the family of *Cyclostomidæ* directly I had seen the animal and operculum of Mr. Guilding's genus *Megalomastoma*; but from the rarity of these shells, I had little hope of so soon being able to get the additional information furnished by the operculum, which was alone wanted to clear up the doubt. I have lately seen another shell which has the polished surface, mouth and operculum of this genus, but is destitute of the groove, and must form another genus of this family, for which I propose the name of *Callia*.—J. E. GRAY.

ON THE BYSSUS OF *UNIO*. BY JOHN G. ANTHONY, ESQ.—WITH NOTES,
BY J. E. GRAY, ESQ.

“I have discovered another fact with regard to the *Unios* which has escaped the notice of other collectors thus far: in one locality near us (Cincinnati, U. S.), the *Unios* spin a byssus. The location

is a very peculiar one, a strong rapid current running over a gravelly bottom: in such exposed situation our *Unios* do not often attempt a lodgement, but prefer sandy bars or muddy shores where the water is not very deep or rapid. Upon these gravel beds, however, the *large shells* are imbedded, and the young ones spin the byssus by which they attach themselves to the larger shells or the stones of the gravel. In this way I have seen hundreds moored and riding securely at anchor at the utmost tension of their lines; for it is only, as far as I can perceive, a single filament. The thread appears to be attached to the mantle, and is probably produced by it, and is not an umbilical attachment. I saved some of the animals in spirits."—Letter, 16th May, 1840.

This account is curious in several particulars; first, as showing the relations of these animals to the family of *Arcadae*; second, as showing what I have long expected from the observations I have made on some marine gasteropodous mollusca,—that many, if not most of the kinds, have the power of forming a byssus when it can assist them in their habits. It is very desirable, however, that the place where the byssus is attached to the animal should be re-examined, for if it takes its origin from the mantle, it is an anomaly in the organization of mollusca. It always arises, as far as I am aware, from some part of the foot, in general from the anterior part of the base, as in *Mytilus*, *Pinna*, *Avicula*, *Pecten*, &c., but sometimes from the end of this organ, as in *Arca*, from whence also, I should suspect, it most probably arises in the *Uniones*.—J. E. GRAY.

ON SOME RECENTLY PROPOSED GENERA OF THE *VIVERRIDÆ*.

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

GENTLEMEN,—You did me the honour of reprinting in your ‘*Annals of Natural History*’ for March, 1840, a short paper on the Crania and Dentition of the *Carnivora*, which I communicated to the Zoological Society. My object, as stated in that paper, was merely to point out a few simple characters by which the groups might be distinguished, the importance of those characters being confirmed by others exhibited, both by the internal anatomy and external structure of the species. Since the publication of that paper, M. Isidore Geoffroy* has furnished us with figures and descriptions of some interesting genera of *Carnivora* from Africa and Madagascar, which, according to my views, should be added to those already included in my list of the *Viverridæ*. They consist of the genera *Ichneumia*, *Galidia*, and *Galidictis*. The first of these (*Ichneumia*) belongs to that subdivision of the *Viverridæ* in which there is a complete bony orbit, and is founded upon three species described originally as species of the genus *Herpestes* or *Ichneumon*. The other two genera (*Galidia* and *Galidictis*†), in the straightness of the lower margin of the rami of

* See the ‘*Magazin de Zoologie*’ of M. F. E. Guérin-Meneville, Parts 9 and 10 for 1839. An extract of this paper appeared in the ‘*Comtes Rendus*,’ &c. for October, 1837.

† In the original paper *Galictis*. The alteration in the name was necessary, Mr. Bell having given the name *Galictis* to a group of the *Mustelidæ*.

the lower jaw, approach the Cats, and in my opinion should therefore be placed at the opposite extremity of the *Viverridæ*, the *Herpestes* group being apparently most nearly related to the Dogs. *Galidia* and *Galidictis* also approach the Cats in having the muzzle proportionately shorter than the other *Viverridæ*, and in having the true molars smaller. The genus *Galidia* appears to be scarcely sufficiently distinct from Mr. Bennett's genus *Cryptoprocta*.

In the Journal of the Asiatic Society of Bengal, No. 89, for May, 1839, Mr. Evans has published his Notes on the Anatomy of the *Arctonyx collaris*, which tend to show that this animal is closely allied to the Badger, and should occupy the situation in which I have placed it in my classification. *Arctonyx* and *Mydaus* I can but regard as subgenera of *Meles*.—G. R. WATERHOUSE.

Zoological Society, Aug. 27, 1840.

RETURN OF MR. GOULD.

We have much pleasure in announcing the safe arrival of our scientific friend Mr. Gould, the celebrated ornithologist, from Australia, after an absence of two years and a half, which he has devoted to the investigation of the habits and œconomy of the animals of that portion of the globe. His collections, we understand, are very extensive; and among other interesting materials brought home for the purpose of illustrating his work on the Birds of Australia, are the nests and eggs of a great portion of the species.

METEOROLOGICAL OBSERVATIONS FOR JULY, 1840.

Chiswick.—July 1. Overcast: boisterous. 2. Rain, with strong wind. 3. Cloudy and fine. 4. Very fine. 5. Cloudy: windy. 6, 7. Fine. 8. Fine: heavy rain. 9—12. Very fine. 13—17. Fine. 18. Overcast. 19. Cloudy: rain. 20. Heavy showers. 21. Very fine: rain. 22. Fine. 23. Cloudy. 24. Overcast and fine: rain. 25. Showery. 26. Cloudy: fine. 27. Fine. 28. Hazy. 29. Very fine. 30. Cloudy: rain. 31. Very fine.

Boston.—July 1, 2. Rain. 3. Stormy. 4. Fine: rain early A.M.: rain A.M. 5. Fine: rain A.M. 6. Cloudy: rain P.M. 7. Cloudy: rain early A.M.: rain P.M. 8. Cloudy: rain P.M. 9. Cloudy. 10. Cloudy: rain P.M. 11—13. Cloudy: rain A.M. and P.M. 14, 15. Fine. 16. Rain: rain early A.M. 17. Fine. 18, 19. Cloudy: rain P.M. 20. Fine. 21. Fine: rain P.M. 22. Fine. 23, 24. Cloudy. 25. Rain: thunder and lightning with rain P.M. 26. Cloudy. 27. Fine. 28. Cloudy: rain A.M. 29. Fine. 30. Cloudy. 31. Fine.

Applegarth Mansie, Dumfries-shire.—July 1. Heavy rain A.M.: cleared up P.M. 2. Drizzling all day. 3. Heavy rain all day. 4. Fair till 4 P.M. then wet. 5. Showery: fair evening. 6. Rainy. 7, 8. Showery: thunder. 9. Fair all day. 10. Showery. 11. Warm: a single shower: thunder. 12. Very wet. 13. Fine dry day. 14. Wet afternoon. 15. Very wet all day. 16, 17. Occasional showers. 18. Fair till afternoon, then wet. 19. Rain early A.M.: cleared up. 20. Fair all day. 21. Heavy showers all day: thunder. 22. Fair all day. 23. Fair till evening, then rain. 24. Showery all day. 25. Showery afternoon. 26—30. Fair all day. 31. The same: a few drops P.M.

Sun shone out 29 days. Rain fell 22 days. Thunder 3 days.

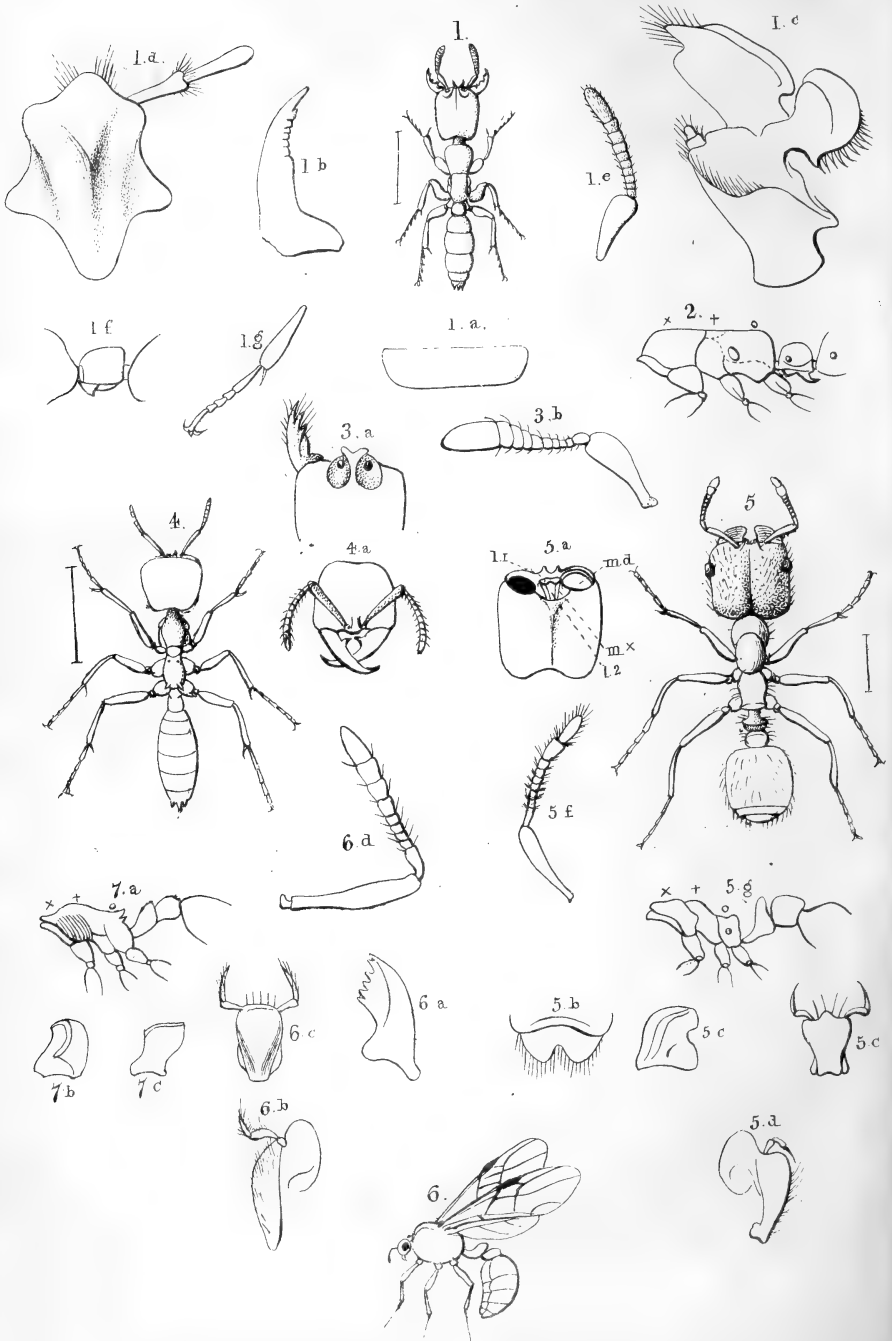
Wind north $\frac{1}{2}$ day. North-north-east $\frac{1}{2}$ day. East-north-east 1 day. East 1 day. South-east $\frac{1}{2}$ day. South 4 days. South-west 8 days. West-south-west 3 days. West 7 days. North-west 2 $\frac{1}{2}$ days. North-north-west 3 days.

Calm 11 days. Moderate 12 days. Brisk 4 days. Strong breeze 2 days. Boisterous 1 day. Variable 1 day.

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. ROBERTSON; by Mr. THOMPSON at the Garden of the Horticultural Society at Chiswick, near London; by Mr. VEALL at Boston, and by Mr. DUNBAR at Applegarth Manse, Dumfries-shire.

Days of Month. 1840. July.	Barometer.				Thermometer.				Wind.				Rain.			Dew point.			
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston. 8½ a.m.	Dumfries-shire.		London: Roy. Soc. 9 a.m.	Self-register.		Chiswick.		Dumfries-shire. Max. Min.	London: Roy. Soc. 9 a.m.	Chiswick 1 p.m.	Dumfries-shire.	Boston.	Chiswick.	London: Roy. Soc. 9 a.m.	Dumfries-shire.
		Max.	Min.		9 a.m.	3½ p.m.		Fahr. 9 a.m.	Max.	Min.	Max.									Min.	Max.	Min.
1.	29.922	29.985	29.809	29.40	29.60	62.0	68.2	52.4	58	58	61	50	.133	.01	...	...	.01	58	58
2.	29.774	29.739	29.544	29.54	29.31	61.2	66.6	59.6	66	55	54	59½	...	.02	.30	...	.02	58	58
3.	29.540	29.708	29.483	29.12	29.35	58.8	66.5	56.5	68	51	62	56	.033	...	.16	...	...	54	54
4.	29.878	29.810	29.676	29.26	29.55	61.3	69.2	53.7	72	56	58	59½	.080	...	.10	...	...	56	56
5.	29.732	29.710	29.681	29.13	29.34	63.3	68.6	58.7	69	50	63	60	...	...	.02	...	.14	55	55
6.	29.810	29.767	29.434	29.20	29.42	62.6	75.3	53.3	67	49	62	59	.016	s var.	.02	...	.187	55	55
7.	29.634	29.718	29.536	29.33	29.48	59.7	71.7	50.6	71	51	53	61	.138	w.	.83	...	...	55	55
8.	29.822	29.764	29.625	29.26	29.49	61.2	66.3	53.8	66	48	60	59	.025	w.	.06	...	...	55	55
9.	29.878	29.728	29.798	29.64	29.73	59.4	67.3	51.3	68	48	60.5	59	.500	NW.	.05	...	...	53	53
10.	29.996	29.946	29.893	29.30	29.74	60.3	67.7	51.3	67	50	60	63	...	NW.	...	...	...	53	53
11.	30.002	29.936	29.942	29.42	29.81	60.2	66.8	52.0	65	46	56	61	...	NW.	.04	...	...	53	53
12.	30.012	29.949	29.905	29.43	29.84	58.3	69.2	52.2	65	42	55	57½	...	NW.	.41	...	...	53	53
13.	30.012	30.033	29.950	29.46	29.95	55.7	62.7	49.4	62	41	56	59½	...	NE.	.07	...	...	53	53
14.	30.316	30.269	29.942	29.70	30.09	59.4	70.5	50.2	74	55	59	59½	...	w.	.05	...	...	50	50
15.	30.304	30.235	30.137	29.83	29.87	63.7	77.2	57.0	80	48	65.5	59	...	s.	...	...	...	54	54
16.	30.152	30.101	29.919	29.50	29.83	60.5	74.3	56.0	79	46	58	61	...	s.	.10	...	...	55	55
17.	29.998	29.909	29.889	29.36	29.61	62.7	74.6	52.8	75	56	62	58½	...	s.	.03	...	...	60	60
18.	29.778	29.735	29.717	29.18	29.56	63.7	69.7	58.0	70	56	64	61½	...	w.	...	...	...	58	58
19.	29.700	29.662	29.470	29.05	29.34	63.0	68.6	58.7	69	49	61	63	...	w.	.04	...	...	59	59
20.	29.566	29.511	29.441	28.94	29.24	63.3	70.0	53.2	69	51	63.5	63½	...	w.	.09	...	...	58	58
21.	29.630	29.646	29.563	29.00	29.35	63.7	76.0	55.3	74	47	63.5	64	...	w.	.066	...	...	59	59
22.	29.820	29.844	29.757	29.22	29.62	61.4	70.2	52.7	69	49	60	62	...	w var.	.54	...	...	56	56
23.	30.032	30.013	29.981	29.43	29.78	59.7	72.4	53.5	65	51	56	59½	...	w.	.01	...	...	52	52
24.	30.066	29.993	29.906	29.50	29.74	61.7	64.5	55.0	66	56	58	58	...	w.	...	...	...	54	54
25.	29.814	29.774	29.646	29.24	29.58	60.3	67.4	58.5	67	54	58	64	...	w.	.22	...	...	58	58
26.	29.694	29.739	29.627	29.16	29.70	58.8	70.2	56.3	66	54	61	66	...	NE.	.05	...	...	56	56
27.	29.956	29.926	29.745	29.37	29.79	61.0	62.4	55.3	70	49	64	64	...	NW.	.24	...	...	58	58
28.	30.084	30.078	30.019	29.47	29.84	61.7	71.4	55.6	74	58	63	65	...	w.	...	...	...	57	57
29.	30.260	30.171	30.134	29.63	30.04	64.7	71.8	60.2	75	54	65	69	...	NW.	.03	...	...	57	57
30.	30.148	30.095	30.029	29.47	29.90	65.4	72.0	60.2	69	51	62.5	65	...	SSW.	...	...	...	61	61
31.	34.210	30.159	30.126	29.59	30.01	62.3	73.2	58.7	70	45	60	61	...	NW.	...	...	...	60	60
Mean.	29.921	29.898	29.780	29.30	29.650	61.5	69.8	54.9	69.35	50.77	59.9	61.1494	Sum.	1.68	2.76	5.28	1.815	Mean.	56.





THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

XIII.—*Observations on the Genus Typhlopone, with descriptions of several exotic species of Ants.* By J. O. WESTWOOD, F.L.S.

[With a Plate.]

HAVING in my 'Introduction to the Modern Classification of Insects' figured an insect from the collection of C. C. Babington, Esq., under the name of *Typhlopone fulva*, and which, without hesitation, I considered to be a *neuter Ant**, it becomes necessary,—now that Mr. Shuckard has, in a previous page of these Annals, stated his conviction that it is the *female* of a genus belonging to another family, in which neuters do not exist,—that I should give my reasons for the opinion I have advanced, that it belongs to the family of the Ants, and is a neuter insect, and which I still retain.

Ignorant although we are of the males of this genus, it is not only upon a comparison of known individuals of *Typhlopone* with the females and neuters of the Ants, and with the females of the *Mutillidæ*, that I found my opinion; we are now acquainted with four facts relative to the habits of these insects. 1st, One of Mr. Shuckard's specimens is stated by him still to retain within its jaws the wing of a *Termes*. 2ndly, Another, of which the head alone remained, had attacked and pertinaciously retained hold of the leg of an ant, which had evidently pulled off the body of the *Typhlopone*, in order to rid itself of its incumbrance. 3rdly, Mr. Raddon has obtained many specimens of *Typhlopone*, found alive in casks of sugar from the West Indies. And 4thly, Mr. Babington's three specimens were also found in sugar. Now these are circumstances

* I have in this paper continued to employ the term 'neuter' for the abortive sex of the *Heterogyna* and other social *Hymenoptera*, although it is certainly improper, such individuals being, in fact, females, with partially developed female organs. The term 'worker', which has also been applied to them, is not exclusively their own, because the real productive females, amongst the humble-bees and wasps, work as much as the so-called 'neuters'. It would perhaps be better to term them 'pseudo-females.'

which are well known to be the habits of neuter Ants. Of the extraordinary pertinacity with which some of the latter retain hold of these and larger insects, I have collected various notices in my 'Introduction' (v. 2, p. 230.), whilst the partiality of Ants for sugar is very great, and well known. One species is indeed named *Formica Saccharivora* by Linnæus.

I proceed, therefore, to structural peculiarities.

The large and flattened head is not exclusively characteristic of the *Formicidæ*, but the want of eyes and ocelli occurs only in *Typhlopone*, and in various blind ants, mentioned in my 'Introduction' (v. 2, p. 218.). The antennæ are equally similar in structure in *Typhlopone* and several ants. In my drawings of *T. fulva*, made immediately after the meeting of the British Association at Cambridge, the antennæ of *T. fulva* are represented as having only eleven joints; that is, one joint less than the typical number in female and neuter aculeate *Hymenoptera*. A specimen recently given to me by Mr. Raddon, exhibits also eleven decided joints in the antennæ. Mr. Shuckard describes them as "consisting apparently of only ten joints," and blames me for not having described these organs, as well as for having omitted a generic and specific description of *T. fulva* in my 'Introduction,' where they would have been out of place. Mr. Shuckard does not endeavour to show in what way the loss of the two joints, which he states to be wanting, occurs, but he assumes that the circumstance of *Myrmecodes* and other apterous *Mutillidæ* having only eleven joints in the antennæ, proves that *Typhlopone* is allied to those genera. Now Latreille, with true philosophic spirit, has shown how this loss occurs in the *Myrmecodes* and *Myzine* ('Règne Animal,' 5. 316, 318.), namely, by the second joint being lodged within the extremity of the first joint, by which it is hidden. Such is also the case in the *Thynni*, which are the males of *Myrmecodes*; but it is not so in *Typhlopone*, and the loss must be accounted for in some other manner. Mr. Shuckard, indeed, describes the *T. Thwaitzii* as having eleven jointed antennæ, and *T. Spinolæ* as having apparently twelve joints, arising from the large terminal joint being divided in its middle by a slender dark ring, thus proving that it is by the soldering together of the terminal joints, and not by the immersion of the second joint within the apex of the long basal joint, that this is effected. Hence we perceive an identity of structure between *Typhlopone* and the Ants, and a dissimilarity between them and the *Mutillidæ*. The former is still further confirmed by the fact, that I have detected in some species of Ants, which I shall describe at the end of this paper, only ten joints in the antennæ, and that

Odontomachus armatus, Latr. (neuter = *Daceton armigerum*, Perty), *Cryptocerus atratus* (female and neuter), *Atta cephalotes* (female and neuter), and others, have only eleven jointed antennæ, the second joint being exposed. No previous author has noticed this curious circumstance, and Mr. Shuckard stating that "this curtailment is never found in the apterous social *Heterogyna**", thereon founds an unwarranted relationship with the *Mutillidæ*.

The situation of the antennæ close to the mouth, and the elongated basal joint with the following joint affixed so as to form an elbow, are also characters which *Typhlopone* possesses in common with the *Ants*.

The mouth is remarkable for the extraordinary minuteness of the palpi. The curtailed structure of the trophi (that is, of the maxillæ, labium and palpi) is stated by Mr. Shuckard peculiarly to distinguish the *Dorylidæ* from both the *Formicidæ* and the *Mutillidæ*. But this is not the case, as I have instanced a considerable number of species of ants in which both the maxillary and labial palpi possess much fewer joints than the typical number (Intro. 2, p. 219.).

The structure of the thorax is very interesting in *Typhlopone*. Mr. Shuckard has, however, completely mistaken its formation, considering the prothoracic collar as the mesothorax, and overlooking the true mesothorax. This has evidently resulted from the want of a careful examination of the corresponding parts in the allied groups, and the absence of generalization in the views taken of the thoracic organization; hence, therefore, the erroneous nature of the observations which Mr. Shuckard has published relative to the supposed peculiar distinction between *Typhlopone* and the other apterous *Heterogyna* of both groups, and of the relation between *Typhlopone* and the *Dorylidæ* in this respect †.

The principle upon which the variation in the development of the thoracic segments is regulated, depends entirely upon

* Mr. Shuckard has made some observations relative to the adoption of the term *Heterogyna* of Latreille, contending that the term ought to be retained for the *Mutillidæ*, instead of being applied to the *Ants*, as it is by Saint Fargeau and Haliday. It appears to me, however, that the term was intended to apply either to the distinction which existed between the winged females of *Formica* and the wingless females of *Mutilla*, or to the difference between the winged females and the wingless pseudo-females of *Formica*. In this latter sense the name is the most appropriate that could be applied to the *Formicidæ* as distinct from every other group of insects.

† Amongst other things, Mr. Shuckard states that when the meso- and metathorax are of unequal size in the winged males of *Heterogyna*, it is the latter which is most developed,—a statement neither confirmed by nature nor by the principle that the segments of the thorax are always in proportion to the size of the locomotive organs which they respectively bear.

the locomotive organs and their action. In wingless insects motion is of course performed by the legs alone, and for this end the thoracic segments are nearly equally developed, especially when the legs are nearly of equal size. This is especially to be seen in the typical *Myrmecia* of New Holland, in which, from the elongated form of the body, each segment is necessarily drawn out to its full length of development. Here we find the collar of the prothorax large, oval, longitudinally or obliquely striated, emarginate behind, receiving the front of the mesothorax in the emargination, and which, as well as the metathorax, is transversely striated. The examination of a very few species of neuter Ants will show the more or less gradual coalescence of the meso- and metathorax; the prothorax, however, remaining always most distinct and large, and such is exactly its structure in *Typhlopone*. In the apterous females of the typical *Mutillidæ*, on the other hand, all the segments are consolidated into a single mass.

Of the legs, I shall merely observe, that the employment of the character to be derived from the calcaria is fallacious, because although many Ants possess but one spur to each tibia, there are certainly many which possess two to each of the four hind tibiæ. Such is especially the case in the typical *Myrmecia*, in which one of the two spurs of each of the four hind legs exhibits a very beautiful structure. At the same time, there are others, such as *Cryptocerus atratus*, *Pheidole providens*, &c., which are entirely destitute of calcariae in the four hind legs. And it is moreover to be observed, that both in respect to the spurs and the tarsal ungues, the formation is identical in all the three kinds of individuals of *Myrmecia*, as well as in both sexes of *Thynnus*, and even in both sexes of *Mutilla**. In *Typhlopone* the ungues are perfectly simple: so also may we reasonably expect them to be in their males.

Another circumstance also deserves to be noticed, namely, the entire want of cilia or bristles on the fore legs of *Typhlopone*, a character found in the apterous female *Mutillidæ*, and dependent upon their habits of burrowing in sand. The absence of these appendages consequently either proves that *Typhlopone* is an ant or a parasitic Mutillideous insect; none such, however, have as yet been observed amongst the *Mutillidæ*; indeed it is not only contrary to analogy to suppose that the female of a parasitic aculeate Hymenopterous insect should want wings, (its œconomy rendering the possession of them absolutely necessary for its existence,) but the habits noticed above are sufficient to disprove the supposition.

* In both sexes of *Mutilla Klugii*, for example, each of the ungues of which is furnished with a remarkable seta, as long as the unguis itself.

Lastly, of the abdomen, it may be stated that the pedunculated base is especially characteristic of the ants, and that the trispinose apex is only found, as Mr. Shuckard notices, in an American Ant.

One of the most important characters employed by Mr. Shuckard in his descriptions of the *Dorylidæ*, is that derived from the structure of the male genital organs,—a character which has already been employed by Audouin in the *Bombi*, and by Vander Linden and others in the *Libellulidæ*, and proved to be of very great value in determining the species of these insects. Mr. Shuckard, indeed, says, that in respect to its large size in the *Dorylidæ*, “it exclusively resembles several of the solitary *Heterogynæ*,” and hence he considers the analogy as strongly in favour of the connexion of these genera with the *Mutillidæ*. He, however, overlooks the fact that the males of all those groups which swarm in the air at certain periods of the year are furnished with very large organs of generation, and for a very evident purpose. This is extraordinarily the case in the wasps, as well as in the hive-bee, the *Ephemeræ*, *Chironomi*, and the Ants. As regards the first and last of these groups, reference may be made to the plates of DeGeer’s 2nd volume, or the figures 85.5, 88.6, in the 2nd volume of my ‘Introduction.’ In these groups, however, the males are much smaller than their partners, and therefore the analogy thence assumed in respect to the *Dorylidæ* does not necessarily exist.

Such are the considerations which induce me (although in the absence of an opportunity of ascertaining by internal dissection the state of the sexual characters of the individuals of *Typhlopone* yet observed) to consider these insects as being unquestionably neuter Ants. And as they are equally strong when applied to the African genus *Anomma*, I have no more hesitation in deeming that genus equally Formicidæous, as it differs only in trivial characters from *Typhlopone*.

I had proposed to myself to have extended these remarks to an examination of the opinions entertained by Mr. Shuckard relative to the sexual relationship between *Typhlopone* and *Labidus*, the parasitic nature of the *Dorylidæ*, the relationship between the latter and the *Mutillidæ*, and the observations on *Scleroderma*; all of which I consider untenable. I must, however, defer these subjects till another opportunity. Before laying down my pen, however, I must express the pleasure I have received from the careful manner in which Mr. Shuckard has executed the *descriptive* portion of his memoir, and the ingenious manner in which he has treated the *conjectural* part.

By way of supplement, I submit the following descriptions of several Ants, which, especially in the structure of their antennæ and oral organs, serve to illustrate the preceding observations, and to confirm the relationship of *Typhlopone* with the Ants:—

CAREBARA, Westw.

(καρηβαρω̄, *capite doleo*, ob capitis exiguitatem.) Characteres e fœminâ desumpti.

Caput minimum oculis ocellisque munitum.

Antennæ minimæ vix capite longiores, graciles, ad apicem paullo crassiores, supra os insertæ 10-articulatæ, articulo 1^{mo} longo; 2^{do} obconico; 3^{tio} præcedenti multo minori, reliquis magnitudine et longitudine sensim increscentibus; ultimo ovali.

Mandibulæ mediocres corneæ curvatæ, apice oblique truncato et irregulariter denticulato.

Maxillæ minutæ, apice in lobum tenuem ovalem terminato. Palpi maxillares minuti 3-articulati articulo 1^{mo} brevi crasso, duobus ultimis gracilibus subæqualibus.

Mentum corneum obovale versus basin attenuato, labium subductum. Palpi labiales minuti graciles biarticulati.

Thorax ovalis, suprâ mesothorace maximo fere omnino occupatus.

Abdomen maximum ovale subdepressum segmentis subæqualibus, basi binodosum.

Alæ maximæ; venis ut in fig. 6. dispositis.

Pedes breves tibiis 4 posticis ecalcaratis.

Species unica. *Carebara lignata*, Westw.

Tota luteo-fulva, nitida tenuissimè punctata; facie linea longitudinali sub ocellum medium impressa et versus os furcata; antennis in foveolis inter se et oculos æque distantibus insertis; mesothoracis scuto utrinque linea impresso, parapsides fere efficientibus, scutelloque utrinque parapteris bene determinatis; alis infuscatis, cellula prima submarginali in una alarum anticarum in duas partes vena fere secta.

Long. corp. lin. 10½; expans. alar. lin. 20.

Syn. *Myrmica lignata* De Haan MSS.

Habitat in Java. In Mus. Hope.

SOLENOPSIS, Westw.

(σωλήν *canalis* et ὄψις *facies*, ob faciem canaliculatam.)

Characteres e pseudo-fœmina desumpti.

Caput maximum subquadratum horizontale posticè emarginatum, suprâ linea media longitudinali in duas partes divisum anticè in medio bituberculatum. Oculi parvi laterales ante medium marginis locati.

Antennæ breves graciles prope os in foveolis duabus insertæ; 10-articulatæ, articulis duobus apicalibus majoribus.

Labrum parvum inter mandibulas et supra os deflexum bilobum.

Mandibulæ magnæ valde curvatæ crassæ apice obliquo, edentulæ.

Maxillæ et mentum minima fere membranacea, labium subduc-

tum. Palpi maxillares et labiales biarticulati ; gracillimi brevissimi, apice seta instructi.

Thorax valde angustus, prothorace mediocri ; mesothorace majori. Abdomen magnum fere circulare subdepressum segmentis basalibus duobus nodos duos formantibus, segmento proximo maximo. Pedes graciles tibiis 4 posticis ecalcaratis, unguibus tarsorum simplicibus.

Species unica. *Solenopsis mandibularis*, Westw.

Tota castaneo-fulva nitida tenuissime punctata, hirta ; oculis, margine antico capitis acuto, mandibulisque nigris ; abdominis apice fusco, mesothorace utrinque in tuberculum conicum elevato ; nodo 1^{mo} pedunculi abdominalis elongato, apice elevato-conico, 2^{ndo} brevi subrotundato.

Long. corp. lin. 3.

Habitat in America Æquinoctiali. D. L. Guilding.

In Mus. D. Hope.

This insect is so closely allied to the *Pheidole providens*, W. (*Atta providens* of Col. Sykes, figured in the Transactions of the Entomological Society, vol. i. pl. 13. fig. 5.), that it can only be regarded as a geographical subgenus, distinguished chiefly therefrom by the peculiarity of its antennæ and the smooth and glossy body. As the former has not hitherto been characterized generically, I take this opportunity of doing so.

PHEIDOLE, Westw.

Sub-genus Asiaticum *Solenopsidi* proximum.

Caput maximum posticè emarginatum anticè haud bituberculatum, striolatum obscurum, anticè linea utrinque obliqua impressa versus oculos ducta in quibus insident antennæ 12-articulatæ, graciles breves, articulo 2^{ndo} sequenti majori, tribus ultimis magnis clavam formantibus. Mandibulæ crassæ intùs concavæ extùs curvatæ apice truncato (in fig. supr. cit. erroneè dente medio depictæ).

Labrum, maxillæ, labium, mentum, palpi, pedes, pedunculus et abdomen ut in *Solenopside*.

Species unica, *Pheidole providens*, W.

Atta providens, Sykes, loc. cit. supr.

Habitat in India Orientali. D. Sykes.

The following are descriptions of the individuals of *Typhlopone* which have fallen under my notice, and which are distinct from those described by Mr. Shuckard :—

Species typica, *Typhlopone fulva*.

Luteo-fulva nitida tenuissime punctata, capite posticè nonnihil angustiori, margine postico parum emarginato, margine antico nigricanti, tuberculis duobus mediis in lineas elevatas posticè productis desinentibus et inter has carinas canali impresso posticè ad tertiam partem capitis ducto et gradatim terminato ; antennis in fossulis duabus mediocriter impressis, insertis : castaneis 11-articulatis articulo 1^{mo} fulvo ; ultimo articulis tribus

antecedentibus vix majori; mandibulis castaneis apice nigro; metathorax æqualis haud impressus; pedunculus abdominis anticè subtruncatus, postice latior angulis lateralibus posticis rotundatis; subtùs ad basin angulariter productus. Mandibulæ ad apicem subacutæ angulo prominente versus medium lateris interni denteque parvo paullo sub apicem, spatio inter angulum et dentem subapicalem subserrulato.

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

In Mus. D. C. C. Babington. In saccharo detecta.

Individuum alterum etiam in saccharo detectum differt statura minori, lineas $3\frac{1}{2}$ longitudinis tantum habens, colore obscuriori sc. testaceo-fulvo; dente mandibularum subapicali magis prominenti angulo medio tamen fere obsoleto, canali faciei nisi inter carinas frontales oblitterata.

Typhlopone Shuckardi.

Testaceo-fulva nitida tenuissimè punctatissima; capite lateribus parallellis, posticè valdè emarginato fronte carinata et canaliculata ut in *T. fulva*; antennis piceo-castaneis 11-articulatis articulo ultimo duobus præcedentibus paullo majori, mandibulis piceo-castaneis apice nigricantibus, dente subapicali minuto et obtuso vix prominente; metathoracis dorso canaliculato; pedunculo abdominis subtùs versus basin in hamum brevem acutum producto, abdominis apice 5-denticulato, denticulis lateralibus majoribus.

Long. corp. lin. 5.

In Mus. nostr. Communic. D. Raddon. In saccharo detecta.

Typhlopone Dahlbomii.

Pallidè lutea, mandibulis obscurioribus; nitida tenuissimè punctatissima, capite lateribus subparallelis posticè vix emarginato impressionibus duabus frontalibus magnis rotundatis in quas insident antennæ breves clavatæ 11-articulatæ articulo ultimo maximo (præcedentibus 5 majori); impressionibus carina media tenui anticè dilatata separatis; canali omnino obsoleto, mandibulis apice acutis dentibusque duobus magnis et acutis intùs armatis; metathorace haud canaliculato pedunculoque abdominis subtùs inermi, æquali.

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

In Mus. D. C. C. Babington. In saccharo detecta.

DESCRIPTION OF THE FIGURES.—Plate II.

Fig. 1. *Typhlopone fulva*, W. Magn. auct.

1 a. Labrum; 1 b. mandible; 1 c. maxilla; 1 d. labium; 1 e. antenna; 1 f. abdominal peduncle; 1 g. posterior tibia and tarsus.

Fig. 2. Thorax and abdominal peduncle of *T. Shuckardi*, W.; × prothoracic collar; + mesothorax; 0 metathorax.

Fig. 3 a. Front of head of *T. Dahlbomii*, W.; 3 b. antenna of the same.

Fig. 4. *Anomma Burmeisteri*, Sh. Magn. auct.
4 a. Front of its head.

Fig. 5. *Solenopsis mandibularis*, W. Magn. auct.

5 a. Underside of head; md. one of the mandibles, the other removed;



Fig. 1.

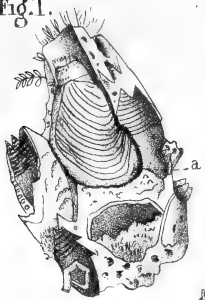


Fig. 4.



Fig. 2.

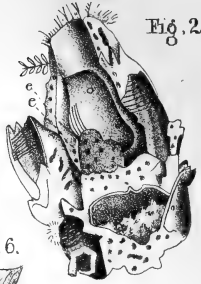


Fig. 5.



Fig. 6.



Fig. 8.

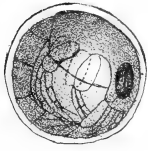


Fig. 7.

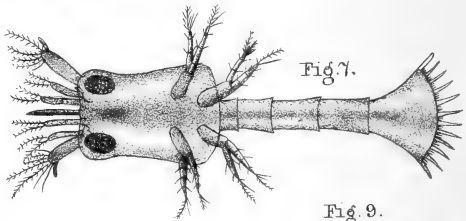


Fig. 11.

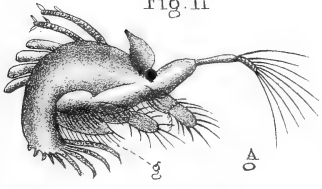


Fig. 9.



Fig. 10.

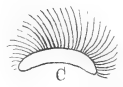


Fig. 12.

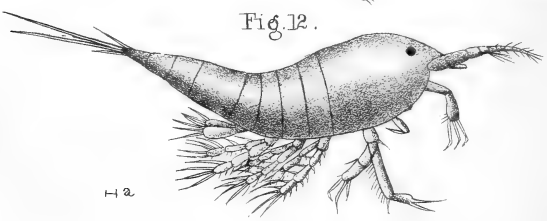
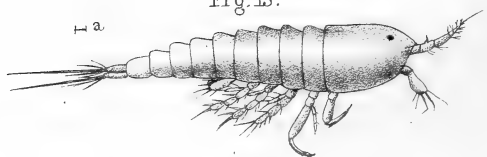


Fig. 13.



l 1. labrum; *m* × maxilla; *l* 2. labium; 5 *b*. labrum; 5 *c*. mandible; 5 *d*. maxilla; 5 *e*. labium; 5 *f*. antenna; 5 *g*. thorax and basal joints of abdomen; × prothoracic collar; + mesothorax; 0 metathorax.

Fig. 6. Carebara lignata, W. Mag. nat.

6 *a*. mandible; 6 *b*. maxilla; 6 *c*. labium; 6 *d*. antennæ.

Fig. 7 a. Thorax and basal joints of abdomen of *Pheidole providens*, W.; × prothoracic collar; + mesothorax; 0 metathorax; 7 *b*. and 7 *c*. mandibles in different position.

XIV.—*Zoological Notices*. By Dr. A. PHILIPPI*.

[With Two Plates.]

1. On *Clavagella balanorum*, Scacchi. Plate III. fig. 1—6.

Cl. vagina adnata, abbreviata, apertura simplici; valvis subtriangularibus; libera tenui, rugosa, parum convexa; spinis fistulosis irregularibus absconditis.

Habitat in cespitibus Balanorum ad costam Pausilypi prope Neapolin.

In December of the preceding year Sig. Scacchi made the highly interesting discovery of this living species of *Clavagella*, and communicated it to the Royal Neapolitan Academy; but since years will pass away before the Memoirs of this Academy will appear in print, I believe I shall be doing a great service to zoologists in giving a detailed description of his discovery. We have examined the animal in company, but the observation on the formation of the spinoid tubes is due alone to Sig. Scacchi.

The tube is short, at the most $1\frac{1}{2}$ inch long, very thin walled, and cohering most intimately with the surrounding bodies (almost always *Balanus balanoides*); rarely does it project one or two lines. It is compressed, measures about $2\frac{1}{2}$ lines in the one, $1\frac{1}{2}$ —2 in the other dimension; its superior (upper) aperture is simple; it terminates inferiorly in general in a pear-shaped expansion, in which the *shell* is situated. This consists of a free and of an adhering shell. The *free shell* is the right one; it is of an irregular structure at the dorsal margin (Rückenrande), frequently concave, and seldom exceeding 6 lines in length and 4 in breadth. It is thin and very slightly vaulted, so that there is a wide space on the ventral side between the two shells, which is closed by the thick mantle of the animal. The *lines of growth* are very distinct, and what is very remarkable, they do not run parallel with the

* Translated from Wiegmann's 'Archiv,' Part 2, June, 1840.

ventral margin, but with the anterior margin; so that the point of commencement of the shell is situated at its hinder end, and not at the vertex (Wirbeln), as in other Conchylia. It appears that a great portion of the dorsal margin is subsequently re-absorbed. The vertices thence appear in part uncinatè. The left *adhering shell* is exceedingly thin, otherwise similar to the other. The two shells inwardly, as well as the tube, are of a nacreous lustre; thus rendering it extremely difficult to distinguish mantle and muscular impressions. A *hinge* is entirely wanting, and there is even no peculiar cartilaginous ligament; I merely find a weak fibrous corneous ligament. (Fig. 4 *b*.) Where the two shells touch one another at the back there is frequently a projection in the tube, and we in general meet with an oblique projection (Vorsprung) where the space for the shell ceases and the true tube commences. The *spinoid tubes* are present; they are irregular, and are only employed by the animal where it finds a free space in the *Balanus* mass. They are in general lost on loosening the house, so that rarely any other trace remains of them than the point-like apertures in the interior of the shell, as I have represented in fig. 2 *e*. In some successful cases, however, they are seen very distinctly.

The *animal* has exactly the form of a sack, which in front has but a very small fissure, out of which the apex of the very thin foot can scarcely exert itself. (Fig. 1. and 4.) Posteriorly the mantle is prolonged into two *siphons*, cohering nearly to the apex, which reach to the extremity of the tube. The common portion of the siphons terminates with a fringed border, and then follow two very short tubes, of which the inferior or branchial siphon is broadest. Both are provided at their aperture with simple cirrhi, and are carmine red, while the remainder of the animal is colourless. It has, moreover, to be observed, that the common tube before its border is covered with a quantity of grains of sand, which are not easily separable from it. (See Fig. 3.) Fig. 4. exhibits the animal, after having been some time in spirits, lying on the right shell. The two *adductores*, of which the posterior one is round and large, the anterior one kidney-shaped and small, are at present very distinct. If the mantle is cut open in the ventral line, it is first observed that the mantle in the ventral side is very thick and fleshy; posteriorly the strong muscles which draw back the siphons are in view; in the centre, the semicircular branchiæ, out of which the small narrow vermiform *foot* (*d* in fig. 5. and 6.) projects; and above this, on each side, two very long, linear, somewhat curved *appendices buccales*, *c*. On each side there is only *one*

branchia, which however has fixed itself in the neighbourhood of the back, and has above the seam another narrow appendix, which might be compared with the second branchia, and which half surrounds with its free margin the anterior closing muscle. The branchiæ of both sides cohere in the seam with the posterior half. They are strongly and distinctly striped. Remarkably small is the mass of intestines which project free between the branchiæ. See fig. 6, where this is separately represented.

Respecting the formation of the spinoid tubes Sig. Scacchi says, in his memoir read to the Academy, which he has communicated to me in manuscript, as follows:—

“Rang is of opinion that the spinoid tubes served the purpose of allowing the exertion of a kind of byssus, with which the animal fastened itself to the basis of its dwelling; but no observation supports this view, and I believe I may say with certainty that the *Clavagellæ* have no byssus; moreover, every one will easily conceive how useless this would be to them, since they cohere immoveably to one of their shells. Since they live in the midst of sea-acorns (*Balani*), which form a group of empty shells which grow one upon the other, it must necessarily happen that the *Clavagella* on increasing meets with the cavities of the surrounding *Balani*, when it absorbs or destroys everything round about in order to render its dwelling more spacious. Now observation has shown me, that when such cavities open near the animal, some fleshy fibres proceed from the great muscle which joins the margins of the mantle, and there direct themselves to the place where the cavity of the balanite is open, and form small calcareous tubes. They generally terminate with two small branches which finally close, yet I have sometimes found in some a small aperture at the end. These tubes prevent the entrance of any foreign body, and distribute themselves like the roots of plants, so that those which come near to the inner surface of the *Balani* adhere to it; the others either remain free or attach themselves to sand, and any other foreign substances they accidentally meet with. It appears that but few days are necessary for the formation of these tubes, as among so many individuals which I have had occasion to examine alive, I have only twice had the pleasure to surprise the animal with the above-mentioned fleshy filaments, which lie in the tubes that were just formed; and some other times I have met with some of these filaments, which having performed their office, were dried and now hung as appendices of the epidermis to the great muscle of the mantle.” These spinoid tubes serve then the animal to fix itself, and are consequently most

strongly developed in those species which live in sand, as for instance, *Clavagella bacillaris*.

PLATE III. *Fig. 1. Clavagella Balanorum*, Scac. Sitting in a mass formed for the greatest part of *Balani* overgrown with Sponges, *Serpulæ*, &c., in natural size somewhat contracted; the one wall of the cavity is removed.

a. The fissure in the mantle, through which the foot is exerted.

Fig. 2. The animal is removed; the left shell cohering with the tube is seen, upon which the two muscular impressions are indicated. The points *e.* are the apertures of the spinoid tubes.

Fig. 3. The end of the siphons, magnified, to show that the common part of it possesses its peculiar fringed border.

Fig. 4. The animal killed in spirits, much contracted, lying on the right shell.

a. The mantle fissure for the foot.

b. The rudimentary ligament.

c, d. The two adductors.

Fig. 5. The same, the mantle cut open in the neighbourhood of the ventral line, and thrown back. The branchiæ, the foot *d*, the *appendices buccales*, of which only the two of the one side are represented, are seen.

Fig. 6. The foot with the belly or intestinal mass of the animal, magnified.

2. The genus *Zoë* is the first state of *Pagurus*. (*Fig. 7. and 8.*)

No genus among the Crustacea is perhaps more remarkable, and has more exercised the ingenuity of naturalists with respect to the place it must occupy in the System, than the curious animal discovered by Bosc, and named by him *Zoë*, and but exceedingly few naturalists have seen it again after him. He placed it between the Branchiopoda and the Flea-crabs (*Flohkrebse*); Latreille, in the first edition of Cuvier's 'Règne Animal,' in the order Branchiopoda, between *Polyphemus* and *Cyclops*; at the same time expressing the opinion that it might perhaps belong to the division of the Schizopoda. This latter opinion was adopted by Leach, but most zoologists have placed *Zoë* among the Branchiopods. To these doubts respecting the nature of this animal a new one associated itself, by Mr. Thompson announcing that these curious animals were nothing more than the larvæ of the common crab (*Carcinus Mænas*), which underwent a true metamorphosis. This opinion was strongly opposed by Mr. Westwood. Lastly, Milne-Edwards is of opinion (see Lamarck, 'Hist. Nat. des Anim. sans Vert.' edit. 2. vol. v. p. 195.) that *Zoë* might indeed only be the young state of a species of Decapod, but belonging probably to his division of the Anomura (in which he includes *Dromia*, *Homola*, *Albunea*, *Pagurus*, &c.). Accident has afforded me the opportunity of

making the direct observation, that in effect *Zoë* is nothing more than the first stage of *Pagurus*.

On the 13th of March of this year, I found in Palermo, in a basin in which I kept several sea animals, to my great joy, about a dozen individuals of *Zoë*, but unfortunately already all dead. I hastened to examine them under the microscope as well as possible. The next morning I found to my great surprise the same basin, in which I had the previous day fished out with great trouble a dozen *Zoë*, quite filled with several hundred *Zoë*. I had among other animals in the basin a *Pagurus hungarus*, Herbst., which sat in a *Natica millepuncta*: I immediately conceived the suspicion that the *Zoë* must be its young, broke carefully the *Natica*, and found, in fact, the ovary of the *Pagurus* nearly quite empty, while in the remaining ova I distinctly recognised the little *Zoë*. I freed it with some trouble from the tunics (Eihäuten of the ovum). These small *Zoë* were perfectly transparent, with black eyes, a red spot in the medial line immediately behind the eyes, and at times with a second red stripe before the anus. These red spots are evidently in the intestinal canal, and are remains of the yelk. The cephalothorax occupies two-fifths of the length of the animal, and is prolonged in front into an apparently horizontal beak, posteriorly rounded, behind the eyes slightly constricted. The neighbourhood of the eyes projects vesicularly. The *abdomen* is not quite twice as long and five-articulated. The four first segments are cylindrical and gradually increase in length; the last has the form of a fan, and bears twelve radiately-placed spines, of which the outer ones are the shortest. The *eyes* are sessile, very large, black, reticulately latticed. The *exterior antennæ* are biramifidate, and originate on the under side; their common petiole scarcely projects to the margin of the cephalothorax; the outer branch is pretty broad, terminates exteriorly with a spine, and bears at its apex a number of bristles: the inner branch is shorter, much narrower, and bears only two bristles. Between the two ramifications there is another short semifalcate, slightly ciliated member. The *inner antennæ* are as long as the outer ones, narrow, biarticulated, and terminate with two bristles. Of all the other organs I only recognised the two perfectly similar pair of feet, which are biramifidate, and recall to mind *Cyclops*. The outer branch is triarticulated, the inner somewhat stronger one quadriarticulated. The terminal joint is in both short and acute, and furnished with long bristles. All the longer bristles of the feet, as well as those of the antennæ, are ciliated.

Fig. 7. *Zoë*, the young of *Pagurus hungarus*, Herbst., very highly magnified.

Fig. 8. The same, still in the egg, likewise very highly magnified.

3. *Asterope*, a new Genus of Ostracopoda.
Plate III. fig. 9—11.

I had frequently found in the sea-sand, and between Zoo-phytes, *Cytherina*-like shells of several species, which differed essentially from *Cytherina* by an incision (indentation) in the shell, but only on the 6th of March of this year did I succeed in finding in Palermo an individual with the animal. If indeed it was not possible for me to distinguish all its organs, yet I fully convinced myself that the animal also is so considerably distinct both from *Cypris* and *Cytherina*, as well as from *Cypridina*, Milne-Edwards (which genus I have likewise been so fortunate as to observe), that it must necessarily form a separate genus.

The shell is only half a line long, of a brownish colour, perfectly elliptical, but has in front and beneath an incision, and on both sides of this incision the margin is thickened. Beneath the incisure lie the antennæ; behind the first pair of feet, at the hinder extremity, the apex of the tail peeped out. With a greater magnifying power the shells appeared beset with opake white points. The shells could be easily removed, and the animal now appeared as shown in fig. 11. Immediately behind the eye, which on being pressed between the glass plates showed itself to be a *double* one, a pear-shaped *muscle* is directed upwards, and serves to fasten the animal on each side to the shells; behind which I observed a couple of cylindrical annulated filaments provided with some bristles, and behind these still two other pair, shorter, thicker filaments, not annulated, and not furnished with bristles. These organs probably serve for the adhesion of the eggs. There is only one pair of *antennæ*, the greatest organ on the whole animal, as it equals the body in length. They are situated immediately beneath the eyes, have a large ovate basal joint, which forms with a second cylindrical joint of the same length the petiole, and terminates with a short many-jointed flagella (Geissel) beset brush-like with long bristles. There are two pairs of feet, both of which are directed forwards, and seem to be only biarticulate; both joints are subelongate, much compressed, nearly foliaceous, and ciliated with few but strong bristles. The *tail* is compressed, broad, curved downwards, and somewhat forwards, and furnished with about ten hooks, which are first at the apex bent, then curved backwards, and which gradually decrease in size from the front hindwards. At the base of each foot are situated two nearly triangular lamellæ, which are anteriorly bent outwards, and densely beset with long stiff cilia, fig. B. query branchiæ? Behind these and before the tail I

noticed another differently formed, and short ciliated lamella, fig. *g*. I moreover found three pairs of falcate palpi or foot-jaws with long cilia, fig. *c*. I did not, however, succeed in observing the other cibarian organs.

Notwithstanding the imperfection of these observations, they still sufficiently prove the independence of this genus. It differs from *Cypris*; 1. by the incision of the shell; 2. by the existence of two eyes; 3. by the broad hook-bearing tail; 4. by having only two pairs of foliaceous feet; 5. by possessing peculiar organs for bearing the eggs, which function in *Cypris* is performed by the third pair of feet. *Asterope* is distinguished from *Cypridina*; 1. by the incision of the shell; 2. by the presence of only two pairs of foliaceous feet; 3. by its simple tail (in *Cypridina* it consists of two lamellæ), &c. *Cytherina* differs from *Asterope*; 1. by the want of the incision of the shell; 2. by the presence of *four pairs of feet*, as quite correctly stated by O. F. Müller; 3. by the tail consisting, as in *Cypridina*, of two lamellæ. (I have observed about eight species of *Cytherina* near Naples.)

The generic characters were accordingly as follows:—

Testa bivalvis, corpus abscondens, antice subtusque incisa. *Antennæ* duæ simplices, apice penicillatæ. *Oculi* duo! *Pedes* quatuor compressi, subfoliacei. *Fila* peculiaria ad retinenda ova. *Cauda* compressa uncinis pluribus terminata.

The species might be characterized in the following manner:—

Asterope elliptica. A. testa exacte elliptica, nitida, sublente fortiori, punctis opacis albis adpersa.

PLATE III. Fig. 9. *Asterope elliptica*, Phil. Magnified.

A. Its natural size.

Fig. 10. The left shell, inside view, moderately magnified.

Fig. 11. The animal magnified sixty times.

B. One of the four lamellæ attached to the base of the feet, still more highly magnified.

C. One of the three pair of lamellæ, which are situated near the cibarian apparatus.

g. The lamellæ between the feet and tail.

4. Short characteristic of several new Genera of the Family of the Copepoda.

During the great heat of the summer months I have occupied myself in Sorrent in examining the minute animals which live among the small Algæ. Here dwell, only to speak of the Crustacea, especially *Caprellæ*, some *Dynamene*, *Janira*, *Jossa*, *Juera*, which latter three appear to be very rare; numerous

Amphithöe, some *Gammari*, and above all *Cytherinæ*, and a vast number of *Cyclops*-like animals, together with *Peltidiæ*, and an allied genus. The new genera which I found among them I will now briefly enumerate, reserving a more detailed description of them for a longer labour.

1. *Nauplius*, mihi (non O. F. Müller*). (Fig. 12.)

Corpus elongatum, postice sensim attenuatum, segmento primo s. capite (cum segmento primo thoracis connato) maximo; *cauda* bifida, setigera. *Antennæ* quatuor; superiores multiarticulatæ, apice penicillatæ; inferiores tri-articulatæ, apice setis uncinatis, basi seta pectinata munitæ. *Pes masticatorius* ungue incurvo falcato. *Pes primus* capiti insertus, desciscens, biramus, ramis elongatis, apice unguiculatis. *Pedes natatorii* birami sex. *Pedes spurii* duo, e lamellis duabus basi communi insidentibus formati, sacculum ovorum ex parte obtegentes.

This genus is abundant in species. It is distinguished from *Cyclops*; 1. by the varying construction of the first pair of feet which do not serve for swimming; 2. by the foot-jaw; 3. by the lamella, with cover for the greater part of the ovary. It is remarkable that the foot-jaw and first pair of feet are exactly so constructed as in the genus *Peltidium*†, which genus I have been able to investigate more completely on a couple of new species than it was possible on *P. purpureum*.

2. *Laophonte*, mihi. (Fig. 13.)

Omnia ut in *Naupliis*, sed primum corporis segmentum cum capite non coalitum, ideoque *par primum pedum desciscens* non capiti sed segmento peculiari thoracis insertum, biramum, ramo altero minimo rudimentario, altero ungue unico maximo terminatum.

Only one species, but very common; the back appears serrated, from the individual segments being placed sharply from one another.

3. *Psamathe*, mihi. (Pl. IV. fig. 1.)

Corpus elongatum, semiteres. *Pes masticatorius* lamellis duabus terminatus. *Pedes* sex, birami, natatorii. *Pedes spurii* duo, biarticulati, angusti. Reliqua ut in *Cyclope* vel in *Nauplio*.

Only one species, rare, elongated as *Cyclops*, but at the same time flat, thus forming the transition to the scutiform Copepoda. The cibarian apparatus is very peculiar, almost exactly as in the scutiform genus *Thyone*. Very remarkable

* O. F. Müller gave this name to the young state of *Cyclops*.

† For description and figure of this new genus, see *Ann. Nat. Hist.* vol. iv. p. 303. Pl. IV. fig. 12, 13.—EDIT.

Fig. 3.

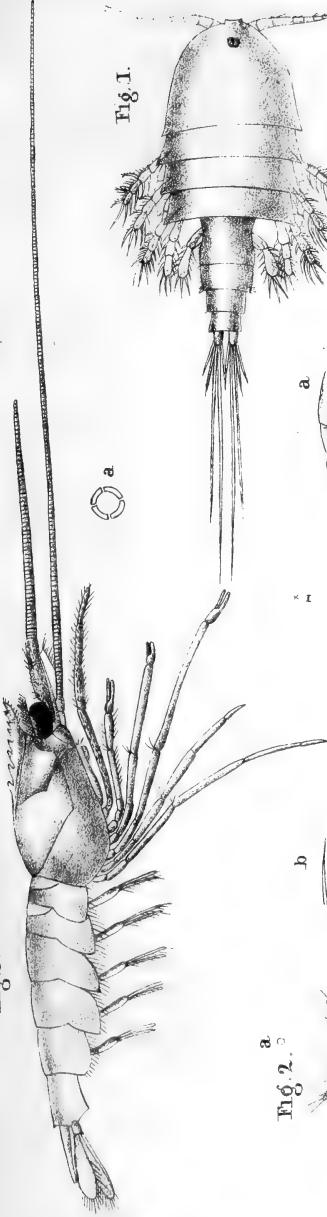


Fig. 1.

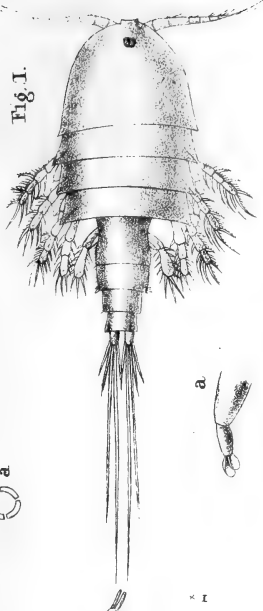
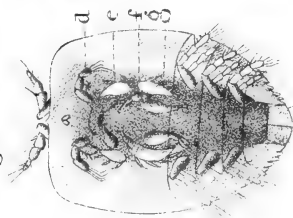


Fig. 2.



b



c



Fig. 6.



Fig. 5.

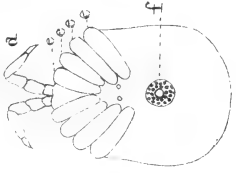
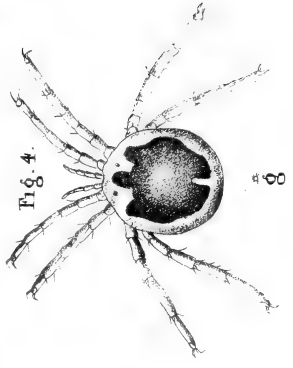


Fig. 4.





is the parallelism between *Nauplius* and *Peltidium*, and between *Psamathe* and *Thyone*.

4. *Thyone*, mihi. (Pl. IV. fig. 2.)

Corpus depressum scutiforme, ovatum, segmentis quinque constans, segmento primo maximo. *Cauda* e lamellis duabus formata. *Oculi* duo confluentes. *Antennæ* quatuor; anteriores multiarticulatæ; inferiores triarticulatæ, apice setis uncinatis, basi seta pectinata munitæ. *Pes masticatorius* apice lamellis duabus terminatus. *Pedes* sex, natatorii, birami; *Pedes spurii* duo lamellares, spatium inter segmentum penultimum caudamque opplentes.

Three species, the one, *Th. viridis*, nearly $\frac{3}{4}$ ''' long, common. The cibarian apparatus exceedingly complicated.—*Peltidium* differs by the foot-jaws, the tail, and by the first pair of feet being differently constructed; *Sapphirina*, Thompson, from the body having nine segments. There are two pairs of peculiar fringed lamellæ near the cibarian organs (fig. 2 *e.* and *g.*), perhaps analogous to those lamellæ in *Cypris*, regarded by Strauss as branchiæ.

5. *Peneus siphonoceros*, mihi. (Pl. IV. fig. 3.)

P. rostro brevissimo, supra 7-dentato inermi; flagellis antennarum superiorum æqualibus, omnibus quatuor canalem clausum formantibus.

I have gradually obtained in Naples about half a dozen individuals of this *Peneus*, so highly remarkable for the curious formation of the flagella of the upper antennæ. They are flesh-coloured, the antennæ, feet, and the hinder margins of the abdominal segments darker. The length from the apex of the beak to the extremity of the tail amounts to $2\frac{1}{2}$ inches, of which the abdomen is 1 inch 7 lines, and the beak scarcely $2\frac{1}{2}$ lines. The cephalothorax has no longitudinal furrows. The abdomen is, as usual, very much compressed, the last three joints keeled. The terminal segment has in the centre a broad groove, and terminates with two points. The scale (Schuppe) of the *exterior antennæ* is quite twice as long as the beak, of usual form, with a longitudinal groove; the stalk does not attain to half the length of the scale; the flagellum is once and a half as long as the body. The *inner antennæ* have a very thick stalk, as long as the scale of the outer antennæ, at the base excavated, as usual, for the large black eyes, and with a curved anteriorly directed appendage (process). They have two equally long, and as above stated, very peculiarly formed flagella. They form, namely, with those of the other side, an almost closed tube. For this purpose each single

flagellum is vaulted exteriorly with a keel, interiorly grooved, serrated and finely ciliated at the margins, so that they close completely. The canal continues in the stalk (Stiel), but here only the upper half is formed by the stalk, and is closed inferiorly by the scales of the outer antennæ, as it seems the upper lip divides the canal, which then proceeds right and left to the branchiæ. As far as I am aware, no similar formation exists among the Crustacea.

The *feet* are exactly as in the other species of *Peneus*; all have at the base a filamentary process corresponding to the palpi of the foot-jaws; the three first pair have pincers (*chelæ*), and increase from the first to the third in length, which increase is effected, namely, by the growth of the tibia. The fourth pair of feet is as long as the second, the fifth as long as the third. The *exterior foot-jaw* is nearly twice as long as the first pair of feet, and consists of rather cylindrical and capillary joints.

The figure Pl. IV. fig. 3. will render a more detailed description superfluous.

PLATE III. *Fig. 12. Nauplius ciliatus*, Phil. Sixty times magnified.
a. Natural size.

PLATE III. *Fig. 13. Laophonte cornuta*, Phil. Female, sixty times magnified.

PLATE IV. *Fig. 1. Psamathe longicauda*, Phil. Magnified sixty times.
a. Natural size.
a. The outer foot-jaw magnified 150 times.

PLATE IV. *Fig. 2. Thyone viridis*, Phil. Examined with a power of sixty.
a. Nat. size.
b. The outer foot-jaw, with its palpus more strongly magnified.
d. The second pair of antennæ.
e. The mandible, near it a foliaceous fringed organ similar to the one designated by *g*: should it be considered as branchia?
f. The one foot-jaw.

N.B. The maxillæ could not be represented on this scale.

PLATE IV. *Fig. 3. Peneus siphonoceros*, Phil. Nat. size.
a. Cross section of the tube formed by the flagella of the upper antennæ, magnified.

6. *Pontarachna punctulum*, Ph., an Hydrachnidan of the Ocean. (Pl. IV. fig. 4. and 5.)

Hitherto Hydrachnæ have been found solely in fresh water, but I have met with, and not at all unfrequently in the bay of Naples, a spider belonging to this division of the Arachnida likewise in sea-water. Unfortunately it is so minute, scarcely $\frac{1}{3}$ rd of a line in length, that I have not been able to recognise all its parts, although I have frequently examined several specimens. The *body* is rather globular, anteriorly somewhat acute, quite bare. Its colour is brownish-yellow, more fre-

quently orange-red or brown-red, sometimes even brown with whitish transparent variously indented (*gezacktem*) margin, so that rarely two individuals look perfectly like one another; I once found one which was very beautifully marked with a white T on a dark-brown ground. The pale margin is anteriorly broader, so that the two minute distant *eyes* may distinctly be recognised. The front *feet* scarcely exceed the length of the body; the posterior ones are nearly twice as long. The four *coxæ* are close to each other on every side, and the anterior ones even touch in the central line. (See Pl. IV. fig. 5.) Between the *coxæ* I find two small points, of the importance of which I am not able to form an opinion. Of the following joints the first are the shortest, the last the longest; in gradual progression they are all nearly cylindrical; nevertheless the *femur* seems to be excavated above, the *tibia* slightly below. All the joints, with the exception of the last, are beset on the under side, at the extremity, and likewise in the centre, with bristles. The last is perfectly bare, at the extremity obliquely truncated above, and bears two hooked claws curved under a rather acute angle. Upon the under side of the body there is an annular pointed lamella which surrounds the fissure of the generative organs, fig. 5. *f*, as in *Diplodonta* and *Atax*. Of the cibarian organs I have only been able to distinguish the two *palpi*. These are nearly half as long as the anterior feet, filiform, and quinquarticulated. The first joint is very short; the second and third thick and cylindrical; the fourth the longest of all, likewise cylindrical, but much thinner; the fifth short and acute. Palpi and feet are nearly colourless, at the most yellowish.

Of the six genera which at present constitute the division of the Hydrachnæ, viz. *Diplodonta*, *Atax*, *Arrhenurus*, *Eulais*, *Limnochaeres* and *Hydrachna*, it agrees by the annular lamellæ surrounding the sexual apparatus and other characters, mostly with the first; but differs from them;—1, by the four *coxæ* being close on each side; 2. by the construction of the palpi, which in *Diplodonta* have at the fourth joint an apex of the length of the fifth;—*Atax* possesses a very long fourth joint, which at the extremity is somewhat excavated in order to receive in the outer bend the fifth joint. The other four genera differ still more: *Arrhenurus* and *Limnochaeres* by the very short palpi; *Eulais* by the palpi and the hips; and *Hydrachna* by the palpi, the beak, &c. It hence follows, that even disregarding the maxillæ not discovered by me, there are differences enough to justify the establishment of a new genus, which I call *Pontarachna*, and characterize as follows:—

Corpus subglobosum. Oculi duo, remoti. Mandibulæ . . . nullæ?

minimæ? Palpi duo, elongati, 5-articulati; articulo quarto longiori, quinto brevi, acuminato. Coxæ utriusque lateris unitæ, anticæ duæ in linea mediana quoque sese tangentes. Pedes unguibus duobus uncinatis terminati. Vulva lamina crustacea granulata cincta.

PLATE IV. Fig. 4. *Pontarachna punctulum*, Phil. Drawn magnified sixty times.

g. Nat. size.

Fig. 5. The body beneath, magnified ninety times.

d. The palpi.

e. The coxæ.

f. The plate surrounding the fissure of the generative organs.

7. *Desmophyllum Stellaria*, Ehrenberg. (Plate IV. fig. 6.)

The genus *Desmophyllum*, established by Prof. Ehrenberg in the Memoirs of the Berlin Academy, is not less remarkable by the characters of its calcareous stem, which is constantly unramified, and has fascicularly united lamellæ of the star (Sterne), than by its animal. In this the surprising thinness of the mantle is above all remarkable, which seems to be entirely missing, so that we can most distinctly perceive through it the cells at the margin of the star, nay, even the slightest roughness of the surface. Indeed the animal mass is in proportion to the calcareous mass a true minimum, and so retracts itself on the contraction of the animal into the cavities of the lamellæ, that I regarded the individual I received in this state for the mere house, long before deprived of its inhabitant. I have likewise observed the same on *Cladocora cespitosa*, Ehrenberg (*Caryophyllia*, Lamk.), while the animal mass of *Cladocora* (*Caryophyllia*) *Calycularis* is far more considerable, and even on drying remains as a pretty thick membrane. When the animal of *Desmophyllum Stellaria* has fully expanded itself, it projects about a line above the star, while the border to a good breadth seems to be without any animal envelope. The yellowish coloured oval *mouth*, surrounded by an inwardly and outwardly folded lip, is distinctly perceptible. True *tentacula* are missing; a greenish fleshy mass extends from the mouth to near the margin of the star, and is there drawn out into several folds, at the apex yellowish, which, however, do not evince any definite arrangement, yet generally exhibit two rows. When the folds are most distinct they project at the furthest only $\frac{1}{3}$ rd of a line; greater I have never seen, although I have preserved the animal alive, and observed it for several days. By this want of true *tentacula* the genus differs, likewise with respect to the animal, very essentially from *Cyathina*, Ehrenberg, where the *tentacula* are very regular, filiform, and orbiculate (geknöpft). All

the motions of the animal are in the highest degree slow and sluggish, which I have likewise observed in *Cyathina*, *Oculina* and *Cladocora*.

PLATE IV. Fig. 6. *Desmophyllum Stellaria*, Ehrenberg. Nat. size, sitting on *Nullipora Lithophyllum expansum*, Phil.

XV.—*Thoughts on the Equivocal Generation of Entozoa*. By JAS. L. DRUMMOND, M.D., Professor of Anatomy and Physiology in the Royal Belfast Institution, &c.

IN studying the *Entozoa*, one of the first things which demands our attention, is the peculiarity of the situations which they occupy. When we look abroad upon the features of the globe which we inhabit, we find that every part is filled with animal and vegetable life; whether we visit the frozen regions of the poles, or the countries for ever exposed to the heat of an equatorial sun, we see that every clime has its animals and plants, and these in general, so constituted in their structure and œconomy, as to be fitted peculiarly for the circumstances of the place in which they reside. The White Bear delights in the perennial snows and ice of its native region, and the Lion in the fervour of the torrid zone; but were they to change situations, the former would die from the excessive heat, and the latter would as certainly perish from the intolerable cold.

And so it is with the *Entozoa*; they have been ordained to inhabit, alone, the interior of other animals; and though many of them will live for several days when removed from that situation and put in water, yet that can only be deemed a lingering death, for at length they infallibly perish from the unnatural circumstances in which they are placed. It has been asserted, indeed, that some of the intestinal worms have been found living in other situations. Thus, Linnæus supposed that the Fluke-worm (*Distoma hepaticum*) was to be found in fresh water, as also the common Tape-worm in muddy pools, and the *Ascaris vermicularis* in marshes among the roots of decaying plants. (Rudolphi, i. 371.) But it has been shown by Muller and Rudolphi, that he had mistaken other external species of animals for true *Entozoa*; that his supposed Tænia and Fluke-worm were the *Planaria lactea*, and his *Ascaris vermicularis* a quite different animal.

But even admitting that a true entozoon should be found in a pool or rivulet of fresh water, still something more would be necessary to prove that such was its natural habitat. Every one knows that when an animal is infested with Tape-worm, portions of the latter are frequently ejected along with the

alvine excretions, and therefore the circumstance of a specimen being found in water inhabited by fish of any kind may amount only to this, that it had originally belonged to the fish. Thus the celebrated Muller, when travelling on the borders of Sweden, was told of a rivulet in which *Tæniæ* were to be found; he visited it accordingly, and satisfied himself that the account was true, by taking out of its water bundles of dead Tape-worms coiled together. But what then? Did he find anything more? Yes, he found quantities of the intestines of fish which had been thrown in by the fishermen, which fairly accounted for the presence of the worms. (Rud. i. 373*.) No one who has been in the practice of examining the intestines of fishes in pursuit of their living contents, will be surprised at this account, since the quantity of tape-worm sometimes found in them is often almost incredible. Thus in a salmon of eleven pounds weight, in July, 1838, I found a number of *Bothriocephali*, the longest of which was four feet ten inches, and their united lengths amounted to upwards of fifty-nine feet. In the common Cod their number is often very great, and in a middle-sized turbot I have found upwards of two hundred specimens of the *Bothriocephalus punctatus*, each measuring from ten to eighteen inches in length.

It would be unnecessary to dwell longer on this subject, as I believe all Helminthologists, and all who have considered it, are fully agreed that the *Entozoa* have their natural abode in the animal body alone, and that in any other situation they infallibly perish. But the more difficult question is, *how do they get there?*

This query cannot at present be satisfactorily solved, for the truth is that we know nothing of their origin; but I am not inclined therefore to suppose them to be the entities of equivocal generation, a doctrine still indulged in by naturalists and physiologists of high name and authority, and which formerly was generally embraced with regard to all animals occupying the lower links in the great chain of animated being.

But as the light of science burned bright, innumerable errors were by slow degrees seen into, and have long since ceased to blot the page of truth. They arose out of ignorance; and to a similar origin we are, I believe, to attribute the theory of equivocal generation, whether it be applied to a fungus,

* At a place about a quarter of a mile beyond Belfast Bridge, on Ballymacarret Strand, where worn-out horses are slaughtered, I have more than once seen dead *Tæniæ* in a pool of water, but there could be no doubt that their original habitat had been the intestines of the slaughtered animals, dragged to the said pool by dogs, or kicked into it by idle boys.—J. L. D.

an animalcule, or an entozoon. We know not how a mucor originates on a decaying vegetable or animal matter, nor how millions of animalcules appear in a vegetable infusion, nor how an entozoon shows itself in the intestines or the brain of an animal; but because we do not in our present state of knowledge understand these things, are we to fall into the error of the ancients, and attempt to explain, by what seems next to an impossibility, their appearance on the supposition of a spontaneous generation? Some of these obscure animals have an organization so perfect and admirable, that to me it would seem almost as consonant to reason and sense to attribute the formation and œconomy of an elephant, or I might say, of man himself, to equivocal generation, as theirs.

To some, however, there seems to be no difficulty in the matter; and it is stated with great confidence, that because a clot of effused lymph from an inflamed serous surface becomes organized and sensible, so it is quite easy to conceive that a living worm may be equally produced from unorganized matter; the only difference between the two being this,—that the organized lymph continues adherent to the matrix, while the other is cast off as a separate being.

But that the analogy between an organized portion of lymph and an entozoon is extremely remote, can, I think, be easily shown; there is, indeed, a gap between them which can never be filled up. In the first place, the effused lymph in the example alluded to, however organized it may be, is a constituent, though I grant an unnecessary and superfluous part, of the body to which it is attached; but it is a natural product of that law of the animal œconomy, by which it throws out lymph from inflamed serous membranes, and from the sides of wounds, into which the vessels pullulate for the purpose of uniting the dissevered or adjacent surfaces. It is, in fact, a product of the adhesive action, or adhesive inflammation, as the common term is, and has no life whatever independently of the life of the part on which it is situated. However extraneous or unnecessary to the animal which has produced it, it has no vitality independent of the life of that animal of which it is now an integrant part, and its separation from which is its immediate death.

Again, I would remark, that no growth from effused lymph is ever seen showing any mark of independent life, or in the state of passing from a dependent to an independent vitality. No instance has ever occurred of effused lymph, however organized it may have become, exhibiting, as in the postic fictions of the animals formed from the mud of the Nile, one part as merely organized lymph, and another assuming the

form and functions of a worm. Nor further, has any entozoon been found in a semi-state of formation. There is never any intermediate stage in which it can be shown that the animal is in its transit from an accidental origin to the more perfect state, in which it shall exhibit a complex and independent organization, and like other animals, have organs for the continuation of its species. It would, indeed, require no inconsiderable stretch of imagination to conceive that a portion of effused lymph could assume to itself the power of producing other similar, or rather very dissimilar portions, which would propagate their kind from generation to generation, in *secula seculorum*; for I incline to the belief that the *Tæniæ* and *Lumbrici* of Hippocrates were as much the progenitors of those found at the present day, as were the men and women of his time the ancestors of those now living in the nineteenth century.

In considering the formation of any animal, we cannot move a step without reference to an all-powerful architect; in every structural part, in every function, in every action, in every instinct of such animal, we perceive so great a degree of contrivance, creative power and wisdom, that the conviction is forced upon us that these cannot be the work of chance, that "there cannot be design without a designer; contrivance, without a contriver; order, without choice; arrangement, without anything capable of arranging; subserviency and relation to a purpose, without that which could intend a purpose; means suitable to an end, and executing their office in accomplishing that end, without the end ever having been contemplated, or the means accommodated to it*." Yet, in the doctrine of spontaneous generation all these are dispensed with; we have "contrivance without a contriver, and design without a designer," and a number of atoms collected together form themselves into wonderfully fabricated and sentient beings, independent of those conditions by which other organized bodies are produced. An insensible mass of matter will, we know, become developed into a living being of most complicated structure and wonderful œconomy; an egg will be hatched into a peacock, but the egg could never have existed but for its female parent, nor could it ever be hatched into the living bird without having received the permanent vital principle from its male progenitor, in obedience to those laws ordained by the Deity when the first male and female peacock were created; but the beings of equivocal generation are independent of all such laws; of the contrivance which they display

* Paley's Natural Theology.

they themselves are the contrivers, of the design the designers.

Let us then suppose that a portion either of effused lymph or extravasated blood, or any other substance, is about to go through the process of converting itself into an intestinal worm, and consider what it has to do to effect so complete a metamorphosis; we must suppose that before it assumed its independent and distinct life, the first object would be to form for itself a mouth and an alimentary canal for its future support, a gastric juice of course, and the other necessaries for the function of digestion; now even this, in a particle of matter destitute of mind or intelligence, as is the peacock's egg, would seem to border a little on the miraculous.

Well, then, having provided for what many consider the most important business of life, the eating function, what has it to do next? Why to shake off the homely and ungraceful form of its embryotic clot, and assume the elegant gracility of an ascarid, or a *Spiroptera*, or the broad and jointed amplitude of a tape-worm, the polymorphous structure of a *Scolex*, or the inextricable complexity of a *Distoma*.

Having settled this point, the clot has next to regulate its growth; clots are of very various dimensions, but the *Entozoa* are as certainly defined in their limits of magnitude as any other class of animals. Well, then, it must be obvious, that a clot larger than the species into which it is to be converted must fine itself down to the proper size, or if too small, plump itself up to the same; but by what mysterious power it can do this I profess not to understand.

Having got so far, however, in its own creation, what has it next to do? To cover itself with a proper skin; and in this great taste is often exhibited, the integument of many worms offering a very beautiful appearance; and observe the wonderful phænomenon connected with this. The Deity has spread over the surface of animals and plants (I mean such as He is acknowledged to have formed) an insensible covering, the cuticle, to serve as a protection for the parts beneath. And what does the clot do? Why just the same thing; it covers itself with a cuticle too; though indeed we need not wonder much at this, after its having made for itself an alimentary canal and bestowed upon it the function of digestion.

But the work is not yet completed; motion is not yet provided for, a muscular apparatus is therefore next to be fabricated; first, for the motion of the whole body, and next, for that of individual parts; and so perfectly is this accomplished, that it often forms a source of disappointment and vexation to the investigator of these animals. Some of the nematoid

worms roll themselves up so pertinaciously by the action of their longitudinal muscles, that it is with the utmost difficulty the ends of the animal can be so straightened as to be distinctly seen ; and the muscles of the head and bothria in some species, as in several of the *Bothriocephali*, and particularly in the *Scolex polymorphus*, are in such perpetual activity, and cause so many changes of figure, that hours at the microscope are necessary before we can obtain a satisfactory knowledge of the structure of the head.

It so happens that some species have a much smaller muscular strength and activity than others, as, for instance, the *Echinorhynchi* ; and these might be readily carried through the alimentary canal of the animal in which they reside, had they their muscular power alone to trust to. And how does the clot provide for this ? It forms a trunk or proboscis of exquisite workmanship, which it arms on all sides with sharp horny hooks ; it forms muscles for the especial purpose of pushing out this proboscis, and others for drawing it in at pleasure into a sheath specially provided for it ; moreover, this proboscis is so fashioned that it can be inverted or everted upon itself, that is, it can be pushed out or retracted as a snail does its horn, without which second kind of motion it would be imperfect ; and thus by its twofold motion and its armament of rigid hooks, the proboscis is harpooned into the mucous coat of the intestine at the pleasure of the worm, which latter is thereby secured from removal by the pressure of the passing contents of the bowel. Some species, not content with one proboscis, provide themselves with four, and these in some of the armed *Bothriocephali* present one of the most beautiful microscopic objects to be found in nature.

But the work is not yet complete ; sensation is further wanted. We are to suppose, that as the animal has acquired a digestive apparatus, it has superadded to this the sense of taste ; but at all events it has the sense of touch, and therefore has provided for itself a system of nerves ; for without a nervous system in some form or another, none, I presume, will insist that there can be sensation. With regard to the sense of smelling I say nothing ; and persons who consider such subjects, would perhaps be of opinion that the entozoic life would be as comfortable without as with that sense. But as respects seeing, since organs of vision would be altogether superfluous in habitats where midnight darkness holds perpetual reign, we find accordingly that in no instance have the *Entozoa* provided themselves with eyes.

Let us next suppose that the clot, which has thus so marvellously metamorphosed itself into an entozoon of admirable

structure, with its organic and animal life, its digestive, motive, and sensitive organs and functions, feels quite comfortable, and wishes to perpetuate its happiness in the continuation of its race or family to future individuals like itself, that it possesses the phrenological organ of philoprogenitiveness,—what will it do?

It will do this, what the Creator has done with the creatures formed by his own hand; it will provide itself with ovaries for containing eggs, the germs of future beings like itself; but how it is to form these, and how it is to impart to them the capability of being hatched into the identical resemblance of their parent, I pretend not to explain.

But we know that even when eggs are formed there is a very essential requisite necessary for bringing them into active life. They must have a certain vivifying power, without which they will remain as dead matter, and the fond hopes of the maternal parent will be frustrated unless this vital influence can somehow or other be procured. The task, then, next to be accomplished, is to provide this male influence; and we find that many species are androgynous, that is, the clot having produced its ovaries and ova, next fabricates organs for secreting the vivifying fluid, by whose presence the ova shall obtain the power of being developed into worms of the same formation and structure as their wonder-working parent.

Yet surprising as all this may appear, the climax is not yet arrived at. The *Ascarides* and some other genera are not androgynous or hermaphrodite, but distinctly male and female. Now on the principle of equivocal generation, it must be evident that the effused lymph or clot has the power of metamorphosing itself not only into a worm, but into a worm of either sex, as it may choose to determine; and it is equally obvious, that two clots must consult together in order to determine into what species they shall by mutual agreement become transformed. This must be absolutely necessary; there must be a predetermined arrangement between the two; for without this millions of males might be formed without one corresponding female, and millions of females be condemned to live and die in single blessedness.

These and many other wonders, or rather impossibilities, we must have recourse to, in order to support the theory of spontaneous generation; a theory which, in my mind, is as inconsistent with all that we observe of the operations of nature, as those which in the days of ignorance taught that putrid flesh of itself generated bees, that vapour influenced by an east wind changed into *Aphides*, and that the *Lepas anatifera* grew upon trees, and dropping into the sea became at length the barnacle goose.

And why should we have recourse to this theory of equivocal generation in order to account for the formation of the *Entozoa*? Precisely for the same reason that our progenitors indulged in the erroneous notions alluded to. They cherished the absurdity, because they were ignorant of the truth. They did not know that insect ova were hatched into maggots, and that maggots change into flies; and as the place of breeding of the barnacle was not known, they were determined to give it some origin, and they did so on grounds just as valid as those on which some modern physiologists rest the spontaneous origin of entozoic worms. The tentacula of the *Lepas* resemble feathers; why then should the shell not grow up to be a goose? An effused clot of lymph will become organized; why then should it not grow into a Tape-worm? The reasoning on the one side is just as good as on the other; but we may hope that a time will come when we shall have as direct proof of the origin of the entozoon as we have of that of the barnacle. At present, it is true, we are completely in the dark respecting the origin of worms in the interior of other animals; but it is better, more philosophical, more like genuine disciples of truth, to confess our ignorance, than to adopt a theory which is in direct opposition to what occurs in every department of organized nature with which we are properly acquainted.

For my own part, I can no more conceive that *Entozoa* are the creatures of chance than the animals they inhabit; though as to the manner of their origin, of which so little as yet is known, I pretend to go no further than is expressed in the old distich,—

The things we know are neither strange nor rare,
But wonder how the devil they got there.

Got there as they will, however, their possession of a distinct and independent life, their having sensation, voluntary motion, generative organs and functions, a digestive apparatus and other attributes of animals, while they exhibit the most minute, elaborate and exquisite workmanship, and also display the most unquestionable proofs of their whole composition, both general and partial, having been fabricated with the utmost wisdom and adaptation to their mode of life, show as clearly as if the proofs were written with a sunbeam, that they cannot be beings of fortuitous origin; that they are the offspring and work of the same Almighty hand which formed all the other races of animated being; and that to suppose their admirable formation to be the result of a kind of chance, is to impart to unintelligent matter that power and wisdom which belong only to the Deity himself.

XVI.—*Catalogue of the Land and Freshwater Mollusca of Ireland.* By WM. THOMPSON, Vice-President of the Natural History Society of Belfast.

[Continued from p. 34.]

Gen. 5. SUCCINEA, Drap.

1. *S. putris*, Flem., Jeff. Gray, Man. p. 178†.
S. amphibia, Drap. p. 58. pl. 3. f. 22; *Turt. Man.* p. 91.
Helix putris, Linn. *Mont.* p. 376. t. 16. f. 4.

Is generally distributed throughout Ireland. Specimens agreeing with the var. β . of Draparnaud—"major solidior, colore carneo"—in form (see pl. 3. f. 23.), colour, and more than ordinary thickness, though not in being larger than usual, are occasionally met with. The varieties γ † ("media magis elongata et colorata") and δ ("minor, apertura ovata") are found in the north. Individuals of this species, which adhere to stones in wet spots at a considerable elevation in the northern mountains, are, as may be expected, invariably much dwarfed in size.

2. *S. Pfeifferi*, Rossm. Gray, Man. p. 179. pl. 6. f. 74.*
S. gracilis, Alder, *Mag. Zool. and Bot.* vol. ii. p. 106.
S. Amphibia, b. *Pfeiffer*, p. 67. t. 3. f. 37.

Although less common than the last, this species or variety is widely diffused over the island—in the north it is not uncommon, and is here generally of the same amber colour as *S. amphibia*; as likewise are English specimens which I owe to the kindness of Mr. Alder; specimens of a reddish horn-colour, and much thicker than usual, have occasionally occurred to me in the north, and in quantity they have been obtained by Mrs. Patterson of Belfast, near Portarlington. Mr. Humphreys notices this shell under the name of *S. oblonga*, Turt., as found about Cork, and by this appellation Mr. Harvey mentions Ballitore (county Kildare) and Limerick as habitats, adding at the same time—"animal darker than in the last [*S. amphibia*], and found in far wetter places." From Finnoe (county Tipperary) I have been favoured by Mr. E. Waller with typical specimens of this *Succinea*, as admirably represented in Gray's Manual (f. 74*).

6. BULIMUS§, Bruguiere.

1. *B. obscurus*, Drap. p. 74. pl. 4. f. 23; Gray, Man. p. 183. pl. 6. f. 63; *Turt. Man.* p. 81. f. 63.
Helix obscura, Mull. *Mont.* p. 391. t. 22. f. 5.

† Wood-cut, p. 178.—The coloured figure, pl. 6. f. 73, seems to me to partake as much of the form of *S. Pfeifferi* as of *S. putris*.

‡ This is probably *S. Pfeifferi*.

§ *Bulimus Lackamensis*, Flem. Gray, Man. p. 181. pl. 6. f. 62.

B. montanus, Drap. p. 74. pl. 4. f. 22; *Turt. Man.* p. 80. f. 62.

Helix Lackamensis, *Mont.* p. 394. t. 11. f. 3.

In Capt. Brown's 'Irish Testacea' this species appears under its original

This species is very local. In his 'Irish Testacea' Capt. Brown notices "one specimen [procured] on a dry mud wall near Cloonooey," p. 529. About the roots of trees in the demesne of Woodlands near Dublin, I have, accompanied by Mr. R. Ball, obtained specimens, the shells of all of which, adult as well as immature, were like those sent me from other localities, and according to the observations of authors, covered with earth. From La Bergerie, Portarlington, I have been favoured with specimens by the Rev. B. J. Clarke. In March, 1837, it was supplied me in quantity from Larne, county Antrim, by Mr. James Manks. From the Falls of Clyde (Scotland), I have specimens collected by W. H. Harvey, Esq.

Animal, rather dark grey above, lighter towards the disk, and when viewed under a lens appearing closely marked all over the back and sides, with darker spots and markings so disposed as to render it very beautiful; disk very pale grey. Tentacula cylindrical, stout, and club-shaped; the upper of ordinary length, the lower short.

2. *B. acutus*, "Brug." Drap. p. 77. pl. 4. f. 29, 30; Gray, Man. p. 185. pl. 6. f. 67.

B. fasciatus, *Turt. Man.* p. 84. f. 67.

Turbo fasciatus, *Penn. Mont.* p. 346. t. 22. f. 1.

This is a local species, but found from north to south—from the neighbourhood of the Giant's Causeway to Youghal. It is especially common on marine sand-banks and pastures, but in remote inland localities is likewise native. It would seem to be more common to the eastern than the western portion of the island, but in the latter it has occurred to me about Ballyshannon, county of Donegal. I have occasionally observed this species inhabiting the crevices of walls at a considerable height, as those of Howth church, county Dublin. M. Michaud remarked on some Irish specimens of this most variable species which I contributed to his collection, that they were the *B. articulatus*, Lam.

3. *B.† lubricus*, "Brug." Drap. p. 75. pl. 4. f. 24; *Turt. Man.* p. 82. f. 65.

name, as last quoted, but no locality is assigned to it. Having written to Capt. Brown on the subject, he very kindly supplied me with the following note under date of April 9, 1840:—"I found the *Bulimus montanus* on the sloping banks below an old castle about four miles from Maryborough, Queen's county, the name of which I cannot remember: it is, however, on the road between Maryborough and Stradbally. I also found it on a limestone gravel ridge near Maryborough, not a mile distant. I afterwards met with it among debris on the mountains of Mourne, close to the sea-shore." As *B. Lackamensis* and *B. obscurus* differ little from each other, except in size, and as the period when the localities just alluded to were visited by this author is now so far distant, it would seem to me, judging from other circumstances connected with the species, that a large variety of *B. obscurus* may not improbably be the shell thus referred to.

† In ignorance of the generic name—*Cionella*, Jeffreys; *Achatina*, Alder; *Zua*, Leach, as adopted by Gray, which this species should properly bear,—I use the older appellation of *Bulimus*.

Zua lubrica, Gray, *Man.* p. 188. pl. 6. f. 65.

Helix lubrica, Mull. *Mont.* p. 390. t. 22. fig. not good.

Is common, and generally distributed over Ireland. From under stones on the dry mountain side at Wolfhill, near Belfast, and on sea-side pastures I have obtained a few specimens of a handsome variety, of a pale grey colour and transparent, with a white peristome; in such localities this shell does not present to the same degree the rich amber colour and brilliant polish which it does in woods or shady places. The animal is blackish. From an examination of the food contained in seven Starlings (*Sturnus vulgaris*), shot at different places in the north of Ireland, from the month of December to March, during a mild winter, it would appear either that the *B. lubrica* is a special favourite, or that its haunts are similar to those of the bird; as six of the Starlings, in addition to *Helices* and other food, contained specimens of this shell varying from five to thirteen in number.

7. ACHATINA, Lam.

1. *A. Acicula*, Lam. Gray, *Man.* p. 191. pl. 6. f. 71; *Turt. Man.* p. 89. f. 71.

Bulimus Acicula, *Drap.* p. 75. pl. 4. f. 25, 26.

Buccinum terrestre, *Mont.* p. 248. t. 8. f. 3.

This handsome species is found sparingly, but from east to west, in the more southern half of Ireland. Mr. W. H. Harvey has procured it on the "sand-hills, Miltown Malbay, and from under stones near Limerick," but in the latter locality marks it as "very rare." Mr. T. W. Warren of Dublin, has supplied me with specimens procured by him on different occasions in the rejectamenta of the river Dodder near that city. At La Bergerie (Queen's-county), it is found by the Rev. B. J. Clarke; and at Finnoe (county Tipperary), by Mr. Edw. Waller; by Miss Ball at Castle-martyr demesne (county Cork); and by Miss M. Ball at Dromana (county Waterford).

For the *Cionella elongata*, Jeff. noticed with doubt as Irish by Mr. Jeffreys, *Linn. Trans.* vol. xvi. p. 348. see Gray's Manual, p. 18. under *Achatina octona*.

8. PUPA, Lam.

1. *P. umbilicata*, *Drap.* p. 62. pl. 3. f. 39, 40; Gray, *Man.* p. 193. pl. 7. f. 78; *Turt. Man.* p. 97. f. 78.

Turbo muscorum, *Mont.* p. 335. t. 22. f. 3.

This is one of the most common of the testaceous Mollusca throughout Ireland and her islands, and especially abundant where limestone and chalk prevail. From the sea-shore to a great elevation in the mountains it is found †. It is subject to considerable va-

† Mr. Alder, with reference to Newcastle-upon-Tyne, remarks of this species—"under stones, common; seldom in moss" (*Newc. Trans.* vol. i. p. 33); in Ireland it is common among mosses and lichens in suitable localities.

riety in form and colour; the toothless var. not unfrequently occurs, and on a sea-bank at Belfast Bay I once obtained a specimen with two teeth †, but differing in no other respect from the ordinary shell, I cannot consider it otherwise than an accidental variety of *P. umbilicata*. Specimens whitish and opaque, like "dead shells," not unfrequently occur containing the living animal. Occasionally in the north, at the South Islands of Arran, and about the lakes of Killarney, I have procured a few individuals of a crystalline transparency, the elegance of their appearance being much enhanced by the pure white margin of the peristome. The animal is of a very pale grey colour.

2. *Pupa Anglica*, Alder. Gray, Man. p. 195. pl. 7. f. 82.

Vertigo Anglica, Fer. Turt. Man. p. 102. f. 82.

This species, considered peculiar to England when described by Ferussac, and in the very latest work treating of the British land Mollusca having only the localities—"north of England, Northumberland, Lancashire," attributed to it, is found in the north and south, in the east and west of Ireland; but at the same time is by no means general, or, except in particular spots, plentiful, like *P. umbilicata*. Under stones, on marsh plants, in wet moss, &c. it harbours. I first met with it in June, 1833, in the county of Londonderry, at the side of the river Bann near its junction with the ocean; in numerous localities throughout Down and Antrim, and in the demesne of Florence-court, county Fermanagh, it since occurred to me; in the west on the mountain of Benbulbin in Sligo; in the south about O'Sullivan's cascade, at the lower lake of Killarney; and in the east in the Glen of the Downs, county Wicklow. Mr. W. H. Harvey obtained this species "near Ballitore and on the sand-hills, Miltown Malbay," but notes it as very rare. In the collections of Mr. T. W. Warren and Mr. Edw. Waller of Dublin, are specimens procured by the former gentleman at Ardmore (county Waterford), and in the neighbourhood of the metropolis; and by the latter at Annahoe, county Tyrone—near Portarlinton it is found by the Rev. B. J. Clarke, and by the Rev. T. Hincks near Cork, where it is "abundant in wet moss." In England I have collected the *P. Anglica* at Twizel House, Northumberland; in Scotland about Ballantrae, Ayrshire.

The shells of this *Pupa* commonly vary in colour from pale greyish brown to a deep reddish shade of this colour, and are rarely of a glassy transparency: the margin of the mouth and teeth are generally of the colour of the shell, but sometimes pure white. Mr. Gray having had the opportunity of consulting the work only of M. Michaud, refers his *Pupa tridentalis* with doubt to this species, but from having been favoured by its describer with specimens of this shell from the neighbourhood of Lyons, I can state with certainty that it is en-

† Capt. Brown, in his 'Illustrations,' &c. quoting Pfeiffer, notices his *P. bidentatus* as a Portmarnock shell. My specimen is not identical with what Pfeiffer figures. Rossmassler does not consider *P. bidentatus* distinct from *P. marginata*. See Rossm. Part I. p. 83; and Gray, Man. p. 197.

tirely distinct from *P. Anglica*, and a species unknown as British. Mr. Gray makes Pfeiffer's *Pupa bidentata*, 1. 59. t. 3. f. 21, 22, synonymous with *P. Anglica*, but judging from the diagnosis and figures I cannot think them the same.

3. *Pupa marginata*, Drap. p. 61. pl. 3. f. 36—38; Gray, Man. p. 196. pl. 7. f. 79†; Turt. Man. p. 98. f. 79.

Is common, and although not generally diffused, is found from the extreme north to south, and east to west of Ireland. It is particularly partial to the sand-hills or pastures bordering the coast, and to marine islets, as those in Strangford lough—in the inland parts of the country it likewise occurs. The tooth is rarely visible: specimens containing the living animal are not unfrequently of a whitish colour‡.

9. VERTIGO, Müller.

1. *V. edentula*, Alder. Gray, Man. p. 199. pl. 7. f. 80; Rossmassler, x. p. 28. tab. 49. f. 646.

Pupa edentula, Drap. p. 59. pl. 3. f. 28, 29; Turt. Man. p. 99. f. 80.

This species is found from north to south of Ireland. Since September, 1832, I have met with it in numerous localities throughout the counties of Down and Antrim, at the Glen of the Downs in Wicklow, and in shell-sand from Portmarnock (county Dublin). Anahoe, county Tyrone, Mr. E. Waller—La Bergerie, Queen's-county, Mrs. Patterson (of Belfast)—neighbourhood of Cork, Rev. T. Hincks. The typical form of *V. edentula* I generally find under stones; the elongated and cylindrical variety in woods—in autumn and winter this latter is most readily obtained on the fallen leaves of trees; in summer, on the under side of the fronds of ferns (*Aspidii*, &c.), the shell and plant, though the naturalist only will perceive the former, being in beauty equally attractive. This elongate variety has seven and occasionally even eight volutions, and attains the length of $1\frac{1}{2}$ line: when of this size, the animal §, so very minute relatively to the shell, has a grotesque appearance when bearing this along, which is carried singularly erect, not more out of the perpendicular than the leaning tower at Pisa! This variety, judging from descrip-

† The larger wood-cut at p. 197, representing this species magnified, is the most characteristic in the work. Rossmassler's figure 323 is particularly good.

‡ *Pupa junipera*, Alder. Gray, Man. p. 197. pl. 7. f. 81.—Turbo juniperi, Mont. p. 340. t. 12. f. 12.

P. Secale, Drap. p. 64. pl. 3. f. 49, 50.—Vertigo Secale, Turt. Man. p. 101. f. 81.

In a list of additions to the Irish Fauna published in the Lond. and Edin. Phil. Mag. 1834, p. 300, this species was enumerated in consequence of my having been assured that specimens which I saw in a Dublin collection were found in this country—their owner now believes that they must have been brought from England.

§ When adult, the animal varies in colour from greyish-white to blackish-grey.

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tion and figures, is perhaps the *Pupa inornata*, Michaud, Comp. p. 63. pl. 15. f. 31, 32, apparently differing from it only in size—it is described to be two lines in length: my largest specimen is $1\frac{1}{2}$ line, but this discrepancy is not greater than might be anticipated between individuals obtained in the north of Ireland and at Lyons, where the *P. inornata* was discovered. I at first thought this var. might be *Pupa muscorum*, Drap. (Phil. Mag. 1834, p. 300.), but specimens of this shell from Montpellier, since sent me by M. Michaud, prove that it is not so—these are identical with examples of *Pupa cylindrica*, which I have collected at Salisbury Craigs near Edinburgh, a locality in which this rare species was discovered by Mr. E. Forbes.

2. *Vertigo pygmæa*, Fer. Gray, Man. p. 201. pl. 7. f. 83; Turt. Man. p. 103. f. 83.

Pupa pygmæa, Drap. p. 60. pl. 3. f. 30, 31.

This is the most widely distributed species of *Vertigo* over Ireland, occurring throughout the country. It is generally found but sparingly where it does prevail, and is most easily procured under stones, both in dry and wet situations, from the sea-shore to a high elevation in the mountains. The usual number of teeth is four, of which one is central on the upper or body portion.—On a sea-bank, Belfast bay, I once met with a *Vertigo* resembling the ordinary *V. pygmæa* in every respect, but with the addition of a tubercle, about the size of one of the teeth, placed *outside* the mouth and near the junction of the outer lip with the body volution. Animal dark lead colour, or rather blackish-gray above, disk blackish-gray anteriorly, becoming suddenly paler, so as to be nearly white at the opposite extremity.

3. *Vertigo substriata*, Alder. Gray, Man. p. 202. pl. 7. f. 84.

V. sexdentata, Turt. Man. p. 103. f. 84.

This species, though rare, has a wide distribution in Ireland. In the glen at Holywood House (county Down), I obtained specimens in 1832, and subsequently in shell-sand from Portmarnock (county Dublin). Mr. W. H. Harvey gives as habitats "Miltown Malbay, and near Limerick—rare at Ballitore (county Kildare)." In the neighbourhood of Ballantrae, Ayrshire, this *Vertigo* has occurred to me. Reference alone to Montagu's specimens would seem to prove whether his *Turbo sexdentata*, p. 337, be this species, as his description is partly applicable to this (in number of teeth), and partly to *V. palustris* (in being smooth)—the locality in which it was found would be more suitable to the latter: the figure in 'Testacea Britannica,' throws no light upon the subject.

4. *Vertigo palustris*, Leach. Gray, Man. p. 204. pl. 7. f. 85; Turt. Man. p. 104. f. 85.

V. septemdentata, "Fer." Rossm. Icon. x. p. 28. tab. 49. f. 647.

In numerous localities throughout the counties of Down and Antrim I have since 1832 procured this well-marked species, which,

as its name denotes, is an inhabitant of the marsh: it nevertheless seems invariably to be not only free from dirt, but presents a high polish. By the Rev. B. J. Clarke the *V. palustris* has been obtained near Portarlington, and by Mr. Edw. Waller at Finnoe, Tipperary. In England I have procured it near Twizel, Northumberland, and in Scotland in several localities around Ballantrae. Mr. Gray, in the Introduction to his edition of Turton's Manual, mentions the *V. palustris* and *V. angustior* to "have been only yet recorded as found near London and in the west of England," p. 37—in 1834 I published both species as indigenous to Ireland. Phil. Mag. 1834, p. 300. Reference to this communication, though a mere list of species of land and freshwater Mollusca previously unrecorded as Irish, would have shown that several species noticed in the Manual as local, have a considerable range of distribution.

5. *Vertigo pusilla*, "Müll." Jeffreys, Linn. Trans. vol. xvi. p. 361. Gray, Man. p. 205. pl. 7. f. 86.

V. heterostropha, Leach. Turt. Man. p. 105. f. 86.

Pupa *Vertigo*, Drap. p. 61. pl. 3. f. 34, 35.

Is very rare, but has been found in the north-east and west of the island. From under a stone on a dry bank in Colin Glen, near Belfast, I obtained a specimen in 1832, as Mr. Hyndman did in an adjacent glen some time afterwards; in shell-sand from Portmarnock I have detected it, and Mr. Harvey has supplied me with a specimen from Miltown Malbay, where he states the species is very rare. A shell from Flanders, favoured me by M. Michaud, under the name of "*Pupa Vertigo*, Drap. (*Vert. pusilla*, Mich.)," is identical with that under consideration.

6. *Vertigo angustior*, Jeffreys. Linn. Trans. vol. xvi. p. 361; Gray, Man. p. 205.

Turbo *Vertigo*, Mont. p. 363. t. 12. f. 6.

In 1833 I was favoured by Mr. W. H. Harvey with specimens of *Vertigo* labelled "*V. heterostropha*, two species, from the sand-hills Miltown Malbay, the smaller common, the larger very rare." The smaller are of this species, which has always seemed to me distinct from the *V. heterostropha* of Drap. and of Turton's Manual. A comparison of Montagu's Turbo *Vertigo* (tab. 12. f. 6.) with the *V. heterostropha* in the works just mentioned, will show the obvious difference. To Mr. Jeffreys the merit is due of clearly distinguishing these species. Since 1834, when this *Vertigo* was published as indigenous to Ireland, I have not obtained any more information respecting it.

10. BALÆA, Gray.

1. *B. perversa*, Flem. Gray, Man. p. 207. pl. 6. f. 70.

B. fragilis, Gray. Turt. Man. p. 87. f. 70.

Pupa *fragilis*, Drap. p. 68. pl. 4. f. 4.

Turbo *perversus*, Mont. p. 355. t. 11. f. 12.

This species is generally distributed over the island. Its favourite

abode is on the stems and branches of trees, where it shelters itself beneath the loose bark or in its crevices; and on trees whose bark from smoothness will not afford it shelter, this *Balæa* lurks in the mosses and lichens which adorn them—in the tufts of these cryptogamous plants I have remarked it buried, whilst the *Vertigo edentula* displayed itself at the outside.

11. CLAUSILIA, Drap.

1. *C. bidens*, Drap. p. 68. pl. 4. f. 5—7; Gray, Man. p. 212. pl. 5. f. 53.

C. laminata, *Turt. Man.* p. 70. f. 53.

Turbo laminatus, *Mont.* p. 359. t. 11. f. 4.

Is a rare and local species in Ireland. The first native specimens I have seen were in the collection of Mr. T. W. Warren of Dublin, who had procured them in Belamont Forest near Coothill, county Cavan. In Sept. 1837 I had the gratification of seeing numbers of this fine *Clausilia*, after heavy rain ascending the stems of stately trees in the demesne of Florence Court, county Fermanagh, the seat of the Earl of Enniskillen. At Dovedale, in Derbyshire, I have met with it.

2. *Clausilia nigricans*, Jeffreys. Gray, Man. p. 217. pl. 5. f. 58.

C. rugosa, *Drap.* p. 73. pl. 4. f. 19, 20; *Turt. Man.* p. 74. f. 58.

Turbo bidens, *Mont.* p. 357. t. 11. f. 7.

Is very commonly distributed over Ireland and the surrounding islands. It is an extremely variable species in being more or less ventricose, in the striæ being obscure or prominent, in the form of the mouth, and occasionally even in the number of internal lamellæ—the largest specimen I have found in the neighbourhood of Belfast is $7\frac{1}{2}$ lines in length, and has thirteen volutions; several others of the usual length of 6 lines have likewise this number. The colour commonly varies from a very pale greyish-white to deep reddish-brown; very rarely specimens of a glassy transparency occur, and in such of these as I have found, the animal was equally colourless. To Mr. Gray, Mr. Alder, and Mr. Forbes, I have shown the specimens differing as here described, and they agree with me that they must all be considered *C. nigricans*†.

Fam. 4. "AURICULADÆ."

Gen. 1. CARYCHIUM, Müller.

1. *C. minimum*, Müll. Gray, Man. p. 221. pl. 7. f. 77; *Turt. Man.* p. 96. f. 77.

Auricula minima, *Drap.* p. 57. pl. 3. f. 18, 19.

Turbo Carychium, *Mont.* p. 339. t. 22. f. 2.

This minute species is commonly distributed over Ireland, and

† Since the above was written the fine work of Rossmassler has been consulted, in which numerous varieties of *C. nigricans* or "*C. rugosa*" are admirably represented. Icon. part 7. p. 23. fig. 477—487. The *C. obtusa*, Pfeiffer, which is common in Ireland, is here included (and judiciously I consider) as a var. of *C. rugosa*.

may be found in moss, on decaying leaves and wood, under stones, &c., in dry as well as wet places, though the latter are its favourite abode—in the north of the island specimens rarely attain one line in length.

Gen. 2. АСМЕ, Hartmann.

1. *A. fusca*, Gray, Man. p. 223. pl. 6. f. 66.

Auricula lineata, Drap. p. 57. pl. 3. f. 20, 21.

Bulimus lineatus, Turt. Man. p. 83. f. 66.

Turbo fuscus, Boys and Walker. Mont. p. 330.

Is rare in Ireland, but is widely distributed, being found over the island. Mr. W. H. Harvey was the first to find and distinguish this species as a native—he notes it as not uncommon on the sand-hills in Miltown Malbay, where in 1826 he procured both the ordinary form and the variety with the spires reversed. This shell has been procured by Mr. Hyndman and myself in various localities in the counties of Down and Antrim, but not more than three or four individuals have been obtained on any one occasion. I have more than once found this shell, containing the living animal, under stones on bare clayey banks, in which situations the only other mollusk met with was *Helix chrysellina*. At Annahoe (county Tyrone), Mr. Edw. Waller has obtained the *A. fusca* (both a. and b. Turton, p. 83.); as Mr. T. W. Warren has done in the neighbourhood of Dublin, and the Rev. B. J. Clarke at La Bergerie, Queen's county. The Rev. T. Hincks of Cork, favours me with two southern habitats—Ballinhassig Glen (county Cork) and near Mucruss, Killarney (county Kerry).

Fam. 5. LIMNÆADÆ, Jeffreys.

Gen. 1. LIMNEUS, Drap.

1. *L. auricularius*, Drap. p. 49. pl. 2. f. 28, 29, 32; Gray, Man. p. 232. pl. 9. f. 100; Turt. Man. p. 117. f. 100; Rossm. Icon. 1. 98. t. 2. f. 55.

Helix auricularia, Mont. p. 375. t. 16. f. 2.

Through deference to those who have paid much more attention to the subject than myself, I note this *Limneus* under the head of a distinct species, although I am disposed to believe that it is only an extreme form of *L. pereger*. The *L. auricularius*, as figured in both editions of Turton's Manual, and by Draparnaud, is not very unfrequent in Ireland, but of the extremely expanded form represented by Rossmassler is very rare, and from one or two still ponds only, abounding in subaquatic plants of various species, have I seen it. Pfeiffer's figure (part 1. t. 4. f. 17, 18.) is somewhat intermediate between those just mentioned, and corresponding to it I have procured specimens. All forms, from the ordinary *L. pereger* to the *L. auricularius*, it seems to me may be closely traced blending into each other—reference to the figures in many works will be found to present various forms, though in all the aperture is greatly expanded. Some specimens of *L. auricularius*, which I collected in Stow Pool,

Lichfield, in July, 1836, are more distinct than any which I have seen represented; the spire is more minute, and the upper part of the outer lip goes off from the body of the shell in the form of a straight line; but of all the individuals obtained on this occasion no two are precisely alike, but vary from the extreme form described to the *L. ovatus*, Drap.

2. *Limneus pereger*, Drap. p. 50. pl. 2. f. 34—37; Gray, Man. p. 233. pl. 9. f. 101†; Turt. Man. p. 118. f. 101. A very rare form.

Helix peregra, Mont. p. 373. t. 16. f. 3.

This species, presenting endless variety, is abundant throughout the waters of Ireland, from the smallest drain to the vast expanse of Lough Neagh. Some of the forms which have been considered as distinct species may be enumerated as occurring in this country, as *L. ovatus*, Drap., *L. intermedia*, Michaud (Comp. pl. 16. f. 17, 18.), *L. marginata*, Mich. (Id. f. 15, 16.), *L. lineatus*, Bean, *L. acutus*, Jeffreys—of these two last I judge from comparison of authentic specimens, the former favoured me by Mr. Alder, the latter by their describer. One variety seems to require especial notice—the *Gulnaria lacustris*, Leach. On the shores of Loughs Neagh and Earn I have collected specimens identical with those so named by Dr. Leach in the British Museum, and which are from the lakes of Cumberland—their donor General Bingham. It would seem to be the same form which Capt. Brown figures under the name of “*Lymnæa lacustris*, Brown’s MSS.,” and states to have been found by him in Loch Leven, Kinross-shire. Illustrations Brit. Conch., pl. 42. f. 24, 25. From lakes in various parts of Ireland I possess this form, which, from its extreme delicacy, I look upon as an inhabitant of still water, and from its rare occurrence, except when cast ashore, of deep water also. The specimens, which containing the living animal, have occasionally been found in shallow water, have I presume been driven thence in storms, to which conclusion I am led by having once at Lough Earn, and frequently at Lough Neagh, looked in vain for a living individual with a shell of this form at the edge of their waters, though plenty of the more common forms of *L. pereger* were there. The variety under consideration is intermediate in form between the typical *L. pereger* and *L. glutinosus*, with a short spire and ample aperture; shell very thin, longitudinally striated; striæ regular, frequent, and strongly marked; about one in thirty of the specimens examined somewhat spirally cut, “like the facets of glass”; slight fold on the pillar lip; an epidermis-like covering, of a dull greenish-yellow colour. By the chief cultivators of this branch of natural history in Great Britain, to whom I have sent this shell, it was considered a particularly well-marked variety‡, and M.

† The wood-cut at p. 235 is much more characteristic than figure 101, which is that of the first edition repeated. I have shells similar to f. 101, from the vicinity of Belfast.

‡ Mr. Gray remarks—“The *Gulnaria lacustris* of Leach is very peculiar, from the erosion of its tips, probably arising from its locality, the lakes of

Michaud, in acknowledging the receipt of specimens from Lough Neagh, remarked that the form was unknown to him in France.

I have seen the *L. pereger* attached in numbers to the backs of turtles, kept in a pond at Fort William, near Belfast, when it was amusing to observe these animals swimming about, with the *Limnei* still keeping "their seats" upon them.

3. *Limneus involutus*, Harvey.

Amphipeplea involuta, Gray, *Man.* p. 245. pl. 12. f. 147.

This *Limneus* so remarkable in form was discovered by Wm. H. Harvey, Esq. in a small lake on Cromaglaun Mountain near the lakes of Killarney. A description of it will be found in the *Annals Nat. Hist.* for March 1840, p. 22. Its specific character is—spire sunk within the outer whorl; aperture very large, extending to the apex.

4. *Limneus stagnalis*, Drap. p. 51. pl. 2. f. 38, 39; Gray, *Man.* p. 236. pl. 9. f. 104; Turt. *Man.* p. 121. f. 104; Rossm. f. 49.

Helix stagnalis, *Mont.* p. 367. t. 16. f. 8.

This, the largest European *Limneus*, though by no means generally distributed, occurs in every portion of the island. It differs very much in size, according to locality; mature specimens, which I have found in the cold water of Lough Neagh, where barren of sub-aquatic plants, did not exceed one inch in length, whereas in drains in which such plants abound, they attain double this size.

A *Limneus* collected by my friend Richard Langtry, Esq., of Fort William, near Belfast, when on a tour through Upper Canada in 1835, seems identical with *L. stagnalis*. It differs from the ordinary form only in tapering rather more towards the apex, and in the second largest volution being a little more tumid; but in these respects an extensive series of Irish specimens before me differ very much. The American specimens were taken in the river connecting Buckhorn with Pigeon Lake.

5. *Limneus palustris*, Drap. p. 52. pl. 2. f. 40—42. and pl. 3. f. 1, 2; Gray, *Man.* p. 239. pl. 9. f. 107; Turt. *Man.* p. 123. f. 107; Rossm. f. 51, 52.

Helix palustris, *Mont.* p. 370. t. 16. f. 10.

Common, and generally distributed over Ireland—in size, form, and colour very variable. In the river Bann, near Kilrea, I have procured specimens of the ordinary colour, but with the addition of spiral narrow white bands—in some waters the different species of *Limnei*, &c., are so marked. A shell differing from the *L. palustris* in general proportion (being much shorter relatively to its breadth) and in colour (generally of a uniform pale yellow), is common to

Cumberland." *Manual*, p. 236. This erosion is but too common in the specimens I have collected in Ireland, but was always attributed by me simply to the progress of decay, the shells having for some time been exposed on the beach. When the tips were eroded the shells always presented other marks of decay.

Lough Neagh and other lakes in Ireland: it is found attached to stones at the edge of the water, and where the adjacent bottom is stony, with very little vegetation—under similar circumstances it has also occurred to me in the first-named locality. It is identical with the var. β . of Mr. Jeffreys, who has favoured me with specimens from Battersea, near London. The small size, different colour, and freedom from all adventitious matter, I should be disposed to attribute to the colder water and less food in such localities, than in the ponds and ditches, in which the ordinary form prevails.

6. *Limneus truncatulus*, Jeffreys. Gray, Man. p. 240. pl. 9. f. 108.

L. minutus, *Drap.* p. 53. pl. 3. f. 5—7.

L. fossarius, *Turt. Man.* p. 124. f. 108.

Helix fossaria, *Mont.* p. 372. t. 16. f. 9.

Is generally distributed over Ireland. It inhabits drains, ditches, &c., like the *L. palustris*; but in moist spots, and about springs, at a considerable elevation in the northern mountains†, is likewise found, and is here always of a very small size. In July, 1833, when accompanied by Mr. Hyndman, I remarked many of this species alive, and adhering to stones which lay dry upon the shore of Lough Neagh, far above the summer level of its waters‡—these were of uniform size, very small, and when containing the living animal, of a very dark reddish brown colour. Many varieties of the *L. truncatulus* have occurred to me in Ireland; among them was one very much elongated, and another with regular longitudinal striæ, the latter of which is well remarked by Dr. Turton, to be “very elegant.” *Man.* p. 125.

7. *Limneus glaber*, Gray, Man. p. 242. pl. 9. f. 106.

Limneus elongatus, *Drap.* p. 53. pl. 3. f. 3, 4; *Turt. Man.* p. 122. f. 106.

Helix octanfracta, *Mont.* p. 396. t. 11. f. 8.

I have not seen any Irish specimens of this *Limneus*, which is thus noticed in the supplement to Mr. Jeffreys's paper in the *Linnean Transactions*, vol. 16. p. 520: “Ireland, Rev. James Bulwer.” On inquiry of Mr. Bulwer, he stated that the shell so noticed was considered by him but a variety of *L. palustris*. By a letter from Mr. Jeffreys, dated June 8, 1840, I learn that “*L. elongatus* was mentioned as Irish on the authority of the late Dr. Goodall, who stated that he had received specimens from Mr. Bulwer.” Mr. Jeffreys adds, “I have, however, two or three undoubted specimens among a collection of Irish shells, which I purchased about three months ago from Mr. John Humphreys of Cork—the tray which contained them was labelled ‘Cork.’” From Mr. Humphreys I learn that he

† In such places it is preyed on by the Lapwing (*Vanellus cristatus*), from whose stomach I have taken it.

‡ Montagu has, on the contrary, remarked that when left dry the animal perishes. *Test. Brit.*, p. 372.

had not identified the species, but that the note of locality appended to the shells alluded to by Mr. Jeffreys was strictly correct †.

2. ANCYLUS. "Geoffroy."

1. *A. fluviatilis*, Mull. Drap. p. 48. pl. 2. f. 23, 24; Gray, Man. p. 249. pl. 10. f. 125; Turt. Man. p. 140. f. 125.

Patella fluviatilis, Mont. p. 482.

This species is distributed over the island, and is equally found attached to stones in the mountain torrent, the river, and the still waters of the lake. The var. described by Montagu (p. 483.) as being strongly striated, and by Jeffreys (p. 390.) as being pellucid, &c., I find upon the first stones wet by mountain springs, on their gushing from the earth. All the specimens from these localities are much smaller than those found in still water, and coated with green vegetable matter, which is entirely adventitious, and may be seen in like manner coating the little prominences of the stone to which the *Ancylus* adheres—this and the animal being removed, the shell is crystalline. Under the name of "*Ancy. fluviatilis*, Drap. var. montana," M. Michaud has favoured me with specimens from the Pyrenees, quite identical with the var. just noticed, as it need hardly be remarked are others from France with the ordinary form.

I had often observed that beautiful and graceful bird, the Gray Wagtail (*Motacilla boarula*), feeding about the mountain springs, but was not aware of its propensity for mollusca, until on opening the stomach of one without knowing where the specimen had been killed, I found it to be filled with shells of this species, all of which being of the var. *a.*, afforded evidence whence they had been procured.

Animal blueish-gray beneath; portion which comes in contact with the shell blackish-green—of six specimens, which I once kept in a dry chip box for eighteen hours, two perfectly recovered on being immersed in water.

2. *Ancylus lacustris*, Mull. Drap. p. 47. pl. 2. f. 26, 27; Turt. Man. p. 141. f. 126.

Velletia lacustris, Gray, Man. p. 250. pl. 10. f. 126.

Patella lacustris, Mont. p. 484.

This species, although rare, has been met with in the north, east, and west of Ireland, in still and gently flowing waters. It was noticed by Captain Brown in his 'Irish Testacea' as "plentiful in a mill-race a mile below Naas." By the late Mr. Templeton's MS. I find that the species had been previously observed by him "on

† *Limneus glutinosus*—*Amphipeplea glutinosa*.

Is enumerated in Turton's 'Catalogue of Irish Shells,' but without any locality being named. Mr. Gray notes it as found "in stagnant ditches, England, Ireland." Man. p. 244.—Mr. Gray informs me that he mentioned the species as Irish from specimens sent to the British Museum many years ago, by a gentleman then resident in Ireland, and who had contributed a number of species from this country to that collection; but of the *L. glutinosus* having been one of those so derived there is now no certain record.

Potamogeton, &c., in the drains of the bog-meadows near Belfast." Between the fourth and fifth locks of the Lagan canal, a few miles from this town, I have, at the end of September, procured many specimens, all of which were on the under side of the leaves of the yellow water-lily (*Nuphar lutea*) and great water-plantain (*Alisma Plantago*)—Pond in the demesne at Moira, county Down, Mr. Hyndman—Near Limerick, Mr. W. H. Harvey—Beechwood, near Portmarnock, county Dublin, Mr. T. W. Warren—Glasnevin Botanic Garden, Dublin, Dr. Coulter—Finnoe, county Tipperary, Mr. Edward Waller.

3. *PHYSA*, Drap.

1. *P. fontinalis*, Drap. p. 54. pl. 3. f. 8, 9; Gray, Man. p. 251. pl. 9. f. 110; Turt. Man. p. 127. f. 110.

Bulla fontinalis, *Mont.* p. 226.

Is common, and generally distributed over Ireland, occurring on aquatic plants in stagnant and gently flowing water. It is subject to considerable variety.

2. *P. hypnorum*, Drap. p. 55. pl. 3. f. 12, 13; Turt. Man. p. 128. f. 113.

Aplexus hypnorum, *Flem.*; *Gray, Man.* p. 255. pl. 9. f. 113.

Bulla hypnorum, *Mont.* p. 228.

Although much less common than *P. fontinalis*, is generally diffused over the island, and found as frequently in very shallow, as in deep water.

4. *PLANORBIS*, Muller.

1. *P. corneus*, Drap. p. 43. pl. 1. f. 42—44; Gray, Man. p. 258. pl. 8. f. 95; Turt. Man. p. 112. f. 95.

Helix cornea, *Mont.* p. 448.

Has been found only within a very limited portion of the island. It still prevails in the locality recorded by Capt. Brown—near Maynooth, in the county of Kildare. From about Naas in the same county I have been supplied with specimens by Mr. R. Ball; and by the Rev. B. J. Clarke, with some obtained by him near Lea Castle, Queen's county.

2. *Planorbis albus*, Mull. Gray, Man. p. 259. pl. 8. f. 97; Turt. Man. p. 114. f. 97.

P. hispidus, *Drap.* p. 43. pl. 1. f. 45—47.

Helix alba, *Mont.* p. 459. t. 25. f. 7.

Prevails generally over Ireland. Specimens of *P. glaber*, Jeffreys, which I owe to the kindness of their describer, seem to me (as to Mr. Alder) identical with *P. albus*.

3. *Planorbis laevis*, Alder. Gray, Man. p. 261. pl. 12. f. 148.

Is found in the north-east of the island. Early in the winter of 1832 I obtained a number of this species on aquatic plants (especially *Callitriche aquatica*), with *P. imbricatus*, in a small pond at

the Falls, near Belfast, and about the same time procured others in the rejectamenta of the rivers Blackwater and Lagan, in the same neighbourhood. In the demesne of Portavo, near Donaghadee, and in the vicinity of Portaferry, localities in the county of Down, it has likewise occurred to me. The animal is dark gray; tentacula very pale gray—dead shells are white. It was the *P. levis* which was marked with doubt as "*P. glaber?* Jeff." in Phil. Mag. 1834, p. 300.

4. *Planorbis imbricatus*, Mull. Gray, Man. p. 261. pl. 8. f. 94;
Turt. Man. p. 111. f. 94; Drap. p. 44. pl. 1. f. 49—51.
P. cristatus, Drap. p. 44. pl. 2. f. 1—3.
Helix nautilus, Mont. p. 464. t. 25. f. 5.

This handsome and well-marked species is known to me as occurring throughout Ireland, with the exception of the extreme south, where however there is little doubt that it exists. It is very variable in form—the varieties 1 and 2, and the "monstrosity with the volutions detached, and raised above each other" (Turt. Man.), I have procured on the same plant. The entire animal, together with the tentacula, are of a pale gray colour.

5. *Planorbis carinatus*, Mull. Gray, Man. p. 262. pl. 8. f. 89;
Turt. Man. f. 89; Drap. p. 46. pl. 2. f. 13, 14, 16.

Is much less common than *P. marginatus*, but found in all portions of the island—in the earliest catalogues it was inserted as indigenous. In the neighbourhood of Portaferry, county Down, and about the city of Dublin (a recorded locality), it has occurred to me. I have seen specimens which were obtained near Portarlinton by the Rev. B. J. Clarke; at a lake near Tyrrell's Pass, Westmeath, by Mr. Ovens; and at Lough Gounagh (county Longford) by Mr. R. Callwell, of Dublin †.

In 1833 Mr. W. H. Harvey favoured me with specimens labelled "*P. planatus*, Turt. Man.," from Portumna on Lough Derg, an expansion of the Shannon, where he stated that the form was frequent, noting it at the same time to have been found by him at Ballitore (county Kildare), where it is very rare—these shells correspond exactly with Turton's description of *P. planatus*, Man. p. 110. This seems to be the common form (though the normal one does likewise occur) at Lough Derg, as testified by specimens since obtained from Portumna and Killaloe ‡, near its northern and southern extremities—some from Nenagh (county Tipperary) have been kindly submitted to my inspection by the Rev. T. Hincks of Cork; near this city the "*P. planatus*" is noticed by Mr. Humphreys as met with. Mr. Alder and Mr. Forbes consider the Lough Derg shell *P. carinatus*, and, according to the former, it is the *P. disciformis*, Jeff.

† Mr. Edw. Waller has favoured me with marl shells of this species from Finnoe, and remarks that it is the only shell found there in marl that is not to be had in a living state; but this he attributes to the draining of a marsh.

‡ To the kind attention of Mr. John J. Marshall of the former, and the Rev. C. Mayne of the latter place, I am indebted for them.

6. *Planorbis umbilicatus*, Mull. Jeffreys, Linn. Trans. v. 16. p. 384.
P. marginatus, *Drap.* p. 45. pl. 2. f. 11, 12, 15; *Gray, Man.* p. 265. pl. 8. f. 87, 88, 90; *Turt. Man.* f. 87.

This species prevails in every quarter of the island, but is not generally distributed. Attached to stones at Ram's Island, Lough Neagh, I find a small variety†, about half the ordinary size, and which is concave beneath, with the keel obscure—Mr. Alder remarked on some of these which I had the pleasure of adding to his collection in 1835—"Turton's *P. rhombæus*, of which he sent me specimens, is the same thing in a younger state." Mr. Jeffreys, in a letter dated Oct. 2, 1838, when acknowledging the receipt of the Lough Neagh shell, observed that he considered it distinct from *P. marginatus*, and that from a similar shell previously found at Cardiff, he had named the form *P. inæqualis*. It is to a distorted individual of the *P. marginatus*, found in a pond at the College Botanic Garden, Dublin, that Capt. Brown applied the name of *Helix cochlea* (Irish Test. p. 528. pl. 24. f. 10.), and Turton that of *Helix terebra* (Conch. Dict. p. 62. f. 55.)—Mr. O'Kelly, to whom the shell belongs, always considered it *P. marginatus*, and as such noticed it in the Dublin edition of Pennant's Brit. Zool., p. 363. The Rev. T. Hincks writes me from Cork that "the var. of *Plan. marginatus* with the volutions elevated into a spiral cone was once taken in Ballypheane bog." I have myself met with monstrous forms of several of the native species of *Planorbis*.

7. *Planorbis vortex*, Mull. Gray, Man. p. 267. pl. 8. f. 91; *Turt. Man.* p. 109. f. 91; *Drap.* p. 44. pl. 2. f. 4, 5.
Helix vortex, *Mont.* p. 454. t. 25. f. 3.
8. *Planorbis spirorbis*, Mull. Gray, Man. p. 268. pl. 8. f. 98; *Turt. Man.* p. 115. f. 98.
P. vortex, β . *Drap.* p. 45. pl. 2. f. 6, 7.
Helix spirorbis, *Mont.* p. 455. t. 25. f. 2.

The species which my correspondents (chiefly judging from the descriptions and figures in Turton's Manual) have considered as the *P. vortex* and *P. spirorbis*, are noted as generally common in Ireland—these shells merge so into each other that I was in the habit of putting all that were collected throughout the north together. On comparing these with examples of "*P. spirorbis*" from the neighbourhood of Newcastle, and of "*P. vortex*" from that of London, presented me by Mr. Alder, I find that although some of them are as large as the *P. vortex*, have seven volutions, and a carinated edge to the lower one, that they are not of the extreme form designated by this name, and consequently come under *P. spirorbis*; so likewise do a number of specimens from the neighbourhood of Portarlinton sent me by the Rev. B. J. Clarke—those from the river Shannon, favoured me by the Rev. C. Mayne of Killaloe, may

† The size is, I conceive, attributable to the coldness of the water and scarcity of subaquatic plants.

be placed under *P. vortex*, as may those also collected at Lough Gounagh, county Longford, by my friend R. Callwell, Esq. of Dublin. Is the more prominent keel, with other differences necessarily attendant on it, as form of mouth, &c., sufficient for specific distinction between *P. vortex* and *P. spirorbis*? Under *Planorbis disciformis* Mr. Alder has well remarked, that "the degree of carination is so very variable in different individuals of the same species, that it is rather fallacious as a distinguishing character." Mag. Zool. and Bot. vol. ii. p. 113.

Specimens of *P. compressus*, Michaud, from Lorraine, with which I have been favoured by their describer, are identical with those of *P. vortex* before noticed as from Mr. Alder. Examples of *P. leucostoma*, Michaud, with which I have been presented by this most liberal author, differ only from Mr. Alder's *P. spirorbis* in having a white rim within the mouth—on this subject see Supplement to Mr. Alder's Paper in the Newcastle Transactions, and Mr. Gray's edition of Turton's Manual, p. 267; in this work *P. leucostoma*, Mich., is referred to *P. vortex*, but if this is to be considered distinct from *P. spirorbis*, to the latter *P. leucostoma* must be referred.

9. *Planorbis nitidus*, Mull. Gray, Man. p. 268. pl. 8. f. 93.

P. fontanus, Turt. Man. p. 110. f. 93.

P. complanatus, Drap. p. 47. pl. 2. f. 20—22.

Helix fontana, Mont. p. 462. t. 6. f. 6.

Although somewhat rare, this species is distributed over Ireland. On some living specimens taken near Belfast in Dec. 1834, by Mrs. Hincks, and kindly sent to me, the following note was made—"tentacula moderate, or rather short and uniform in colour with the body of the animal, which changes with age, the adult (with shell $2\frac{1}{2}$ lines in diameter) being black; younger individuals pale gray—the shells of the latter are much the more transparent." These animals seemed indifferent which side of the shell was uppermost, and when undisturbed often moved along with what is termed the under side next the surface of the water.

10. *Planorbis contortus*, Mull. Gray, Man. p. 270. pl. 8. f. 96; Turt.

Man. p. 113. f. 96; Drap. p. 42. pl. 1. f. 39—41.

Helix contorta, Mont. p. 457. t. 25. f. 6.

Like the *P. albus*, generally distributed over Ireland, but of more frequent occurrence, and in greater quantity where found than that species.

Sect. II. OPERCULATA.

Fam. CYCLOSTOMIDÆ.

Gen. CYCLOSTOMA, Lam.

1. *C. elegans*, Lam. Gray, Man. p. 275. pl. 7. f. 75; Turt. Man. p. 93. f. 75; Drap. p. 32. pl. 1. f. 5—8.

Turbo elegans, Mont. p. 342. t. 22. f. 7.

Dr. J. L. Drummond informs me, that when at Sandymount near

Dublin, in 1816, in company with Mr. Tardy, a well-known entomologist, he found one of these shells. In Mr. R. Ball's collection are specimens which were obtained in Glasnevin Botanic Garden, Dublin, but here they might have been introduced with plants from England; in the cabinet of Mr. O'Kelly of that city are two specimens found by himself at Portmarnock; by Mr. S. Wright of Cork, I was shown a similar number, said to have been procured at Youghal †. Notwithstanding this, I am not altogether satisfied that the *C. elegans* is an indigenous species—it has on different occasions been introduced to the country in the present century ‡, but whether to any of the places mentioned previous to the specimens being found there I am uninformed—the fact of only one or two individuals occurring anywhere looks suspicious.

Dr. Turton states that he found a single shell of the *Cyclostoma productum* near the sea-coast in the west of Ireland. Manual, p. 94.

[To be continued.]

XVII.—*On early Contributions to the Flora of Ireland; with Remarks on Mr. Mackay's Flora Hibernica.* By the Rev. T. D. HINCKS, LL.D., M.R.I.A.

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

[Continued from p. 12.]

GENTLEMEN,

MR. MACKAY has adopted the natural arrangement in preference to the Linnæan, and in doing this has probably also adopted that system preferred by the Dublin professor. This may have its use, but it seems a strange thing that no two botanists seem to be satisfied with the same arrangement, which is an inconvenience to those who wish to compare the Floras of different countries. It fortunately happens, however, that the variations in the plants contained, occur chiefly in those orders which contain few genera, for it is with respect to genera that the difference is most troublesome. I shall now proceed to offer some remarks upon the work.

p. 5. RANUNCULACEÆ.—*Thalictrum Alpinum* seems confined to Connaught. Dr. Wade found it in 1801 at Lettery

† Capt. Brown inadvertently notices this *Cyclostoma* as from "Portrush, in the cabinet of Dr. M'Donnell, Belfast." Irish Test. p. 522. The specimens thus alluded to have been shown me by Dr. M'Donnell, and are English—the species is unknown to him as Irish.

‡ Many years ago the *C. elegans*, brought alive from France, was turned out in the neighbourhood of Belfast. Here also, in 1835, a few individuals were introduced, as well as at Killiney-hill near Dublin, and in a garden within that city; and more lately at Summer-hill near Limerick—I am not aware of their having increased in any of these places.

Mountain, Ballinahinch, county Galway. This gentleman was supposed not to have always given due acknowledgement to his fellow-labourers, and was therefore regarded with some jealousy; but this is no reason for suppressing his name, when he was early in his notice of a plant.

Thalictrum minus is found in all the four provinces of Ireland; it was found at Newcastle, county Down, by Mr. Templeton, in 1793. Smith mentions *T. majus* as found by him near Mallow, county Cork.

p. 6. *Anemone Apennina*. Mr. Mackay gives Underwood's authority for its having been found above thirty years ago growing in shady spots near the ground now occupied by the Glasnevin garden. Now Mr. Underwood furnished a catalogue of plants, which was published in the Dublin Society Transactions in 1803-4, in which he inserted this plant as found wild in Ireland. Mr. Templeton sent him queries respecting this and other plants in that catalogue, and I lately read Mr. Underwood's reply, in which he says that *he had never seen it wild*, but had inserted it on Dr. Wade's authority. Dr. W. has it in his *Plantæ Rariores*, but adds that he cannot take upon him to say that it is truly indigenous. It grows freely in gardens near Glasnevin.

p. 8. *Ranunculus arvensis*. Mr. M. inserts this plant as found in corn-fields near the Man-of-War, county Dublin. Mr. Templeton found it at Agnew's hill, and in Mr. Barklie's shrubbery at Inver near Larne, but thought it probable that it might have been from seed mixed with corn. It is the *R. arvorum, arvensis, echinatus* of Threlkeld, who gives between Raheny and Kilsaughan, county Dublin, as a habitat, flowering amongst corn. It is also mentioned in Underwood's catalogue as a native of Ireland. I am not sure whether these notices are to be considered as additional authority for its being native, or as confirming Mr. Templeton's suspicion.

p. 9. *Caltha palustris* var. β . *radicans*. Mr. Templeton brought this variety into his garden, where it soon lost its peculiarities in a different situation. This confirms the propriety of not making it a species.

p. 10. *Helleborus viridis*. The specimen referred to in the herbarium of the Cork Institution, which was collected and presented by the late Mrs. Hincks, is there marked as *from the Botanic Garden*, and I never heard of its being found wild by Mr. Drummond. Smith, however, states it as found wild at Tallagh, county Waterford, and Doneraile, county Cork. Dr. Wade says he found it near Dundrum; but Mr. Underwood says that he never saw it wild, so that it is not unlikely it was an escape from a garden and soon eradicated,

as the place has been visited by many botanists. *Helleborus foetidus* (*Helleboraster maximus*, &c. of old writers) is mentioned by both Threlkeld and K'Eogh, the latter of whom gives the Sliebh Baughta mountains, between the counties of Clare and Galway, and Drumcallagher, county Limerick, as habitats. It is marked as a doubtful native in Great Britain.

Mr. Mackay has 8 genera and 24 species of this order. Of these the old botanists had 6 genera and 14 species; Mr. Templeton, 6 genera and 18 species. Those in which Mr. Templeton was deficient, were *Clematis vitalba* and *Helleborus viridis*, both questionable; *Thalictrum alpinum*, *Ranunculus hirsutus* and *parviflorus*, and *arvensis*, which last he regarded as doubtful. At the end I will give a comparative table of the genera and species in each natural order.

p. 17. *Matthiola sinuata*. Mr. Mackay gives one of the isles of Arran as a habitat. Would it not have been well to have added, that Smith says he found it at Beal Castle, near the mouth of the Shannon, in nearly the same longitude, not much to the south, and near the sea?

p. 22. Threlkeld inserts *Nasturtium petræum foliis bursæ pastoris*, which is *Teesdalia nudicaulis*, Hooker, and not a rare plant in England. It would be well to have some notice of plants said to have been found, but wanting confirmation.

p. 30. *Subularia aquatica*, "said to have been found in Lough Neagh by Sherard." This is language which seems to imply a doubt of that eminent botanist having found it there. Now we know that Sherard was in that neighbourhood, probably in 1696. Ray mentions it on his authority; so do Threlkeld and Molyneux, the former of whom gives it the name of *juncifolia*. Mr. Templeton found it in Lough Neagh before 1794, as I find from letters to Dr. Martyn, Editor of the Gardener's Dictionary, and to Mr. Dickson, of Covent Garden; so that there can be no reasonable doubt of the fact. I think I have heard that it has been seen in Sherard's specimens, preserved at Oxford, but I do not recollect my authority.

p. 31. *Viola hirta*. My name is mentioned as authority for this plant being found at Blarney. I have it in a marked catalogue as found by Mr. Drummond. I am obliged by the notice of me, as kindly meant, but I wish it clearly understood that I do not consider myself as a competent judge. In the present instance there is no reason to doubt the plant having been found.

p. 38. *Hypericum calycinum*, though I think Mr. Mackay right respecting this plant; yet perhaps it should have been

mentioned that Smith states it as found wild at Ballymaloe, county Cork.

p. 39. *Hypericum elegantissimum non ramosum* of Threlkeld, is given by Sir J. E. Smith as a synonym of *Hypericum montanum*. I find J. White, a gardener of the D. S., quoted as having found this last on mountains in the county Louth. Underwood, in his catalogue, 1804, says it is found in Ireland.

p. 49. I consulted the Herbarium of the Cork Institution in 1839, and found there the *Cerastium aquaticum* as gathered by Mr. Drummond on the banks of the Lee.

p. 76. *Astragalus hypoglottis*. The largest of the south isles of Arran is quoted for this plant as found by Messrs. Ball and Thompson in 1834, as it should be, instead of 1804. Smith says that he found it in the mountains about Killarney, county Kerry.

p. 79. *Trifolium procumbens*, β . Hooker, *campestre*, found by Mr. Templeton at Blackhead and Dunluce Castle, county Antrim.

p. 85. *Hedysarum Onobrychis*, or *Onobrychis sativa*, Hooker. This plant is stated to have been found by J. White, and was admitted as Irish in Underwood's catalogue. Mr. Templeton has recorded that he saw it among Mr. Molden's specimens, gathered between the Black Rock and Malpas's Monument, on a calcareous soil. I am sure, however, that it was in Mr. Templeton's list of *introduced* plants, which included many that have been inserted.

p. 86. *Spiraea filipendula* is in Molyneux's list, sent to Threlkeld. Was it on this authority that Underwood inserted it as Irish? I observe Mr. Mackay has not inserted it.

p. 110. *Epilobium roseum*. I was surprised to find this wanting in the list. The entry in Mr. Templeton's handwriting is, "*E. roseum*, E. Bot. 693, found and determined in the Orchard, Aug. 13, 1820." When we consider how particular Mr. Templeton was about admitting doubtful plants, and that he was a remarkably close and accurate observer, this plant has more claim to admission than many which have been inserted on a single authority.

p. 116. *Peucedanum Ostruthium*, a habitat in the county Down, is given on Mr. Campbell's authority, but no more said. Threlkeld has *Peucedanum*, *Hogs' Fennel*, ditches near the sea, which is a likely habitat. K'Eogh mentions it, and Smith, both in his 'Waterford' and 'Kerry,' stating S.E. of Passage in the former county as a habitat. Dr. Barker wrote to Mr. T. that he had found a *Peucedanum* in the county Waterford, but the species is not mentioned.

p. 118. *Meum Athamanta*. Mr. T. has the following entry: “*Athamanta Meum*, E. B. 2249, found plentifully among the grass in the lawn at Maryville, Malone; but as I have not found it elsewhere, it is probably lately introduced, 1818.” Such caution gives more weight to Mr. T.’s authority when he does admit a plant.

p. 135. *Hedera Helix*. Mr. T. observed that “Ivy growing against rocks produces gum.” I have not seen this noted.

p. 144. Smith, in his ‘Kerry,’ mentions *Cineraria palustris* and *integrifolia*, the latter on Knockanore mountains. Have botanists looked for these plants? The same author mentions *Diotis maritima* as found on Ballyheigh Strand. Dr. Barker, in 1800, mentioned *Cineraria palustris* as very common in the county Waterford; and in one of his letters to Prof. Martyn or Mr. Dickson, Mr. Templeton mentions a plant resembling a *Cineraria*, respecting which I do not know that he satisfied himself.

p. 148. *Senecio*. Mr. T. has “*lividus*, E. B. 2515, found about lakes and bogs in the neighbourhood of Ballinahinch, Aug. 14, 1810.” As he was evidently familiar with *Sylvaticus*, he could not have confounded them, if, as Sir W. Hooker thinks, the plant in E. B. was not distinct from it.

p. 164. *Hieracium umbellatum*. Mr. Templeton found a *Hieracium* at Tullamore, under the Mourne mountains, which he could not assign to any species he knew. This was in 1793, and he sent specimens to Prof. Martyn, and it was referred to in different letters of that period. The Professor, after some time, answered, “that after examining it with Dr. Smith (Sir J. E.) and Mr. Dickson (Covent Garden), they all thought it *umbellatum*.” Mr. Templeton cultivated it in his garden, and was at one time inclined to think it might be a variety of *H. subaudum*, but seems to have been at last satisfied that it was *umbellatum*. J. White, employed by the Dublin Society, said that he found this plant in the Mourne mountains about 1803, ten years later. Mr. Mackay speaks of it as found in the county Wicklow; and by Mr. D. Moore in the county Derry. Both these must have been at a much later period.

p. 216. *Betonica officinalis*. This plant is stated in Smith’s ‘Waterford’ to have been found near Cappoquin, and Mr. Templeton marked it as found in the county Waterford, 1801, on Dr. Barker’s authority. Mr. Mackay has southern habitats near Killarney, noticed, I presume, by himself, and he adds, “Shane’s Castle woods, Mr. Templeton.” In Mr. T.’s own Flora he does not say that he had seen it wild, but quotes ‘*Plantæ Rariores*’ for Shane’s Castle. There must have

been an error in transcribing the list sent to Mr. Mackay, for Mr. Templeton was not a man who would give his authority for what he did not know, nor would any of his family contribute intentionally to an error, however trifling. The northern habitat therefore rests on the authority of Wade's 'Plantæ Rariores.'

p. 219. Mr. Tighe, in the statistical account of Kilkenny, mentions *Thymus Acinos*, wild basil, as found there. It had been previously mentioned by K'Eogh and Threlkeld. There can scarcely be a doubt that it was an introduced plant; but Sir W. J. Hooker has it as found in cultivated fields, though rare in Scotland; and why not admit it on such combined authority into the Irish Flora? It is now called *Acinos vulgaris*. The hedge hyssop (*Gratiola*) was said by K'Eogh to be wild on the Burren mountains, county Clare; but the notice is confined to him. Has this district been thoroughly examined by any competent botanist? It is, I think, limestone, and chiefly retained as sheep-walk, so as to have been less cultivated than other parts; it might therefore be expected to have some rare plants, especially as Connemara, the Arran Isles, Kerry, &c., lying near the Atlantic, have been so productive of them. *Gratiola officinalis* is found in moist places in several parts of Europe, as far north as Denmark; and *G. linifolia*, a native of Portugal, differs little from *G. officinalis*, except in being smaller, and its leaves linear and entire. Portugal is nearly in the same longitude, and has the same exposure to the Atlantic as the west of Ireland.

p. 231. SCLERANTHÆ OR PARONYCHÆ.—Dr. Smith, in his 'Kerry,' mentions *Herniaria glabra* as found at Lamb's Head, mouth of Kenmare river. Mr. Mackay has borne testimony to the correctness of this author in instances which came under his notice; it is probable, therefore, that he was correct in this, as neither the *place* nor the *character* of the plant would lead us to think it introduced or confounded with another. Two species of *Herniaria* have been established by Mr. Babington, and admitted by Sir W. J. Hooker: *H. glabra*, found in Jersey and Guernsey; *H. ciliata* (separated from the other), found near the Lizard Point, Cornwall. This species might be the one found near the mouth of Kenmare river.

p. 240. *Ceratophyllum demersum*. The northern habitats for this plant in Mr. M.'s Flora are "Near Killaleagh, Isle of Rathlin and Lough Neagh—Mr. Templeton." There has been some mistake, originating perhaps in the substitution of N for L. It should be, "Isle of Rathlin, and Lough Leagh, near Killaleagh." Mr. Templeton, on whose authority the habitats are given, found it at Rathlin, 1795, and at L. Leagh, 1804.

p. 243. By some mistake, originating perhaps in the list sent to Mr. Mackay, the habitats for *purpurea* and *rubra* are the same, so far as Mr. Templeton is concerned. These habitats are more correctly given under *purpurea*, but they really belong to *rubra*, as it was ascertained to be the *rubra* of Hudson, from his herbarium in Mr. Lambert's possession. Mr. T. does not appear to have met with *purpurea*, though he might have called his plant so, till he had the opportunity of comparing it.

p. 245. *S. amygdalina*, stated to be found "by the side of the Bann, at Fairhead, among rocks," Mr. Templeton. The notice belonged to *pentandra*, and has been transferred (by a mistake, pardonable enough amidst various communications) to *amygdalina*, which Mr. T. appears not to have found, though he had it in his garden. The above appears as one habitat, but is really two; "by the side of the Bann, and at Fairhead, among rocks," the places being at a considerable distance. Mr. T. found it in three places—1st, in 1793, near Ballycastle, but then considered it as introduced; 2nd, apparently wild, near the Bann; and, at a still later time, among the rocks at Fairhead.

p. 248. Mr. Templeton early proposed the union of several of the species combined by Sir W. Hooker under *fusca*. In 1793 he wrote to Professor Martyn, that a willow he called *rosmarinifolia*, *fusca* and *repens*, were only varieties; but in 1794, having got a plant of *S. rosmarinifolia* from London, he told Mr. Dickson that he saw that he had been mistaken respecting it. He included *S. prostrata* and *ascendens* as other varieties, which he mentioned to Dr. Taylor in a letter in 1814, so that he anticipated the union of these species made by Sir W. J. Hooker, and adopted by Mr. Mackay.

p. 285. ASPHODELEÆ.—Dr. Smith, in his 'Waterford,' states that *Asparagus sylvestris* is wild on the sea-coast at Tramore. Threlkeld and K'Eogh had both previously stated it to be wild on the sea-coasts, and I think it is in Mr. Tighe's catalogue of maritime plants, but I have not the list to refer to. It is found on the opposite coasts of England and Wales, and it is reasonable to think that the gentlemen mentioned either found it or some plant mistaken for it. The *Juniperus Sabina*, which is mentioned by Threlkeld, Smith, and others, Mr. Templeton conceived to have originated in *Lycopodium alpinum*, which is found on the mountains, referred to as habitats of savin. They might have been indifferent botanists, but we have no ground for suspecting them of wilful falsehood.

Remarks of the preceding kind might perhaps be increased, but these are what occurred to me, and they may be thought by some of little use. In communicating them, I comply with

the wish of others, and I trust have said nothing which can be offensive to any; but I shall be particularly happy if I can contribute in the least degree to the due estimation of a departed friend, who is, and ought to be, the pride of the North of Ireland, the late JOHN TEMPLETON, to whom Belfast, in particular, owes much of that high character which she has attained amongst the cultivators of Natural History in all its branches.

Comparative Summary of the Plants noticed by Botanists before 1760; of those noticed by Mr. Templeton and his coadjutors before 1804; and of those noticed by Mr. Mackay in his 'Flora Hibernica,' according to the Natural Orders adopted by him.

ORDERS.	O. B.		T.		M.	
	G.	Sp.	G.	Sp.	G.	Sp.
1. Ranunculaceæ ..	6	14	6	18	8	24
2. Berberidæ	0	0	0	0	1	1
3. Nymphæaceæ ..	2	2	2	2	2	2
4. Papaveraceæ....	3	5	4	7	4	8
5. Fumariaceæ	2	2	2	3	2	4
6. Cruciferae	20	37	20	33	23	49
7. Violaceæ	1	4	1	6	1	8
8. Cistineæ	1	1	0	0	1	1
9. Droseraceæ	1	3	1	3	1	3
10. Polygalæ.....	1	1	1	1	1	1
11. Malvaceæ	2	4	2	4	3	5
12. Hypericineæ....	1	7	1	8	1	9
13. Caryophyllæ ..	10	15	10	28	11	37
14. Linææ	2	4	2	4	2	5
15. Tiliaceæ	1	1	1	1	1	2
16. Acerineæ	1	2	1	1	1	2
17. Geraniaceæ	2	7	2	11	2	13
18. Oxalidæ	1	1	1	1	1	1
19. Portulacæ	0	0	1	1	1	1
20. Crassulaceæ	3	6	4	8	4	10
21. Saxifrageæ	3	6	4	10	4	18
22. Salicariæ	2	2	2	2	2	4
23. Rhamneæ	1	1	1	2	1	2
24. Ilicineæ.....	1	1	1	1	1	1
25. Celestrineæ	1	1	1	1	1	1
26. Leguminosæ....	12	22	13	31	15	41
27. Rosaceæ	11	23	13	33	13	50
28. Pomaceæ	2	4	2	4	2	5
29. Grossulaceæ....	0	0	1	3	1	3
30. Onagrariæ	1	4	1	6	1	6
31. Circæaceæ.....	1	1	1	2	1	2
32. Halorageæ	0	0	2	2	2	3
33. Umbelliferæ	25	31	28	38	29	44
34. Stellatæ	4	8	4	10	4	13

ORDERS.	O. B.		T.		M.	
	G.	Sp.	G.	Sp.	G.	Sp.
35. Caprifoliaceæ ..	5	6	5	6	5	6
36. Vacciniææ	1	2	1	3	1	3
37. Campanulaceæ ..	1	1	1	3	1	4
38. Lobeliaceæ	2	2	2	2	2	2
39. Valerianææ	2	2	2	4	2	4
40. Dipsaceæ	3	3	3	3	3	3
41. Compositæ	36	56	36	62	40	87
42. Boragineæ	8	11	8	14	8	16
43. Convolvulaceæ ..	2	3	2	4	2	4
44. Plantagineæ	1	4	2	5	2	6
45. Polemoniaceæ ..	1	1	1	1	1	1
46. Plumbagineæ ..	1	2	1	2	1	3
47. Oleinææ	2	2	2	2	2	2
48. Ericææ	5	6	4	5	5	9
49. Pyrolaceæ	1	1	1	3	2	5
50. Apocynææ	1	1	0	0	1	2
51. Gentianææ	4	5	5	7	6	11
52. Solanææ	5	6	3	3	5	7
53. Primulaceæ	5	10	7	13	7	13
54. Lentibulariæ	1	1	2	5	2	6
55. Scrophularinææ . . .	9	21	9	23	10	30
56. Orobanchææ	2	2	2	3	2	4
57. Melampyraceæ ..	1	1	1	2	1	2
58. Verbenaceæ	1	1	1	1	1	1
59. Labiataæ	19	28	17	31	20	43
60. Polygoneæ	2	11	3	17	3	20
61. Chenopodeæ	5	12	5	17	5	19
62. Schlerantheæ ..	0	0	1	1	1	1
63. Urticææ	3	4	3	4	3	5
64. Resedaceæ	1	1	1	3	1	3
65. Euphorbiaceæ ..	2	6	2	7	2	9
66. Empetreaæ	1	1	1	1	1	1
67. Callitrichinææ ..	0	0	1	2	1	2
68. Ceratophylleæ ..	0	0	1	2	1	2
69. Ulmaceæ	1	1	1	1	1	4
70. Amentaceæ	7	13	6	24	9	43
71. Myricææ	1	1	1	1	1	1
72. Coniferaæ	3	3	3	3	3	3
73. Aroideæ	1	1	1	1	1	1
74. Typhaceæ	2	2	2	5	2	5
75. Fluviales	1	4	4	13	4	15
76. Pistiaceæ	1	1	1	3	1	4
77. Juncagineæ	0	0	1	2	1	2
78. Alismaceæ	1	2	2	4	2	4
79. Hydrocharideæ ..	0	0	2	2	2	2
80. Irideæ	1	2	1	2	2	3
81. Orchideæ	4	8	7	16	8	22
82. Melanthaceæ	0	0	1	1	1	1
83. Amaryllideæ	1	1	1	2	2	4

ORDERS.	O. B.		T.		M.	
	G.	Sp.	G.	Sp.	G.	Sp.
84. Asphodeleæ	3	5	3	4	3	6
85. Smilacæ	2	2	0	0	2	2
86. Butomeæ	1	1	1	1	1	1
87. Restiaceæ	0	0	0	0	1	1
88. Junceæ	2	5	3	14	3	16
89. Gramineæ	9	10	27	73	30	80
90. Cyperaceæ	3	5	8	56	8	66
91. Filices	13	18	13	25	15	32
92. Lycopodiaceæ ..	1	2	1	4	1	4
93. Marsiliatæ	0	0	1	1	2	2
94. Equisetaceæ	1	4	1	6	1	8
95. Characeæ	1	2	1	5	1	7

In the preceding list Mr. Mackay's Flora is taken as the basis, and no plant is admitted in any order which he has not inserted; of course additions might have been made of plants recorded as found by the older botanists; and while a very few are omitted in Mr. M.'s work, which Mr. T. considered as natives, many were passed over by him which he did not recognise as native, and did not insert in his list. Again, a few were omitted which he had entered on the authority of *Plantæ Rariores*, or other authorities, but had not verified. On the other hand, a few may have been reckoned which he did not find till after 1804; but, on the whole, I believe the first list contains a fair statement of what was known of the botany of Ireland previous to 1780, including the discoveries of Smith and others; the second, a fair statement of what was known to Mr. Templeton and his correspondents previous to 1804, when Mr. Mackay came to Ireland; and the third, the number of plants in each natural order contained in Mr. Mackay's work, without including a few additions that have been since made*. It will appear that the old botanists were peculiarly deficient in water-plants, and in the grass, and grass-like tribes, whilst the late discrimination, and consequent increase of species, must tend to swell the apparent difference. Many plants may still be added, but the fact that the Flora of Ireland was not so neglected as some imagined, will, I trust, be made evident by the statements in the preceding paper and lists.

I have now, gentlemen, with best wishes for the success of your useful publication, to subscribe myself your obedient servant,

THOMAS D. HINCKS.

Belfast, May 6, 1840.

Cor. Sec. Belfast Botanical Society.

* The list of course includes all discovered after 1804, which are contained in Mr. M.'s work, whether discovered by Mr. M. himself, Mr. Templeton, Mr. Drummond of Cork, Mr. Moore, or others to whom Mr. M. has assigned them.

XVIII.—*Report of the Results of Researches in Physiological Botany made in the year 1839.* By F. J. MEYEN, M.D., Professor of Botany in the University of Berlin*.

On the Nutrition and Growth of Plants.

M. LAMPADIUS† has instituted some new experiments on the vegetation of wheat in different soils, and on the quantity of earthy matters contained in the wheat plants so cultivated; from which he arrives at the conclusion that the quantity of earthy matter in the plants produced on the different soils (viz. those rich in alumina, silicic acid, lime or magnesia) remains always the same, and that these substances are not taken up mechanically by the roots, but are selected by the *Vegetative Power* by means of the roots, and are then deposited in different combinations in the plants for the formation of their several parts.

The facts from which these conclusions were drawn were the following: A piece of field was divided into 5 beds, each 20 Prussian feet square. Each bed received first of all 5 lbs. of manure (a mixture of cow- and horse-dung), then on the 1st bed were strewn 5 lbs. of finely powdered quartz, on the 2nd the same quantity of alumina, on the 3rd the same of chalk, and on the 4th 5 lbs of carbonate of magnesia; the 5th was left without any mineral manure at all. On each bed were sown 2 Pruss. cubic inches of wheat, about 675 grains. The next summer the vegetation appeared most vigorous on the bed strewn with alumina, and the produce of grains of wheat on the 5 beds, was, according to weight, as follows:—

Bed	Produce.	
	oz.	dr.
1	24	2
2	28	6
3	26	2
4	21	4
5	20	0

After incineration it appeared that the grains which had been produced from the different beds contained almost equal

* Translated from the German, under the direction of the Author, by Henry Croft, Esq.

On commencing the publication of Professor Meyen's Report for 1839, it is with much concern that we have at the same time to record the death of the author, whereby Natural History sustains a heavy loss. Translations of his valuable Reports for the years 1835 and 1837, by Mr. W. Francis, have been published; the former in the Lond. and Edinb. Philosophical Magazine, vol. xi. pp. 381, 435, 524; xii. 53; the latter in a separate volume.—See Annals Nat. Hist. vol. v. p. 211, and Mag. Nat. Hist. vol. iv. p. 408.

† Erdmann's und Marchand's Journal für practische Chemie, Bd. xviii. p. 257—269.

quantities of inorganic matters, and the same result was obtained on incinerating the chaff, the straw, and the roots; and it moreover appeared that the roots and chaff were the richest in inorganic substances. The entire plants contained by weight from 3·7 to 4·08 per cent. The quantitative examination of the ashes showed that the quantities of silicic acid, lime, magnesia and alumina were nearly the same in the plants grown on all the different soils.

The conclusions which M. Lampadius has drawn from these analyses appear certainly quite evident; but at the same time I may be allowed to remark, that the results would have turned out quite differently if he had chosen some more easily soluble salts as manure, instead of chalk, silicic acid, &c., and that the above experiments would have been much more valuable if he had before given the analysis of the soil with the manure used; and therefore I believe that the question as to whether the roots are able to select this or that substance, remains completely unanswered by this in other respects highly interesting research.

M. Boussingault has continued his chemical researches on vegetation*, and has this time chosen as his subject the impoverishment of the soil and the study of the benefits of "alternation (*wechselwirthschaft*—*assolements* †)." In the researches of M. Boussingault alluded to in last year's Report, it was shown that plants receive a part of their nourishment from the air; and in the present memoir M. B. endeavours to show that the most fruitful "alternation" (!) is that by which the greatest quantity of elementary bodies is absorbed from the atmosphere. Now it is highly important to know the exact quantities derived from the air, in order to be able to compare the merits of different methods of cultivation. On an estate, with the products of which M. B. was well acquainted, it was found, that the manure which was used for one hectare of land contained 2793 kilogrammes carbon. The produce from this piece of land contained on the other hand 8383 kilogr. carbon, and from this M. B. concludes, that the carbon derived by the plants from the air was at least 5400 kilogr. The given quantity of manure for one hectare of land contained 157 kilogr. nitrogen, while the produce contained 251, and therefore the atmosphere must have yielded the excess of 94

* "De la discussion de la valeur relative des assolements par l'analyse élémentaire."—Ann. des Sciences Naturelles, Part. Botan. 1839, t. xi. pp. 31—38."

† *Wechselwirthschaft*. Different kinds of corn or other plants are cultivated on a piece of ground in a certain succession for three or more years; the land is then allowed to lie fallow for a certain time, and then the same succession or alternation is proceeded with.

kilogr. In another very productive alternation (?) which was however abandoned on account of the climate, the quantities of matters taken from the atmosphere appeared to be much greater. The produce contained 7600 kilogr. carbon, and 160 nitrogen more than the manure employed; by a three years' alternation, the fourth year the ground being manured and lying fallow, the quantity of carbon absorbed from the air was only 4358, and of nitrogen 17 kilogr.

According to M. B.'s researches, of all our common cultivated plants, *Helianthus tuberosus* takes up most from the atmosphere, and therefore this is the plant with which the smallest quantity of manure produces the largest quantity of nutritious matter. The chemical composition of the several products have been placed together in a table: in it we find the ultimate analyses of wheat, rye, barley, wheat-, rye-, and barley-straw, potatoes, beetroot, turnips, *Helianthus tuberosus* and of its stalks, yellow peas, pea-straw, red sorrel, and of manure. M. Boussingault remarks, that most of these nutritive substances have different tastes, but at the same time almost the same ultimate constitution. It cannot be said that these bodies consist of carbon and water, for in almost every instance there was a small excess of hydrogen; and from this it follows that during vegetation water is decomposed, as MM. Edwards and Colin (Report for 1838, p. 7) are said to have proved.

A very advantageous report of the above research was given to the Academy on the 14th of January, 1839, in the name of the Commission, by M. Dumas.

M. Unger, in a treatise, entitled 'Die Antrittz quelle bei Gratz in Bezug auf ihre Vegetation*,' the contents of which are principally of a physical nature, has made known a number of observations, from which he arrives at the conclusion, that the free carbonic acid in springs has no influence in promoting vegetation, that it nevertheless causes the appearance of some plants, and must therefore be ranked among those causes which influence the *quality* of the vegetation.

M. Nietner, court-gardener in Schönhausen, near Berlin, has explained his views with regard to the necessity of varying plants, in order to arrive at successful results in their cultivation †. The theory, he states, is on the whole as follows: "The spongioles being the only parts of the subterraneous part of the plant which imbibe nourishment, give off certain substances, which for succeeding plants, if they be of the same

* Linnæa of 1839, pp. 339—356.

† Kurzer Umriss der Rotation oder des Wechsels der Pflanzen. Verhandlungen des Vereins zur Beförderung des Gartenbaues in den Preussischen Staaten, xiv. 1839, pp. 158—162.

species, are injurious; but if of a different genus, are, if not exactly favourable to their growth, still certainly not hurtful, as in the former case." This theory is to be found, it is true, in the most celebrated botanical works, but in the newer physiological ones it is circumstantially enough proved, that this theory is nothing better than an hypothesis, for the known experiments on which it has been founded have been shown to be incorrect; and therefore I cannot agree with those views according to which the advantageous influence of the changing plants is explained by M. Nietner. The several instances which are adduced as proving the correctness of the above theory, can be explained in a different manner; particularly the luxuriant growth of rye after three years' cultivation of sorrel, in which case the soil requires no manure. I do not suppose it is necessary to assume here an excretion from the sorrel roots which is beneficial to the rye, which moreover has by no means been proved; but one must look for this excellent manure in the roots and stubble of the sorrel plants.

Moreover, M. Nietner remarks, that carrots, parsnips? (weisse Rüben), and other bulbous plants acquire a bitter unpleasant taste, and become scarcely edible when cultivated on a soil which in the previous year has borne tobacco. This may however be explained by the great mass of the tobacco plants which always remains on such a field; these masses, abounding in alkaloids and still imperfectly decomposed extractive matters, pass over more or less into those plants which follow next.

It has at length been acknowledged in France that the results of the experiments of Macaire on the excretions of the apices of the roots of plants, on which so important theories have been founded, cannot be correct. M. H. Braconnot of Nancy has opposed the conclusion drawn by Macaire from his experiments. M. Braconnot* planted a large specimen of *Nerium grandiflorum* in a pot which had no opening at the bottom, and let it grow therein for three years, and when the earth was examined at the expiration of that time, it was found that there was nothing therein beyond the usual salts, and none of that peculiar poisonous sharp principle peculiar to *Nerium*. In the same manner the root-excretions of *Inula Helenium*, *Scabiosa arvensis*, *Carduus arvensis*, and of several *Euphorbiaceæ* and *Cichoriaceæ* were examined, but without satisfactory results. Hereupon some of Macaire's own experiments were repeated; but instead of *Chondrilla muralis*

* "Recherches sur l'Influence des Plantes sur le Sol."—Annales de Chimie et de Physique, Septembre, 1839, pp. 27—40.

common lettuce was taken and placed with its roots in water. The result of this experiment agreed with Macaire's, i. e. a portion of the lacteous sap was found in the water, the appearance of which however M. Braconnot correctly refers to the tearing of the fine rootlets. Some plants of *Euphorbia Peplus* which grew in water, imparted to it no taste, and it remained colourless: moreover the soluble substances in moulds in which *Euphorbia Brioni*, *Asclepias incarnata*, and *Papaver somniferum* had been grown, were examined, but the results were not favourable to Macaire's conclusions. Finally, Macaire's experiment with "*Mercurialis annua*" was repeated. One half of the roots of this plant was placed in a weak solution of acetate of lead, and the other half in pure water. In the end, the water contained some of the lead salt which had been given to the roots in the other vessel. This is, however, explained by Braconnot as the simple effect of capillary attraction in the roots, an explanation to which I cannot assent; it is by no means necessary to seek for such a one, for we can explain the phenomenon much more simply without having recourse to Macaire's views, according to which plants have the power of excreting substances injurious to them by means of their roots.

In last year's Report notice was taken of M. Payen's researches on the chemical composition of the woody substances; but they were only published with additions in the beginning of the present year*. M. Dumas gave an excessively favourable report of this research to the Academy†; however, many of the discoveries contained therein had already been published in Germany, &c., as was shown in the former Report.

It is now several years since the newer microscopes have shown that the original stratum or layer of cellular membrane exhibits characters different from those of the secondary layers: indeed the chemical difference of these parts was proved by the observations of Schleiden, and this fact has been confirmed and extended by M. Payen. The first series of ultimate analyses was made with quite tender cellular tissue, which was viewed as the primitive layers of the woody cells; for this purpose were used the ova of almonds, cucumber sap, the tender cellular tissue of cucumbers, pith of elder, pith of *Æschynomene paludosa*, cotton and "root-spongioles," (*Wurzelschwämmchen*): by this is probably meant the small extremities of roots; for I have long since proved that these "spon-

* *Annales des Sciences Naturelles*, 1839. Part. Botan. i. pp. 21—31.

† *Ibid.* pp. 28—31.

gioles" do not exist. All the analyses show that one may assume the proportion of oxygen to hydrogen to be as in water, and that these substances are isomeric (perhaps polymeric, H. C.) with starch, for the small differences found may be considered as faults in the analyses. With regard to these analyses it may be remarked, that however correct they may be, they by no means show us the correct composition of the primitive membrane; for in the cells of the youngest ova, as well as in those of the cucumber, elder pith, and principally of the root-extremities, indeed, even in the fibres of cotton, there is contained a great quantity of organic substances which cannot be separated without destroying the tender tissue, and the presence of these matters renders the analyses of the membrane unsatisfactory. However, we may assume, that by far the greater portion of these substances have an isomeric constitution with starch. Moreover several kinds of wood were analysed in order to show the difference of composition of the primitive membranes of their cells.

	Oak.		Box.		Aspen.	
	In its natural state.	Treated with carb. of soda.	Natural state.	Treated with carb. soda.	Treated once with carb. sod.	Treated twice with carb. sod.
C ...	54·44	49·68	54·35	49·40	48·00	47·71
H ...	6·24	6·02	6·25	6·13	6·40	6·42
O ...	39·32	44·30	39·50	44·47	45·56	45·87

From these analyses it certainly appears that in the ligneous substance, besides carbon and water, moreover free hydrogen must be present; but here it must also be remarked, that it is almost impossible to separate the membrane of the woody cells from their contents, and the microscope shows that various and perhaps resinous substances are contained in them.

In a note sent into the Academy on the 24th of December, 1838, M. Payen states, that by means of nitric acid he has extracted the incrusting matter of the ligneous cells from the primitive membranes: for this purpose finely rasped oak and box wood were used. The incrusting substance (by which is meant the inner layers of the cellular membrane) dissolved in nitric acid, and was thus separated from the residual tissue, which, after repeated purification, was dried and analysed. The composition was found to be

C	43·85
H	5·86
O	50·28

whilst the above analyses gave quite a different result. According to this then the secondary layers of the cellular membrane must exhibit a striking difference in constitution; but

this is very improbable; for it was shown at length in the former Report, that it is exactly these secondary layers, which by boiling with an alkali, &c., are converted into a starch-like substance; besides, the microscope should have been used before those analyses were made, but such observations are not mentioned.

In the meeting of the Parisian Academy on the 14th of January, M. Payen read a paper, entitled "*Mémoire sur les applications théoriques et pratiques des propriétés du tissu élémentaire des Végétaux**," the contents of which are of considerable interest, but would here lead us too far into the province of Chemistry.

On the 4th of February, 1839, new researches were made public by M. Payen; he gave the composition of the incrusting matter of wood as $C^{35} H^{24} O^{10}$, while the formula for the primitive cellular membrane is $C^{24} H^{20} O^{10}$ or $C^{24} H^{18} O + H^2 O$. In the sitting of the Academy of the 30th of July, a new treatise by M. Payen was read, "*On the tissue of Plants and on the incrusting substance of Wood†*," an extract from which has been published by the author. M. Payen remarks, that he had already made known to the Academy his researches, according to which all young parts of plants contain a considerable portion of substances containing nitrogen; that moreover the peculiar substance of the membranes in different plants has always the same composition; and that in those parts which are grown woody by age, there are contained two chemically different substances, viz. the primitive membrane and the hard incrustation.

"Many tissues," observes M. Payen, "acquire a high degree of hardness without possessing large quantities of incrusting matter." (In the same manner we may bring forward cases where many cells with thickened sides have no hardness, and it is evident from this that the hardness of the vegetable substance does not depend solely on the thickening of the walls of the cells, but on the chemical change in the layers of cellular membrane, M.) The latest analyses and microscopical observations of M. Payen have led him to conclude that wood consists of not less than four different substances, viz. the primitive cellular membrane, and the sclérogène, which again is said to consist of three peculiar matters; the one insoluble in water, alcohol, and æther, the other soluble in alcohol, and the third in all three solvents. The ultimate composition of these four substances in the above order is as follows:—

* *Comptes Rendus* de 14 Janv. 1839, p. 59.

† *Ibid.* 20 Juill. 1839, p. 149.

	I.	II.	III.	IV.
C	44·8	48·	62·8	68·53
H	6·2	6·	5·9	7·04
O	49·0	46·	31·3	24·43

By the action of concentrated sulphuric acid the primitive membrane was converted into dextrin and sugar, and in this manner the sclérogène was separated.

Finally, M. Payen has published a treatise on the different states of aggregation of vegetable tissues*. The substance which forms the cellular membrane is said to be in a pure state, but in a less firm state of aggregation, in starch. He has examined the membranes of several of the lower plants, which are nearly allied to the above-mentioned substance in their chemical and physical properties. The first comes to the consideration of the appearance of starch in lichens, and arrives at the same results as have already been made known in a former Report, viz. that the cellular membranes of lichens are coloured blue by iodine, and that in such plants it is these which dissolve to a jelly. On this occasion M. Payen remarks that he has analysed the spiral vessels of *Musa*, and has found their composition similar to that of other membranes †. Moreover he analysed the purified membranes of the threads of *Rivularia* which support the spores, and found it of the same constitution as starch. In the same way the tissue of mushrooms was analysed, after careful purification, and found to be a substance isomeric with the membranes of other plants; the same was found with the membrane of *Chara*. Finally, M. Payen directs attention to the fact, that the vegetable cellular membrane is only a ternary compound, while the quaternary organic compounds are found among the animal tissues; and although many parts of plants abound in nitrogen, still this body is only found in the *contents* of the cells.

M. Payen has also made known his views concerning the Nutrition of plants ‡. The cambium appears at first as a granular contractile substance, containing nitrogen. This sub-

* "Mémoire sur les états différens d'aggrégation du tissu des Végétaux."—Comptes Rendus de 26 Août, 1839, p. 296.

† "An ultimate analysis of the spiral fibres of *Musa paradisiaca* was made in the year 1838, by Prof. Mitscherlich and myself, (vide Meyen's Pflanzen Physiologie, ii. p. 551, and English translation of Meyen's Report for 1837, p. 26) which, however, gave quite a different result: microscopical observations show that these spiral fibres may be compared with the secondary cellular membranes, and therefore they must have a similar composition to that of Payen's sclérogène, if indeed his apparently so correct analyses may be fully trusted."—MEYEN.

‡ "Mémoire sur la nutrition des Plantes."—Comptes Rendus, de 21 Oct. p. 509.

stance is gradually developed and becomes enclosed in cells whose sides consist solely of carbon and the elements of water.

Afterwards a substance is formed rich in carbon and containing three times more hydrogen than if it consisted of carbon and water. From this it appears to him that the necessity of an excess of hydrogen in vegetation may be proved. The substance containing so much hydrogen is said to be a thick fluid, &c.

[To be continued.]

XIX.—*Account of a Specimen of the Oblong Sunfish, Orthogoriscus Oblongus, taken at Par in Cornwall, and preserved in the Museum of the Royal Institution of Cornwall at Truro.* By JONATHAN COUCH, F.L.S., M.R.G.S. of Cornwall.

NOTWITHSTANDING that the figures and description of the Oblong or Longer Sunfish, as published by Borlase, Montagu, Donovan and Mr. Yarrell, would seem sufficient to remove all doubt of the specific character of this fish, and the great difference between it and the more common species, *O. Mola*; yet even now this conclusion does not seem universally assented to. It is with great pleasure, therefore, that I am able, from examination of a specimen, to add my testimony to that of the above-named distinguished naturalists. The specimen had wandered into the lock of the new-made canal at a short distance west of Fowey; and being deemed extraordinary, though without a full knowledge of the interest attached to it, it was carefully skinned and preserved, to be presented to the Royal Cornwall Museum. The length is 22 inches; depth, measured on the round, from back to belly, $11\frac{1}{2}$; from snout to the eye, $2\frac{3}{4}$; to the origin of the pectoral fin, $8\frac{1}{2}$; length of this fin, $4\frac{1}{4}$; caudal fin $1\frac{1}{2}$ inch wide, or more properly, long; anal fin 6 inches—as I suppose is the dorsal, but the latter is a little injured. The number of fin rays is here given:

P. 15, D. 18, A. 17, C. 18.

The figure of this fish, which is here forwarded, is so little different from that given by Mr. Yarrell ('British Fishes,' vol. ii. p. 354.), as scarcely to require remark; I would therefore only point out, that in this skin there appears a plait bound over the upper lip, and that the rays of the dorsal and anal fins are bent into a curve at their termination; neither of which circumstances are marked in Mr. Yarrell's figure; probably be-

cause they were not conspicuous in the recent specimen originally examined by Donovan.

Mr. Yarrell's figure of the Shorter Sunfish is taken from a young specimen, and therefore but inadequately represents that species in its mature growth. The many opportunities, however, which I have had of examining this fish, and sometimes of large size, will allow of no doubt of its being distinctly separate from its far more rare congener, the Oblong Sunfish. The fin rays will probably be found to differ in the different specimens of both these species; but together with the lengthened form of the body, and shape of the mouth, the different shape of the pectoral fin will be sufficient to prevent all further hesitation on the subject.

Polperro, September 1, 1840.

BIBLIOGRAPHICAL NOTICES.

Icones Fungorum, &c. Tomus 3. J. C. Corda. Pragæ, 1839.

We have already twice noticed this valuable work, which is contributing greatly to our knowledge of Fungi. Our especial object, however, in again adverting to it, is to direct attention to the confirmation it affords of L veill 's new views of the structure and nature of Entophytous Fungi, of which an account is given in the 11th volume of the New Series of Annales des Sciences Naturelles. M. Corda's observations are perfectly independent of those of the French mycologist; and both the learned authors, whose discoveries were published in the same year, appear entitled almost equally to the credit attached to them, though M. L veill  has followed out the subject more completely. Indeed, Corda's observations are confined to a single species. The facts made known are very important, and are scarcely second in interest to those which have been accumulated lately regarding the *Hymenomycetes*.

It is well known that various opinions have prevailed as to the nature of *Entophyta*, and that M. Unger has lately paid much attention to the subject, and has arrived at the conclusion satisfactory to himself, but not equally so to all mycologists, that they are mere exanthemata analogous to cutaneous eruptions in mammalia. M. L veill , however, not contented with this notion, has examined them still more recently, and has discovered that in those species in which the cuticle of the matrix is most easily removed, there is immediately beneath it a true mycelium, from which the fungus is ultimately developed: and Corda, who has given most beautiful figures, though he appears not to have paid particular attention to the more early stages of growth, has shown that this mycelium penetrates the cells and interstices which are beneath the sori. This we have ourselves observed in *Æcidium Euphorbiæ*, the only species we have at present examined. L veill  has also shown that this structure prevails

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in the group, though some points of especial difficulty will probably still occupy his attention. Corda's observations as to the origination of the spores from sporophores and their moniliform arrangement, though something of the kind was figured by Unger, deserve further attention. The fact, then, that the *Entophyta* are true Fungi is completely set at rest, though at present we do not think that their affinities are clear.

Next in point of interest are the observations on *Stilbospora*, *Melanconium*, &c., in which the spores are shown to spring from sporophores. This is easily seen in *Stilbospora pyriformis*, a generally distributed species. A similar structure prevails in the analogous genus *Diplodia*. When these observations are more extended we trust that some light will be thrown on many Fungi now arranged in *Sphæria*, but differing materially in structure. *Acrospermum*, again, appears to be very near to *Sphæronema*, an affinity which could scarcely be suspected from the place long assigned to the genus in the neighbourhood of *Sclerotium*. The last three plates are devoted to the structure of *Hymenomycetes*; and though there is little novelty, they are not without interest. We would again express an anxious hope that the work may meet with due encouragement.

Plantes Cryptogames de France. Fasc. 21. Par J. B. H. J. Desmazières.

This beautiful work, too, we have already noticed, but the present Number is so peculiar, as exhibiting nearly a monograph of *Ceramiaceæ*, of which it contains fifty species, and is so admirably got up, that we should deem it unpardonable not to call the attention of our readers to it. The specimens have been collected in great part by Messrs. Crouan, who have so diligently investigated the *Hydrophytes* of Brest, and they have been conjoined with M. Desmazières in the digestion of the materials.

No pains have been spared in ascertaining the synonyms and reconciling the species of Agardh and Duby, who have considered the subject as if the memoir of Bonnemaïson on the articulated *Hydrophytes* had not existed. The learned authors are most anxious to have the most perfect materials possible, with a view still more accurately to reconcile all differences, and would, we know, feel highly obliged to any British Algologist who would send them specimens of British *Ceramiaceæ*, especially of such species as are described in the English Flora, but have not hitherto been figured.

Monographia Tuberacearum, Auctore Carolo Vittadini. Mediolani, 1831.

To those who are acquainted only with the species of *Tuber* and its allied genera, as described by Fries in the 'Systema Mycologicum,' the present work will afford no little surprise and pleasure. It is, indeed, quite extraordinary to see the number of well-defined species and genera which are here characterized; some of which present a

structure as curious as unexpected. A few will require to be removed to the *Hymenomycetous* group, where one of these subterranean genera, closely connected with *Clavaria* through *Sparassis*, exhibits most beautifully the change which takes place in consequence of a change of habit. Others, again, will fill up blanks among the *Lycoperdonaceæ*, and possibly amongst the *Phalloideæ* also. The affinity of these two groups has been shown in this Journal, and the circumstance of the ultimate condition of the fructifying mass when mature being so different in the two groups, was considered as comparatively of slight importance. This is completely confirmed by the genus *Elaphomyces*, which, though its contents are at length quite dry and dusty, and intermixed with flocci, as in true *Lycoperdons*, is nevertheless a certain ally of *Tuber*. An opportunity of examining both our British species together in the spring, before we had seen the work of Vittadini, had convinced us of this fact, and our views are fully confirmed by the Italian mycologist. The spores are, in fact, not born on sporophores, as in *Lycoperdonaceæ*, but are contained in globose asci or sporangia, as in *Tuber*. It is to be regretted that M. Vittadini does not appear to have been well supplied with authentic specimens of the more northern mycologists, and in consequence there is some difficulty in ascertaining the synonyms. Our two species of *Elaphomyces* are, however, clearly recognizable in *Elaphomyces variegatus*, Vitt., which is our *E. muricatus*; and *E. asperulus*, Vitt., which is *E. granulatus*. Vittadini appears to have been the first person who ascertained the true structure of the *Lycoperdonaceous* group in Bovista, though he was scarcely aware of the great importance of the fact before him, which arose partly perhaps from misapprehension, in common with all mycologists at the time, of the structure of the hymenium in *Hymenomyces*. Klotzsch, indeed, has thrown fresh light in Dietrich's 'Flora Regni Borussici' upon the *Hymenomycetous* genera of the monograph. We most cordially recommend it to the notice of British mycologists, and hope that it may be the means of bringing to light some of the hidden treasures of our woods and plains.

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PART III.

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PART IV.

On a new species of *Waldsteinia*; by Dr. Koch.—On the Vegetation of the source of the Antritz near Grätz; by Dr. Unger.—On *Saracha* and *Physalis*; by Prof. Bernhardt.—Supplement to Account

of the Flora of Hercynia; by E. Hampe.—Vegetation of the Brocken; by E. Hampe.—On the genus *Grubbia*, Endl.; by Klotzsch.—On Monstrosities of Plants; by Schlechtendal.—Prodromus of a monograph of *Lemnaceæ*; by Dr. Schleiden.—On two remarkable transformations of Plants; by Weinmann.—Request to German botanists to supply desiderata in the genus *Artemisia*; by W. D. Besser.—On Mexican Plants collected by Schiede and others; by D. F. L. De Schlechten.—On the irregular form of Papilionaceous Flowers; by A. Walpers.

PART V.

Critical Remarks on Cape *Leguminosæ*; by G. W. Walpers.—On some phænomena in the growth of Dicotyledonous Plants; by Dr. Becks.—On Mexican *Galphimix*; by F. T. Bartling.—On *Pinus Pumilio*; by H. R. Göppert.

PART VI.

On the family of *Piperaceæ*; by C. Kunth.

PROCEEDINGS OF LEARNED SOCIETIES.

BOTANICAL SOCIETY OF LONDON.

March 20.—Daniel Cooper, Esq., Curator, in the Chair.

A paper was read by Dr. W. H. Willshire, "On the nature of some of the lowest Organized Beings." The intention of the paper was to bring before the Society the views lately advanced by Ehrenberg, in his great work concerning the organization and relative place in the scale of animated nature of many of the tribe *Bacillaria*, *Closterina*, &c. It was endeavoured to be proved that a great many members of the family *Bacillaria*, the genus *Closterina*, and several others, must be considered as of a vegetable nature, and not of an animal, as Ehrenberg supposes, and that it is a matter of some doubt how far the members ranking under his sub-division *Naviculacea* may be considered as of an animal organization either. It was shown by Dr. Willshire that the phænomenon of self-division is not peculiar to the animal kingdom, but that it likewise occurs in that of the vegetable; that the whorled ramuli of *Chara* can increase both by transverse and longitudinal self-division; that the formation of spores in *Marchantia*, *Jungermannia*, and some other plants, takes place from self-division of the original cellule; and that the increase of *Conferva glomerata*, &c. is also known to ensue by the same means; and that therefore the mere fact of this mode of propagation in such structures as *Diatoma*, *Fragillaria*, *Desmidium* and others, is not a sufficient proof of their animal condition. It was stated likewise that granular matter, seen within many of these lower beings, and which is regarded by Ehrenberg in many cases as the ova granules or eggs of these creatures, cannot be such; for according to other observers, they become *blue* on the addition of the tincture of iodine, a further proof of their vegetable nature, and a fact particularly noticed by

Meyen in respect to *Euastrum* and *Closterium*; that the mere dissolution from some of these lower beings of moving sporules, or at least mobile portions capable of increase of form and size, is not a proof of the animal condition of the parent bearing them, because from the observations of Vaucher, Lamoureux, Montaigne, and especially the younger Agardh, we may safely conclude that the sporules of a very great many *Algæ*, when ripe, are endowed with the faculty of locomotion; and that this not only takes place when such portions become freed from the mother plant, but in some cases also whilst they are within the interior of the cellules; also, that the fact of locomotion is not a proof at this low extremity of the scale of animal conditions, as we know that it takes place in structures allowed by Ehrenberg himself to be of vegetable nature, such as the *Oscillatorias* and *Zygnemas*; and that Ehrenberg's opinion, that the motion seen taking place in *Oscillatoria* is caused by rapid growth of the filaments, formation of gemmæ, and stimulus of light, is ably and sufficiently disproved by the experiments of Capt. Carmichael; and also, that as we cannot in the present state of our knowledge say that the attainment of a particular *result* from the occurrence of motion, as more apparently ensues in the *Naviculas* than in the *Oscillatorias*, is indicative of animal conditions, because *result* or *purpose attained* is equally observable in the movements of *Zygnema* or even in *Vallisneria*, and the motions of many irritable stamens; it seems to be highly probable, that many of these almost invisible organisms hitherto freely yielded up by the botanist to the zoologist, must not be considered as indisputable claims for such distinction, although they may not appear at once so decidedly vegetable as do *Diatoma*, *Fragillaria*, *Desmidium*, *Closterium* and others.

The paper was concluded with some remarks on the genus *Navicula*, and illustrated with specimens under the microscope of the various genera, together with a series of diagrams.

April 3.—J. E. Gray, Esq., F.R.S., &c., President, in the Chair.

The Secretary announced a donation of a very extensive collection of Foreign Plants, presented by Mr. Emerson through Mr. John Morris. A paper was read from Mr. Riley of Papplewick, Notts, being introductory to a series, which will form a popular "Monograph on Ferns."

June 5th.—D. C. Macreight, M.D., V.P., in the Chair.

A donation of American Plants from Dr. Gavin Watson of Philadelphia, U. S. was announced. Mr. Tatham, of Settle, Yorkshire, presented specimens of *Dryas Octopetala* obtained from the hills in that neighbourhood. Mr. H. M. Holman, of Reigate, Surrey, forwarded living specimens for distribution of the rarer plants of that locality, comprising *Aceras anthropophora*, *Ophrys muscifera*, *Osmunda regalis*, &c. &c. A paper was read, being Part 3. of a Monograph of Ferns. It comprised a description of the British species individually; the remarks being the result of many years personal experience, the author having cultivated every British species side

by side, and watched their specific differences with great care and attention. Mr. Thomas Sansom exhibited a prolific specimen of *Polytrichum commune*, in which a second stem was developed in the place of the stalk bearing the fructification.

ZOOLOGICAL SOCIETY.

Feb. 11, 1840.—The Rev. J. Barlow in the Chair.

Mr. G. T. Lay read the following account of the habits of a Bird of Paradise, *Paradisea apoda*, Linn.:—

“This bird has been in the possession of Mr. Beale upwards of fourteen years, and seemed when I left China at the commencement of the past year to be in full health and vigour. It is fed mainly upon boiled rice, with a few grasshoppers, as meat with its vegetables. These it eats whole when small, but pulls off the legs and wings when large. The tip of the abdomen, with the lower intestine, are rejected, while the rest of the viscera are devoured as a sort of choice morsel. It seizes the insect near its head with so firm a gripe, that life is soon extinct, which answers the double purpose of securing its prey and of shortening the dying throes of the poor victim. It is very careful to cleanse its bill after every such operation, wiping it upon the perch, and shaking it with a peculiar jerk. I have heard one remark that it is not a clean feeder, but this is true only of the mode of eating, which is gross and eager, as the largeness of the mouthful is incompatible with much grace or nicety in conveying the food to the place of its destination.

“The voice is loud and sonorous when he calls in a rapid succession of notes. This is probably the strain in which he answers his fellows in the wild state, and may be heard, from its clearness, a great distance, where walls and dwellings do not interfere with the pulsations. When you approach his cage he often treats you with a ditty, which I have called in my memorandum ‘the song of solicitation.’ It is short, but very pleasing, and not a little curious, for the notes are repeated in harmonic progression.

“*The Serenade of Beale’s bird.*”



“The first four notes are very exactly intonated, very clear, and very sweet. The three last are repeated in a kind of caw, a very high refinement of the voices of a daw or a crow, yet possessing a striking resemblance. And this suggests a lively affinity between the crows and the paradise birds. While this serenade is uttered, the black pupil, encircled by a golden iris, waxes or wanes, as the creature wishes to contemplate more distant or nearer objects. The bill snaps as the prelude of a meal and the token of appetite, while the body is conveyed from side to side by the highest and most easy springs. The crow and its congeners love to range upon the ground,

as having feet formed for walking, but the Paradise Bird shuns the bottom of the cage, as if afraid of soiling its delicate plumage; for I must observe, that it is always as clean and wemless as it is gay and splendid. The Creator, who has poured so much beauty upon it, has also endowed it with an instinct to delight in these charms, and with wisdom to preserve them in their fullest integrity. In the wild state it is not unlikely that they catch their prey upon the wing, either by taking it in flight, like the swallow, or by darting upon it, like the Drongo Shrike, as it passes by the seat of its pursuer.

“The form and disposition of the pennons afford it the power of floating gracefully upon the breeze, not of cutting the air in rapid flight. The ease with which it glides upon the auræ must be increased by the hypochondrial feathers, which are lifted up and displayed in the act of flying. The hypochondrial feathers are yellow at the base, whitening towards the end, with brown shafts. The shortness of the vanes makes them resemble the teeth of a saw near the end. The tail-coverts with long toothed shafts. The feet and legs are of a dark leaden blue. They are strong, and grasp the perch with great ease and firmness.”

Mr. Fraser pointed out the characters of several new species of Humming-birds, which had been placed in his hands by the Earl of Derby for that purpose, and that they might be exhibited at one of the Society's scientific meetings. These birds were obtained at S^{ta} Fé de Bogota, and the collection contained eighteen species, a great portion of which being undescribed, were thus characterized:—

TROCHILUS EXORTIS. *T. rostro quàm caput paululùm longiore; caudâ nigrescente, latissimâ, subfurcatâ; colore viridi; pectore cæruleo enitente; maculâ frontali splendide viridi; lacinia gulari purpurascenti-rubrà nitore cæruleo; menti plumis cæruleis; crisso albo.*

Long. tot. 4 unc.; rostri, $\frac{3}{4}$; alæ, $2\frac{1}{2}$; caudæ, $2\frac{1}{8}$.

Hab. Guaduas, Columbia.

This species is of moderate size; the general colour of its plumage is deep rich green, with bronze reflections; the wings are dusky, with the upper and under coverts of the same green tint as the body: the two central tail-feathers are tinted with bronze, both above and beneath; the remaining tail-feathers, which are broad, are black, but in certain lights a very obscure purplish-green hue is observable; the feathers on the forehead are more compact than the remaining feathers of the head; in some lights they appear to be of a black colour, edged with green; in others they exhibit a most brilliant green lustre.

TROCHILUS CUPREO-VENTRIS. *T. rostro quàm caput paululùm longiore; caudâ brevi, subfurcatâ; femoribus albis; colore splendide viridi, aureo et cupreo enitente; crisso purpurascenti-cæruleo; primariis nigrescentibus; caudâ nigrâ, purpureo tinctâ.*

Long. tot. $4\frac{3}{4}$ unc.; rostri, 1; alæ, $2\frac{3}{8}$; caudæ, $1\frac{7}{8}$.

This species is remarkable for the richness of its colouring; in

certain lights it appears as if it were powdered with gold and copper-coloured particles; the coppery hue prevails most on the belly; and the upper tail-coverts are of a purer green than other parts.

Another blue-vented and white-thighed Humming-bird was described under the name of

TROCHILUS UROPYGIALIS. *T. rostro quàm caput longiore; caudâ mediocri, furcatâ: colore corporis intensè viridî, aureo relucente; reatricibus caudæ fulgidè aureo-viridibus; gulâ crissoque ex purpureo splendide cæruleis; abdomine nitidè viridî; alis nigrescentibus; caudâ ex purpureo atrâ; plumis femoralibus albis, laxis.*

In the female the throat and chest are somewhat rusty, with green spots, and the feathers on the belly are variegated with whitish.

This species is about the same size, and in many respects resembles the *T. cupreo-ventris*, but differs in having the general colour less brilliant, whilst the feathers of the belly and the upper tail-coverts are more brilliant, and present that compact striated appearance which is always observable in those feathers which give that extreme brilliancy to different parts of these birds: it differs, moreover, in having a blue throat, and the belly, instead of being cupreous, is bluish-green. The upper tail-coverts in *T. cupreo-ventris* are of the same loose character as those on the back.

TROCHILUS CORUSCUS. *T. rostro brevi; caudâ latissimâ, subfurcatâ, ex aeneo fuscâ: corpore suprâ, capiteque viridibus nitore aureo; tectricibus caudæ cupreis; primariis purpurascensibus; corpore subtùs viridescente, fuscescenti-ochreo, præsertim ad crissum, tincto; lined gulari, ad pectus tendente nitidè viridî, apice purpurascens-rubro.*

Long. tot. $5\frac{1}{4}$ unc.; rostri, $\frac{3}{4}$; alæ, $2\frac{7}{8}$; caudæ, $2\frac{1}{8}$.

Beak about equal to the head in length; tail slightly forked, the feathers very broad; general colour of upper parts green, with golden reflections, upper tail-coverts coppery; under parts dull brownish-green; tail-feathers above and beneath rich bronze, with golden brown reflections; primaries dusky, with purple reflections: a stripe, extending from the chin to the chest, is composed of compact brilliant feathers; those on the chin and throat are green, and those beyond are purplish-red, exhibiting bluish reflections; under tail-coverts brownish-yellow; some of the feathers are whitish; the feathers on the edge of the shoulders are varied with brownish-ochre.

The female is deficient of the flame-like mark on the throat.

TROCHILUS BRACHYRHYNCHUS. *T. rostro quàm caput breviorè; caudâ brevi, nigro, cupreo et aeneo subnitente; reatricibus utrinque duabus externis cæteris paululùm præstantibus, et ad apicem albis: corpore suprâ, ex aureo viridî, corpore subtùs albo (interdùm flavido lavato), maculis ex aureo viridibus ornato; primariis purpurascensibus.*

Long. tot. $3\frac{5}{12}$ unc.; rostri, $\frac{1}{3}$; alæ, $1\frac{7}{8}$; caudæ, $1\frac{7}{12}$.

In one specimen there is a rufous tint on the upper tail-coverts;

in another there are several purple feathers irregularly scattered with the ordinary golden green ones on the back; perhaps in the adult bird this purple is the prevailing colour of the back.

This small-sized species is remarkable for the shortness of its beak, which is acutely pointed, and a little dilated in the middle.

TROCHILUS DERBIANUS. *T. rostro recurvo, quoad longitudinem, corpus cum capite æquiparante; caudâ mediocri, paululùm furcatâ: colore viridi, corpore subtùs albido variegato; gulâ nigrescente.*

♂ Long. tot. 8 unc.; rostri, $3\frac{3}{8}$; alæ, 3; caudæ, $2\frac{1}{4}$.

♀ ————— $7\frac{1}{4}$ —————, $2\frac{3}{4}$; —, 3; ———, 2.

Bill immensely long, and somewhat recurved, equal in length to the head and body; tail moderate, slightly forked; head and upper parts of body green, with golden and bronze reflections; wings purplish-black; tail blackish, tinted with bronze, the central feathers being the richest; chin and throat dusky, each feather very obscurely tinted with bronze in the middle, and edged with ashy-white; belly and vent green; the feathers edged with white, or in parts greyish, those on the chest are whitish, with a large green spot near the apex; under wing-coverts green.

The female has a shorter beak; and there is more white on the under parts of the body; the feathers on the throat and chin are somewhat variegated with yellowish.

TROCHILUS AUROGASTER, Loddiges' MSS. *T. rostro ferè duplo quàm caput longiore; caudâ mediocriter latâ et furcatâ; plumis corporis permagnis, et suprâ et subtùs: colore splendide viridi; tectricibus caudæ plumisque abdominis nitidè aureo relucetibus; notâ gulari purpureo-cæruleâ, necnon apud frontem notâ, luce favente, gramineo-viridi; crissi plumis aureo-viridibus, ferrugineo marginatis; alarum primariis fuscescenti-nigris non sine æneo nitore; caudâ ex-aureo-æneo-viridi.*

In the female the throat is of a rusty yellow tint, and is sparingly spotted with green; the belly and vent are of an ochreous colour, with heart-shaped green spots; on the former the green predominates, and on the under tail-coverts the yellowish tint prevails.

This species is of moderate size; that portion of the under mandible which shuts into the upper one is white.

TROCHILUS FUSCICAUDATUS. *T. rostro quàm caput longiore; caudâ subrotundatâ: colore ex aureo viridi; plumis gulæ, pectoris, et abdominis, albido marginatis; plumis analibus albis; crisso fusco, rectricibus caudæ submetallicè castaneis, nigrescente marginatis; remigibus alarum nigrescentibus, purpureo paululùm relucetibus; mandibulâ inferiore (apice excepto), necnon superioris basi, pallidè fuscis.*

Long. tot. 4 unc.; rostri, $\frac{7}{8}$; alæ, 2; caudæ, $1\frac{1}{2}$.

Hab. Chachapayas, Peru.

TROCHILUS CYANOPTERUS, Loddiges' MSS. *Tr. rostro quàm caput multo longiore; caudâ latissimâ et leviter furcatâ: colore intense viridi, ad nigrum hîc atque illic vergente, præsertim apud caput;*

primariis tectricibusque alarum metallicè cæruleis, illis ad apices marginesque nigrescentibus; caudâ nigrescente, viridi tinctâ; alis subtùs cærulescentibus.

This is a very large species, being nearly equal in size to the *T. gigas*; its deep green colouring and blue wings render it easily distinguished; the female differs considerably from the male, inasmuch as nearly the whole of the under parts of the body are of a rust-like tint; the two outer tail-feathers are of a blackish colour, but have a white shaft; the outer web is grayish-white, excepting at the margin and at the apex of the feather; the outer edge of the first primary is palish.

TROCHILUS GIBSONI, Loddiges' MSS. *T. rostro quàm caput longiore; caudâ mediocri, rotundatâ: corpore suprâ, sic et reetricibus caudæ duabus intermediis aureo-viridibus; corpore subtùs albo; plumis gularibus magnis, strophium efficientibus, purpureo relucen-tibus; reetricibus caudæ utrinque tribus, exterioribus, ad basin ci-nerascentibus, apicibus albis.*

Long. tot. $2\frac{7}{8}$ unc.; rostri, $\frac{7}{8}$; alæ, $1\frac{3}{4}$; caudæ, $1\frac{1}{8}$.

Hab. — ?

The green on the upper parts of the body of this little species is rather paler, and has a greater admixture of the golden lustre, than usual: words can convey no idea of the brilliancy of the large ruff on the throat; in some lights it assumes a deep blood-red hue; in others there is a slight admixture of purple observable; in others, again, they put on a brilliant cupreous-red tint, as we observe in the copper ore.

TROCHILUS ANGUSTIPENNIS. *T. rostro quàm caput paululùm longiore; caudâ leviter furcatâ, hujus reetricibus, necnon remigibus alarum, valdè arctis: capite corporeque suprâ intensè æneo-viri-dibus; gulâ et corpore subtùs, plumis albis analibus exceptis, aureo-viridi metallicè relucen-tibus; alis caudâque intensè purpureis.*

Long. tot. $3\frac{1}{4}$ unc.; rostri, $\frac{3}{4}$; alæ, $1\frac{3}{4}$; caudæ, $1\frac{3}{8}$.

This small-sized species has the wing and tail-feathers narrower than usual.

TROCHILUS PARVIROSTRIS. *T. rostro parviusculo, acuto, quàm ca-pit brevioris; caudâ leviter furcatâ, mediocri, reetricibus sub-latis: capite corporeque suprâ aureo-viridibus, in obscurum transeun-tibus; frontis plumis ochreo pallidè lavatis; corpore subtùs flavescen-tialbo; gulæ plumis singulis maculâ obscurâ; abdomine sordidè ochreo, plumis singulis maculâ magnâ, obscurè viridi; plumis analibus albis; crissi plumis obscuris, apicibus albis; caudæ rec-tricibus, æneo-viridibus suprâ, subtùs aureo-æneis, scapis albis; reetricum tribus utrinque externis, lined centrali albâ, in externâ utrinque hâc lined extensâ, ferè ad marginem; alis obscuris, pur-pureo subtùs, paululùm relucen-tibus.*

Long. tot. $4\frac{1}{2}$ unc.; rostri, $\frac{1}{2}$; alæ, $2\frac{3}{8}$; caudæ, 2.

This is in all probability a young bird, or perhaps a female of some species, the male of which remains to be discovered; the yellow

white, or cream-colour of the lower part of the throat extends in a narrow line across the back of the neck.

TROCHILUS FLAVICAUDATUS. *T. rostro quàm caput duplò longiore et arcuato ; caudà mediocri : capitis vertice obscurè fusco ; corpore suprà aureo-viridi, corpore subtùs ochreo ; gulæ plumis punctis aureis et cupreis ; pectoris lateribus maculis aureo-viridibus, ornatis ; crisso pallidè ochreo ; reatricibus caudæ duabus intermediis aureo-viridibus, reliquis ochreis, apicibus viridibus ; remigibus alarum obscuris, purpureo relucens ; rostro nigro ; pedibus suprà nigrescentibus, subtùs pallidis.*

Long. tot. $4\frac{3}{4}$ unc. ; rostri, $1\frac{1}{8}$; alæ, $2\frac{1}{2}$; caudæ, $1\frac{3}{4}$.

TROCHILUS MELANOGENYS. *T. rostro quàm caput vix longiore ; caudà sub-brevi, reatricibus mediocriter latis, et acutis : capite et corpore suprà aureo-viridibus ; corpore subtùs ex-ochreo-albo ; abdominis lateribus rufo lavatis ; genis nigris ; lined flavescens albâ pone oculos ; plumis gulæ singulis notâ ad apicem nigrâ, notis lineas longitudinales efficientibus ; abdomine, obscurè, aureo-viridi guttato ; caudâ suprà nigrescente, aneo tinctâ, apicem versus nigrâ purpureo relucens, et reatricibus flavescens-albo, duabus intermediis exceptis, terminatis ; alis obscuris, violaceo relucens ; mandibulâ inferioris basi, pedibusque flavis.*

Long. tot. $3\frac{3}{4}$ unc. ; rostri, $\frac{3}{4}$; alæ, $3\frac{3}{4}$; caudæ, $1\frac{3}{8}$.

TROCHILUS TYRIANTHINUS, Loddiges' MSS. *T. rostro acuto, caput longitudine æquante ; caudâ mediocri, vix furcatâ ; reatricibus latissimis : capite, corporeque suprà, aureo-viridibus ; sic et corpore subtùs, at ochreo variegato ; gulâ nitente, et intensè viridi ; reatricibus caudæ suprà aneo-viridibus, ex-aureo, et cupreo relucens, subtùs, cupreis, aureo nitentibus ; alis obscuris ; rostro pedibusque nigris.*

Fœm : gulâ e castaneo flavâ ; abdomine albo, ochreo lavato ; singulis plumis notâ aureo-viridi.

Long. tot. 4 unc. ; rostri, $\frac{1}{2}$; alæ, $2\frac{1}{8}$; caudæ, $1\frac{3}{8}$.

MISCELLANEOUS.

NOTICE OF A SPECIES OF WARBLER NEW TO BRITAIN.

Amongst the new specimens of British birds which have been lately presented to the British Museum by Mr. J. Baker, was one that was considered a Reed Wren (*Sylvia arundinacea*), but on comparing it with other specimens it was at once suspected to be a distinct bird ; and further, it agreed with none of those at present recorded as being found in this country. On investigation it proved to be a rare species even in the south of Europe, and one that was first noticed by Savi in the 'Nuovo Giornale de Letterai,' Num. XIV. 1824 ; and again in his 'Ornitologia Toscana,' tom. i. p. 270, under the name of "*Sylvia luscinoides*." It is figured by Savigny in the 'Description de l'Égypte,' pl. 13. f. 3, and by Gould in his 'Birds of Europe.' The specimen was obtained, with a second, by the above-

mentioned person last spring in the fens of Cambridgeshire; these were all that were procured.

The following is a short specific description:—

Sylvia luscinioides, Savi (Pseudoluscinia Savi, Bonap.).

General colour above castaneous brown, with the tail very inconspicuously barred with darker; line over the eyes, breast, sides and under tail-coverts paler than the upper parts; throat and middle of the abdomen albescent, the former slightly spotted triangularly with darker. The first quill very short, and the second longest of all. Upper mandible brown, lower and feet yellowish brown.

Total length, $5\frac{1}{4}$; bill, $\frac{9}{12}$; wings, $2\frac{1}{2}$; tail, $2\frac{1}{4}$; tarsi, $\frac{9}{12}$.

GEORGE ROBERT GRAY.

PHYSOPHORES.

Mr. Milne Edwards believes that these are not single animals, but the aggregation of a great number of individuals growing by buds, and living united together like the compound *Polypes*.—*Edwards, Ann. Sc. Nat.* 1840.

ECHINIDÆ.

Mr. M. Edwards and Dr. Peters have discovered that the *Echinidæ* are of separate sexes: the testicles differ little from the ovaries, but they contain a white milky fluid, while that of the ovaries is orange.—*Edwards, Ann. Sc. Nat.* 1840, p.196.

CARINARIA.

According to Mr. Edwards, the nervous system is much more complicated than in any other Gasteropodes; besides the labial ganglions, the cerebral, and the subcesophageal, there are a pair of optic ganglions, a pair of ophthalmic, a pair of hepatic and a subanal ganglion. Lastly, they have stomato-gastric nerves analogous to those which have been observed in Crustacea, and in many other invertebrated animals.—*Ann. Sc. Nat.* 1840, p. 196.

HISTORY OF MOLLUSCA.

M. De Blainville has lately published some extracts from M. Dufou's observations on the habits of mollusca; in which he remarks that this gentleman has observed that the eggs of *Achatina Mauritiana* are disposed in the form of a column, forming a more or less lengthened series; that *Helix unidentata* and *H. Studmanni* are ovoviviparous; that some species of *Calyptrea* are provided with a support distinct from the rock on which they are placed; that *Hipponyx* sometimes hollows out the surface of the bodies to which it is attached; and that the *Byssiferous bivalves* sometimes detach their byssus thread by thread. These remarks with regard to the *Calyptrea* are very interesting, as showing the affinity of the animal to the *Hipponyces*, which have been proposed to be placed with the bivalves. The observations with respect to ovoviviparousness of some *Helices* and the habits of the *Hipponyces* are not new to English malacologists.—J. E. GRAY.

THE GENUS *BROCCHIA* OF BRONN.

In the Philosophical Transactions for 1833, p. 78, I stated that I believed that this genus had been established on specimens of *Capuli* that had been affixed to radiated shells. M. Philippi, in his excellent work on Sicilian Shells, observes, "Non in testa plicata differentiam genericam quæsit cl. Bronn, sed in sinu laterali, et *Brocchia* eodem caractere a *Capulis* quo *Siphonaria* a *Patellis* differt," p. 119. On re-examination of the species I find nothing to distinguish it from *Capulus* but the lateral notch, which varies greatly in size in the different specimens, and appears to be formed by attachment to some extraneous body. M. Philippi however copies Professor Bronn's character without discovering that it contains two very obvious inaccuracies, which, if they were true, would at once separate the genus from *Capulus* and all the other known Molluscous genera: for he says, "Impressio muscularis elongata arcuata transversa intus ad limbum anticum." Now I know no univalve shell that has the muscular scar on the front of the mouth! The fact is, that the Professor has mistaken the front of the shell for the back, and this has led to the other mistake; for he describes the mouth thus, "apertura subrotunda, *margo sinister sinu amplo excisus*," whereas the nick is not on the left but always on the right side of the shell when present. I may further observe, that the right limb of the muscular impression behind the neck is much shorter than the left; or rather, the apex of the shell, which in *Pileopsis hungaricus* is nearly in the centre of the back of the shell, is in *P. sinuosa* on the right side of the back. The shell is dextral, though it has at first sight the appearance of being sinistral.—J. E. GRAY.

"THE SEXES OF LIMPETS. PATELLÆ."

In the last Number (p. 70.) Dr. Wagner refers to the fact of the *Patella* being unisexual as a discovery of his own. It will be found stated with more detail in the first volume of the Annals, p. 482.—J. E. GRAY.

THE EXHIBITION OF FISHES IN MUSEUMS.

In the Royal Museum of Vienna, where they have the best-preserved and exhibited collection of fishes that I have ever seen in any public Museum, the specimens are kept in shallow cases about six or eight inches deep, and are suspended by a wire loop which is inserted into the back of the specimens just before the front of the dorsal fin. If the specimen is long and heavier behind, so that it will not keep its position, there is driven in a small pin just beneath the lower side of the base of the tail to support it. In this manner the fishes appear in the attitude of swimming, and their names are easily attached to the back of the case beneath them; they are also easily taken off the pin to which the loop is suspended, if necessary for examination.—J. E. GRAY.

MR. HECKL'S METHOD OF CLOSING GLASS JARS.

The specimens of fish in the Museum of Vienna which are kept in spirits are inclosed in glass jars covered with a flat glass disc; these discs are made at the same time as the bottles and sent in with them from the Bohemian glass-houses. They and the surface of the lips of the jars are ground together so as exactly to fit each other, and they have an oblique edge shelving towards the inner side, so that when they are placed on the top of the jar there is a small triangular space all round between the upper edge of the disk and the upper outer edge of the lip of the jar, which is left to hold a quantity of the composition by which they are luted. This composition consists of six ounces of white wax and three drachms each of spermaceti and hog's lard mixed together; and Mr. Heckl, who has made many experiments, assured me, that if it was well applied between the two surfaces and filled into the triangular space above referred to, not the least evaporation was observable in bottles that had been set aside for the purpose for more than two years, though some of them had been set upside down to bring the spirit in connexion with the mixture. Indeed so much confidence has Mr. Heckl in the method, that he has had the disk pierced with a small central slit to enable him to support his specimens with silk, only having a small concavity ground out of the upper surface of the disk round the hole, which he fills with this composition. There is a specimen jar of the kind in the British Museum.—J. E. GRAY.

STANDS FOR BIRDS, &c.

In the Vienna Museum the newer specimens of Birds and the smaller mammalia are placed on stands with oval bases; this is far superior to the round or square bases which are usually adopted in English and French collections, as it gives a larger space for the label without occupying more room, which is often much wanted, and at the same time prevents the birds being knocked against each other by accident.—J. E. GRAY.

THE GENUS *GYNAMEDA*, GRAY.

The body which I described under this head in Proceedings of the Zoological Society, is evidently only the basal joint of the body of the English species of *Comatula*, the impressed dots on the convex part being the scars left by the dorsal claspers; and the single opening and the cavity in the flat part are doubtless analogous to the roundish or five-rayed cavity in the joints of the stem of the *Enirmitis*. This fact I have verified by comparing the specimens I described with one of those joints separated from a complete specimen, but it is curious how the two specimens which were described should have been found so completely isolated in the sand; for I had great difficulty, even after soaking the specimen in water for some days,

to separate this joint from the rest of the body, and at last could not do it without breaking part of its edge and some of the other pieces. I have no doubt, after examining the specimens of Dr. Goldfuss's genera *Goniotremites* in the Museum at the University of Bonn, that they also equal the basal part of the body of some fossil Ecrimites as M. Agassiz has already suspected, the five holes round the mouth being similar to the five rays sometimes found in the stem of some species of *Crinoidea*.—J. E. GRAY.

THE EPIPHRAGMA OF *ACHATINA*.

The Epiphragma of the larger species of *Achatina* (as *A. Mauritiiana*) is thin, hard and calcareous, and marked with a long linear impression near the outer hinder angle of the aperture over the respiratory hole of the animal.—J. E. GRAY.

THE HOOPOE.

A fine specimen of the Hoopoe (*Upupa epops*, Linn.) was shot on Skeicoat Moor, near this town, on the 3rd instant, and is now in my possession.—R. LEYLAND.

Halifax, Sept. 16, 1840.

METEOROLOGICAL OBSERVATIONS FOR AUG. 1840.

Chiswick.—Aug. 1, 2. Very fine. 3—9. Hot and dry. 10. Very fine. 11. Showery. 12. Cloudy: rain. 13. Cloudy. 14. Rain. 15. Very fine: showery. 16. Fine. 17. Boisterous with heavy rain. 18. Cloudy. 19. Heavy rain: cloudy and fine. 20. Fine. 21. Foggy: very fine. 22. Foggy. 23—26. Very fine. 27. Foggy: fine. 28. Slight fog: rain. 29. Foggy. 30, 31. Cloudy and fine. The mean temperature of the month was nearly 2° above the average.

Boston.—Aug. 1—3. Fine. 4. Cloudy. 5—10. Fine. 11. Rain. 12, 13. Fine. 14. Cloudy. 15. Stormy: rain P.M. 16. Fine. 17. Stormy: rain early A.M.: rain with thunder and lightning P.M. 18. Stormy. 19, 20. Cloudy. 21. Fine: quarter past three P.M. thermometer 80°. 22. Cloudy: rain P.M.: lightning at night. 23, 24. Fine. 25. Fine: rain P.M. 26, 27. Cloudy. 28. Fine. 29. Cloudy. 30. Fine: rain P.M. 31. Cloudy: rain A.M.

N.B. The warmest August since 1826.

Applegarth Manse, Dumfries-shire.—Aug. 1, 2. Very fine. 3. Mild: showery A.M. 4. Fine. 5. Sultry. 6. Sultry: heat oppressive. 7—9. Sultry. 10. Wet and boisterous P.M. 11. Showery. 12—14. Occasional showers. 15. Fair throughout. 16. Much rain P.M. 17. Heavy rain: thunder: high flood. 18. Fine drying day. 19. Fine, with one slight shower. 20. Drizzling all day. 21. Fine: rain P.M. 22, 23. Fine and fair all day. 24, 25. Showery. 26. Fair all day and clear sky. 27. Wet P.M. 28. Fair all day. 29. Drizzling all day. 30. Fine and fair all day. 31. Remarkably fine harvest day.

Sun shone out 27 days. Rain fell 15 days. Thunder 1 day.

Wind north-west 5 days. East-south-east 1 day. South-east 4½ days. South 7 days. South-south-west 4 days. South-west 8½ days. Variable 1 day.

Calm 12 days. Moderate 11 days. Brisk 5 days. Boisterous 3 days.

Mean temperature of the month.....	57°·60
Mean temperature of August, 1839	55 ·70
Mean temperature of spring water	52 ·33

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. ROBERTSON; by Mr. THOMPSON at the Garden of the Horticultural Society at Chiswick, near London; by Mr. VEALL at Boston, and by Mr. DUNBAR at Applegarth Manse, Dumfriesshire.

Days of Month, 1840, Aug.	Barometer.				Thermometer.				Wind.				Rain.			Dew point.			
	Chiswick.		Boston, 8½ a.m.		London: Roy. Soc.		Self-register, 9 a.m.		Dumfriesshire.		Chiswick.		Dumfriesshire.		London: Roy. Soc. 9 a.m.		Chiswick.	Boston.	Dumfriesshire.
	Max.	Min.	Max.	Min.	Fahr.	Max.	Min.	Max.	Min.	Max.	Min.	London: Roy. Soc. 9 a.m.	Chiswick	Bost.	Dumfriesshire.	London: Roy. Soc. 9 a.m.	Chiswick.	Boston.	Dumfriesshire.
1.	30-278	30-205	29-65	30-06	30-00	63-7	72-6	53-2	73	46	64	67	50	NW.	NW.	...	...	...	56
2.	30-254	30-171	30-135	30-00	30-00	66-7	79-0	55-3	83	51	69	66	52	S.	W.	...	...	...	60
3.	30-244	30-161	30-088	29-97	30-00	70-0	79-3	61-0	87	48	70	68	53½	NW.	W.	...	...	...	62
4.	30-188	30-117	30-082	30-04	30-05	67-5	80-5	61-0	86	56	69	55	55	NW.	calm	...	...	...	58
5.	30-150	30-081	29-991	30-05	30-05	67-2	86-5	59-0	82	55	71	75	53	SE.	E.	...	...	...	61
6.	30-034	29-959	29-917	30-04	30-04	69-6	73-0	60-0	84	62	68	73	54	ENE.	E.	...	...	...	60
7.	30-020	29-991	29-930	30-00	30-03	71-3	78-5	64-0	80	56	70	73	54½	NE.	E.	...	...	...	61
8.	30-150	30-129	30-068	30-12	30-14	65-4	76-0	59-0	80	41	67	73	55½	NNE.	E. calm	...	...	...	59
9.	30-292	30-223	30-106	30-18	30-10	60-2	75-5	52-4	83	51	67	73½	53	N.	calm	...	...	...	54
10.	30-098	30-052	29-779	29-42	29-84	69-5	77-0	60-0	86	58	67-5	64	52	SW.	calm	...	...	...	58
11.	29-614	29-566	29-516	29-40	29-40	63-5	79-7	62-0	85	55	60	64	56	S.	calm	...	...	...	60
12.	29-654	29-589	29-555	29-00	29-38	65-5	70-5	57-0	73	51	63	60	56	WSW.	W.	...	...	...	57
13.	29-656	29-592	29-551	29-32	29-35	63-0	70-0	55-0	73	49	59	63½	46	SW.	W.	...	...	...	54
14.	29-530	29-672	29-479	29-31	29-30	61-0	70-0	56-0	66	50	55	62	51½	SW.	calm	...	...	...	54
15.	29-818	29-663	29-752	29-17	29-50	61-2	67-0	53-5	59	51	60	63½	52	SW var.	NW.	...	...	...	55
16.	29-968	29-911	29-750	29-35	29-64	63-0	67-5	54-5	73	54	63	59½	51½	W.	W.	...	...	...	59
17.	29-206	29-326	29-169	28-86	28-81	59-8	72-0	58-0	63	49	57	61	50½	SE var.	SW.	...	...	...	54
18.	29-374	29-654	29-315	28-66	29-19	59-5	63-2	52-5	62	50	58-5	63½	48	W.	NW.	...	...	...	55
19.	29-712	29-799	29-661	29-11	29-52	57-0	63-8	57-0	70	56	56	64	51½	SE.	calm	...	...	...	57
20.	30-016	29-957	29-915	29-14	29-69	66-0	69-0	60-0	79	59	59	64½	53	W.	calm	...	...	...	56
21.	29-954	29-891	29-775	29-30	29-73	68-0	69-0	60-0	80	59	71	71½	58	SE.	calm	...	...	...	58
22.	29-836	29-818	29-755	29-40	29-68	63-5	77-8	62-5	76	50	66	67	50½	SW.	calm	...	...	...	62
23.	29-998	29-932	29-893	29-30	29-79	63-0	72-5	56-0	77	46	65	64½	51	WSW.	calm	...	...	...	59
24.	30-050	29-976	29-938	29-78	29-82	62-5	72-5	56-0	76	43	65	63½	47½	SW.	calm	...	...	...	55
25.	30-038	29-968	29-907	29-38	29-74	63-5	73-5	54-4	72	58	63-5	60	48	WSW.	calm	...	...	...	55
26.	30-060	30-001	29-964	29-42	29-88	65-0	73-0	61-0	72	49	62	64	42	NW.	calm	...	...	...	61
27.	30-110	30-011	29-936	29-41	29-80	61-5	70-8	56-7	73	55	66	65½	53	W.	calm	...	...	...	59
28.	30-060	30-044	29-991	29-33	30-00	63-5	72-0	60-0	74	55	68	61	54	W.	calm	...	...	...	61
29.	30-204	30-140	30-074	29-57	30-01	60-9	72-0	60-0	73	57	64-5	63½	54	ENE.	NW.	...	...	...	60
30.	30-128	30-053	29-920	29-45	30-15	66-8	69-0	58-0	82	58	69	63½	54½	E.	calm	...	...	...	62
31.	30-184	30-116	30-040	29-60	30-18	63-0	79-5	60-0	74	58	59	64	41½	NE.	calm	...	...	...	59
Mean.	29-964	29-928	29-841	29-31	30-406	64-3	72-7	57-9	76-00	52-68	64-2	61-7	51-5	Sum.	1-62	1-22	3-69	Mean.	58
														1-272					

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

XX.—*On the Stinging property of the Lesser Weever-fish* (Trachinus Viperæ.). By GEORGE JAMES ALLMAN, Esq. In a Letter to WM. THOMPSON, Esq., Vice-Pres. Natural History Society of Belfast.

Bandon, August 20, 1840.

MY DEAR SIR,

I HAVE lately had an opportunity of making some observations on the reputed stinging power of the Lesser Weever (*Trachinus Viperæ*), and the result, I think, may tend to clear up a point with respect to which much difference has prevailed among naturalists. The older naturalists seem almost universally to coincide with the popular opinion entertained respecting this little fish, and to agree in ascribing venomous properties to the wounds inflicted with its spines. There can be little doubt that the fishes to which the ancients gave the names Araneus, Draco, Dracunculus, and probably some others, were the Greater and Lesser Weevers of our coasts; and to those they invariably attribute poisonous properties. Pliny accuses the Araneus of inflicting dangerous wounds with the spines of its back. After speaking of a poisonous fish which he calls Lepus, he says, “Æque pestiferum animal araneus, spinæ in dorso aculeo noxius*.” In another place, speaking of Dracunculus, he tells us that it inflicts poisoned wounds with the spines of the opercula: “Aculeos in branchiis habet ad caudam spectantes, sic ut scorpio lædit dum manu tollitur †.” Similar properties are attributed to the dorsal spines of these fishes by Ælian and Oppian. In the following passage from the Halieutics several spinous fishes are grouped together, all of which are described by the poet as inflicting poisoned wounds, though some of them are undoubtedly innocuous, and classed here with venomous fishes, for the same reason which induces our own fishermen to attribute to the

* Hist. Naturalis, ix. 72.

† *Ibid.* xxxii. 53.

different species of *Cottus*, and other spiny fishes, poisonous properties. For directing my attention to the passage, as well as for the accompanying translation, I am indebted to the Rev. W. Hamilton Drummond, D.D., to whom much is due for introducing this curious poet to the English reader*.

Κεντρα δε πευκηεντα μετ' ιχθυσιν ωπλισαντο,
 Κωβιος, ος ψαμαθοισι και ος πετρησι γεγηθε,
 Σκορπιος, ωκειαι τε χελιδονες, ηδε δρακοντες
 Και κυνες, οί κεντροισιν επωνυμοι αργαλειοισι'
 Παντες αταρτηροισ υπο νυγμασιν ιον ιεντες.

Hal. ii. 457.

“Cruel spines

Defend some fishes, as the Goby, fond
 Of sands and rocks, the Scorpion, Swallows fleet,
 Dragons and Dog-fish, from their prickly mail
 Well named the spinous. *These, in punctures sharp,*
A fatal poison from their spines inject.”

None of the older naturalists, indeed, ever think of denying venomous properties to the Weever; it is the dorsal spines, however, which are almost constantly spoken of as the seat of the virus. Willughby says the six dorsal spines are considered venomous, and therefore the fishermen cut them off on taking a fish. He does not, however, think it proved that the poison is confined to these spines.

Universal as was the belief among the ancients of the venomous character of the Weever, the idea seems to be now almost as universally abandoned, and modern naturalists agree almost to a man in considering it a vulgar error, fit only to be placed among the rubbish which recent investigations have been so rapidly clearing away from the science of nature. Cuvier treats it altogether as an error, and even denies the possibility of the Weever inflicting poisoned wounds. Speaking of its spine, he says, “N’ayant aucun canal, ni communicant avec aucune glande, elles ne peuvent verser dans les plaies un v nin proprement dit †.”

Powerful as is this authority, and that of many other of the moderns, I have been notwithstanding induced to come to quite a different conclusion, and to agree with the ancients in ascribing venomous properties to the Weever.

On the 9th of August, 1839, I was wounded near the top of the thumb by a *Trachinus Vipera*, which had just been taken in a seine with herrings, sand-eels, &c. The wound was in-

* See Essay on the Life and Writings of Oppian, by W. H. Drummond, D.D., M.R.I.A., published in Transactions of Royal Irish Academy for 1820.

† Hist. Nat. des Poiss. t. iii. p. 184.

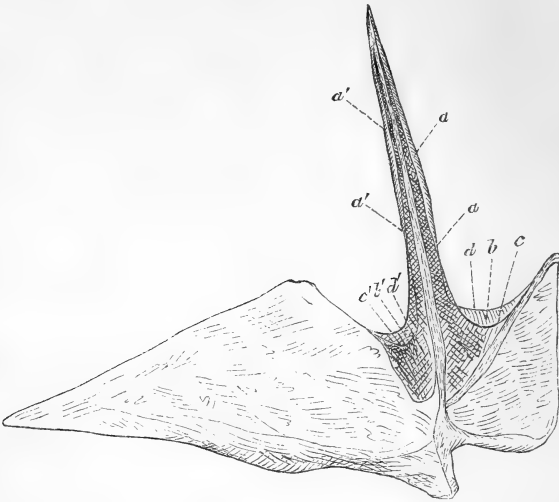
flicted by the spine attached to the gill-covers, during my attempt to seize the fish. A peculiar stinging pain occurred a few seconds after the wound, and this gradually increased during a period of about fifteen minutes. The pain had now become most intolerable, extending along the back of the thumb towards the wrist; it was of a burning character, resembling the pain produced by the sting of a wasp, but much more intense. The thumb now began to swell, and exhibited an inflammatory blush, extending upwards to the wrist. The pain was now distinctly throbbing and very excruciating. In this state it continued for about an hour, when the pain began somewhat to subside, the swelling and redness still continuing. In about an hour and a half the pain was nearly gone. Next morning the swelling of the thumb had but slightly diminished, and was in some degree diffused over the back of the hand; the thumb continued red and hot, and painful on pressure over the metacarpal bone. In a few days the swelling had completely subsided, but the pain on pressure continued for more than a week. No treatment was adopted.

It is here to be remarked, that the wound, of which the above phænomena were the result, was inflicted by the spine of the gill-cover, and not by those belonging to the dorsal fin. Whether, indeed, these latter spines possess any poisonous properties, I have not as yet been able decidedly to determine, though their threatening aspect when erected, and black membrane, present an appearance so formidable, as at once to lead an inexperienced observer to refer to them any stinging power which the little animal may be supposed to possess.

Though I have had no opportunity of making further personal observations on the effects of wounds inflicted by the Weaver, facts which fully bear out the conclusions to which my own experience had enabled me to come, have been related to me by witnesses, in whom I can place all possible reliance. A friend informed me that last autumn he saw a woman stung in the hand by one of these fishes; the poor woman immediately uttered loud cries and seemed to suffer great agony, while in an incredibly short time after the wound the hand had become enormously swollen, and exhibited considerable inflammatory redness. No observations were made on the progress of the case.

The spines of the opercula will be found on examination to be deeply grooved along the edges (a, a, a', a'), each groove terminating at the base of the spine in a conical cavity (b, b') excavated in the posterior edge of the bony part of the operculum. In the sides of these excavations the edges of the grooves lose themselves, so that there is a perfect continuity between each groove and the corresponding cavity.

From the posterior edge of the operculum the integument is continued over the spine to within a very short distance of



the point ; by which means the spine is inclosed in a complete sheath for nearly its entire length, and the groove at each side is converted into a perfect tube, extending from the conical cavity at the base almost to the point of the spine.

The result of this arrangement, is a structure beautifully adapted for the conveyance of a fluid from the base to the apex of the spine.

The spines of the dorsal fin are also grooved, but the grooves disappear towards the base, after becoming superficial, and do not terminate in cavities similar to those at the bases of the spines of the opercula.

I have not as yet been able to detect any specific gland connected with this apparatus. There is, indeed, in the bottom of each of the conical cavities above-mentioned, a small pulpy mass, which may possibly be of a glandular nature ; but in ascribing to it the property of secreting the virus, I do nothing more than hazard a distant conjecture. It seems, indeed, to be chiefly composed of fatty matter ; and on puncturing my hand with a lancet and introducing a little of this substance taken from a fish which had been about twenty-four hours dead, no phænomena of any interest were the result, there being merely a slight smarting produced, such as might be expected from the introduction of any such extraneous matter into a recent wound, and very different indeed from the intense pain produced by the sting of the living fish. The property of secreting the virus may probably with more truth be ascribed to

the pulpy sheath of the spine ; but this, too, is nothing more than conjecture.

This little fish is much dreaded by the fishermen on the southern coast of Ireland ; and an opinion prevails among them, that the pain of its sting will last until the tide has again arrived at the height at which it stood when the wound was inflicted. This opinion, which is altogether incorrect, is universally believed by the fishermen of the south of Ireland ; and I was surprised to find, from the following passage in Willughby's 'Fishes,' that it is neither confined to any particular district, nor of modern origin : "Dolor ab ictu excitatus (ut nobis retulere piscatores) per duodecem horas durat admodum vehemens, hoc est donec mare novo accessu recessive ad eundem altitudinis modum seu terminum redeat, deinde paulatim remittit."

Though the Weever is held in particularly bad repute by the fishermen, their terror is by no means confined to it, as the different species of *Cottus*, and some other spiny fishes, are not exempted from the imputation of inflicting poisoned wounds ; and many of them are confounded under a common unpronounceable Irish name, which may, I believe, be translated "Sting Devil." These fishes, however, though furnished with formidable spines, appear altogether destitute of any poisonous qualities. I have frequently, indeed, allowed the *Cottus Bubalis* to inflict deep punctures on my fingers without experiencing the slightest unpleasant consequences, beyond those of an ordinary puncture ; and it must also be remarked, that the spines of *Cottus*, and of other fishes which I have examined, and which are commonly supposed to be venomous, are of altogether a different structure from those of *Trachinus*, and not at all adapted for the introduction of virus into the wound inflicted by them.

Believe me, dear Sir, very faithfully yours,

GEO. JAS. ALLMAN.

William Thompson, Esq., &c., Belfast.

EXPLANATION OF THE FIGURE.

Right opercular spine of *Trachinus Viperæ*, with the sheath removed, viewed upon the external surface, and magnified about six times in linear extent.

a, a, a', a'. The grooves in the edges of the spine.

b, b'. The conical cavities in which the grooves terminate.

c, c'. The external walls of the cavities.

d, d'. The internal walls.

The parietes of the cavities being transparent, *d'* is represented as visible through the external wall.

XXI.—*Catalogue of Irish Zoophytes*. By ARTHUR HILL HASSALL, Esq., M.R.C.S.L. With 3 Plates.

“It is delightful to see by these miniature existences, small almost to invisibility, and by their careful organization as finely contrived as in the grandest creature, that greatness and littleness make no difference to Him in His Creation or in His Providence. They reveal to us that magnitude is nothing in His sight; that He is pleased to frame and to regard the small and weak as benignly and as attentively as the mighty and the massive. We are high and low, great and small, as to each other, but not to Him.”—*Sharon Turner's Sacred History*.

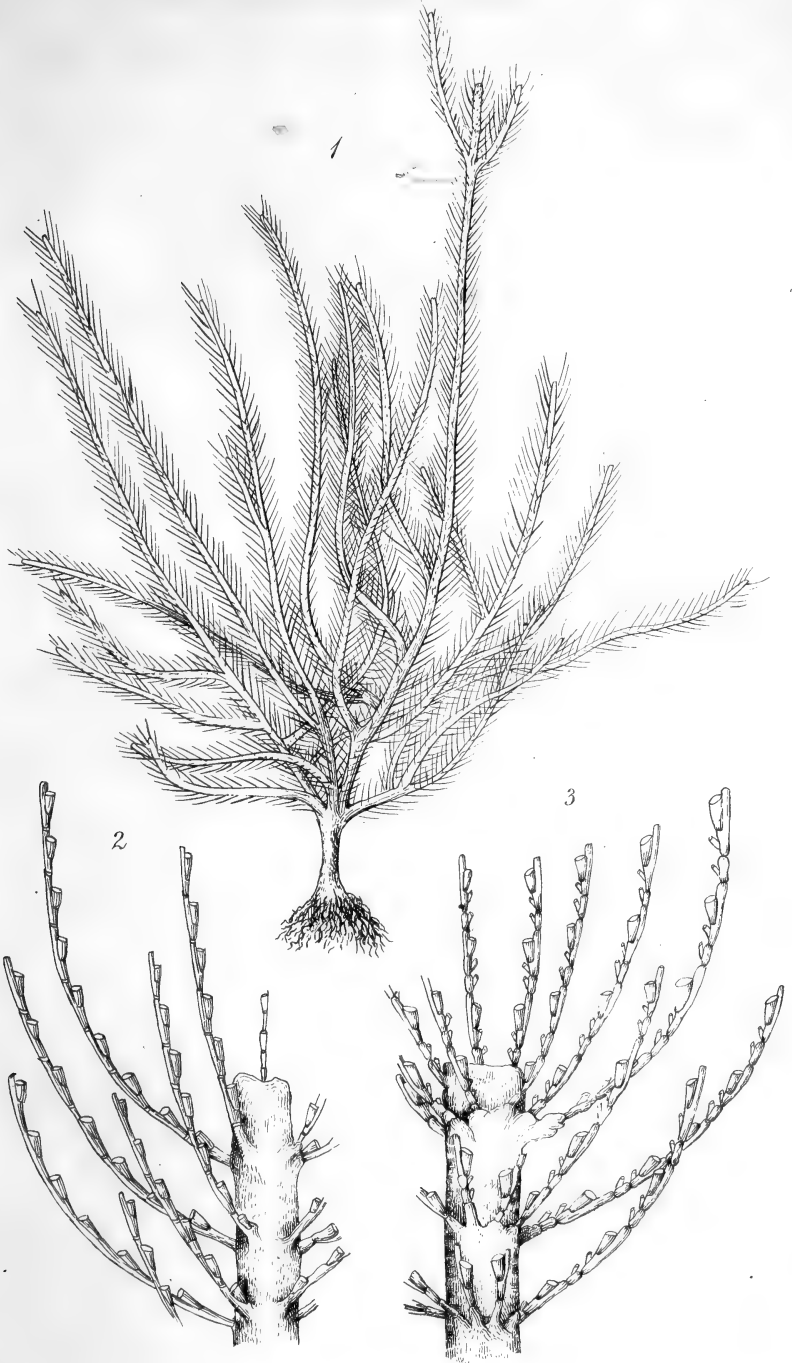
In no part of the animal kingdom is the truth of the above remarks more pleasingly or more beautifully manifested than in the present order; in no other department do we meet with, to an equal extent at least, the same diversity and elegance of form so illustrative of the fertility of invention and beauty of conception of the Divine Mind. The heart must be cold and insensate indeed, that, on beholding these interesting “minims of creation” is not tempted to exclaim with the Psalmist, “in wisdom,” beneficent, infinite wisdom, “hast thou made them all.”

The whole of the zoophytes enumerated in the following Catalogue, with two exceptions, were found in the bays of Dublin and Killiney during the winter of 1838 and spring of 1839. The extent of coast embraced by these bays is about sixteen miles, abounding more in marine productions than any other known locality of similar dimensions.

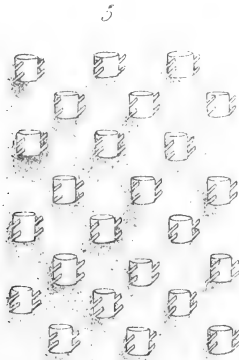
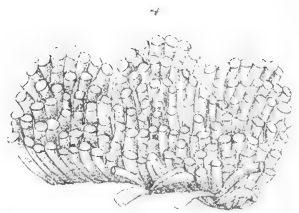
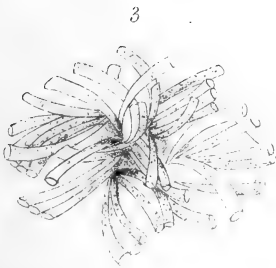
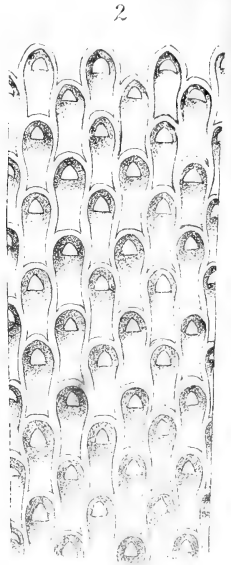
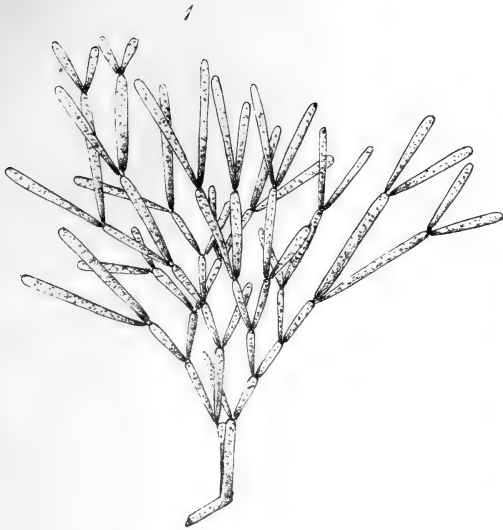
The distribution of zoophytes is often extremely local, in many cases a species being restricted to one particular spot of perhaps not more than half a mile or a mile in extent; it is, on this account, that I have given the habitat of each separately.

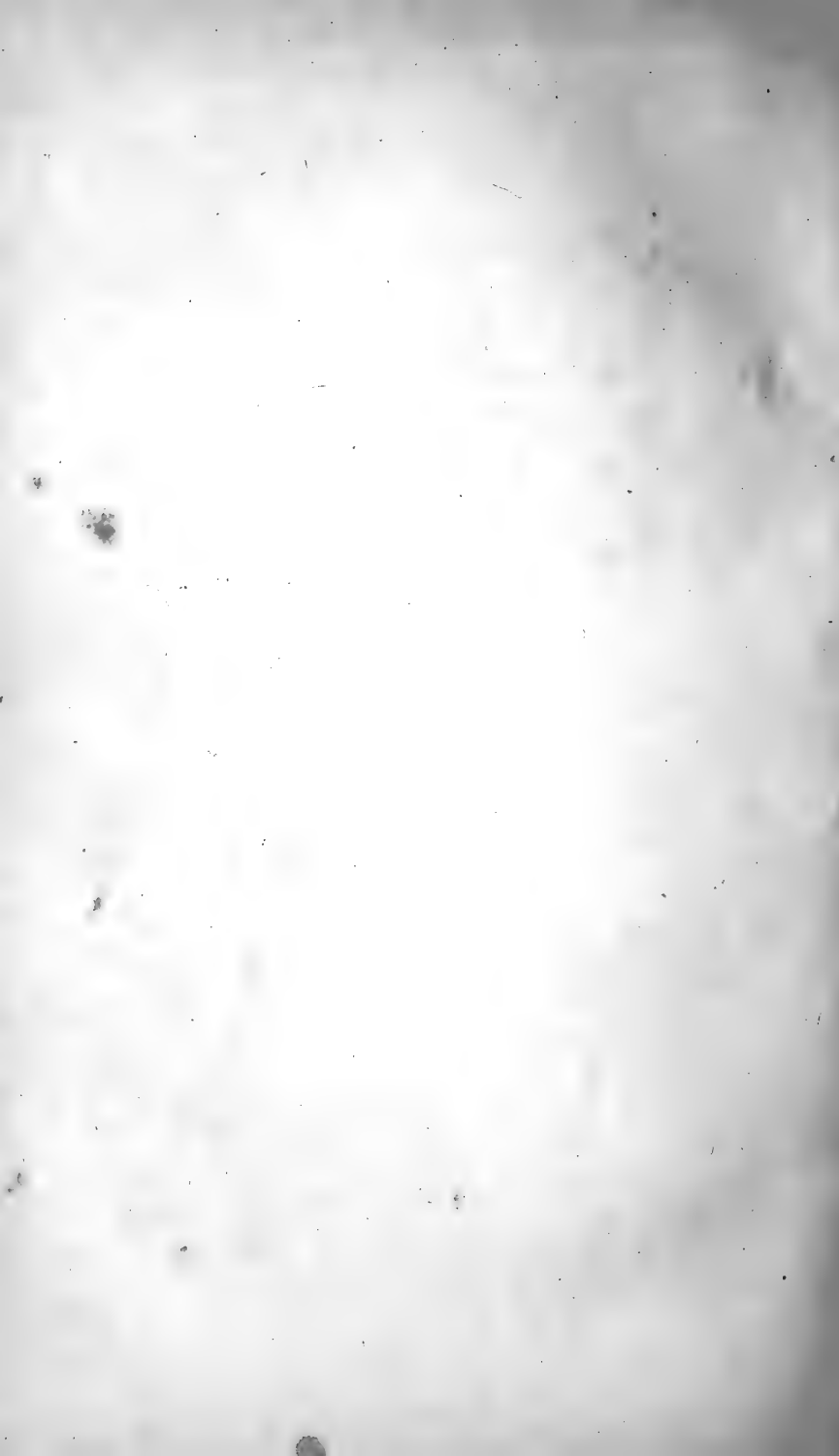
The law of the spiral development of similar parts, so evident in the vegetable kingdom, is here also very generally manifested both in the form of the polypes as well as in that of the polypidoms—this is particularly remarkable in *Antennularia antennina*, *Thuiaria thuja*, *Campanularia verticellata*, and *Vesicularia spinosa*; and traces of this arrangement may be detected in some part or other of the structure of the majority of zoophytes.

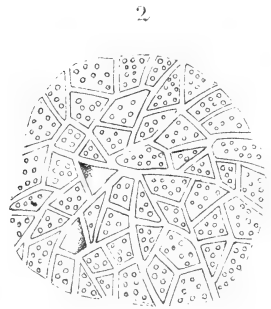
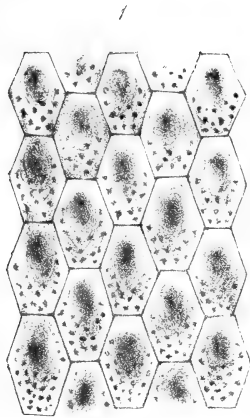
In this catalogue the term Zoophyte is used in the extended signification in which it was employed by Ellis, who embraced in his work the Articulated Corallines and Sponges, denying, however, the existence of polypes in the latter, and











believing in their animal nature from their structure and chemical composition.

I have here to acknowledge the obligation I am under to Dr. Johnston* of Berwick, who kindly afforded me the benefit of his experience wherever I entertained doubts as to the identity of any of the species mentioned, and from whose assistance, in this particular, I am enabled to present this Catalogue with the greater confidence.

RADIATED ZOOPHYTES.

Order I. ZOOPHYTA HYDROIDA.

TUBULARIADÆ.

TUBULARIA.

Tubularia indivisa.—Dublin bay; not common.

T. ramea. This is one of the most delicate and arborescent of the corallines, exactly resembling a miniature tree. The ultimate tubes have four or five distinct rings at their base. Polypidom about six inches in height.

On shells from deep water; rare. Blackrock, Dublin bay.

SERTULARIADÆ.

THOA.

Thoa halicina. A variety of *T. halicina* is frequently met with, distinguished from the ordinary specimen by its irregular mode of branching.

Dublin bay; common.

T. Beanii. Of this extremely elegant zoophyte I have met with several specimens, averaging from four to six inches in height. There is a great resemblance between *Thoa Beanii* and the preceding, with the variety of which it may be readily confounded, particularly when deprived of its very characteristic vesicles. It may, however, be known from it by the branches passing from the main stems nearly at right angles, but at unequal intervals, and by its being *irregularly ringed*, having also a joint between each cell, in which respect it agrees with *T. halicina*.

SERTULARIA.

Sertularia polyzonias. Between this and the one following there is a manifest relation. They are both usually found upon *Flustra foliacea*, though not confined to it.

Killiney bay; not common.

S. rugosa.—Kingstown; not common.

S. rosacea. Usually found as a parasite on *S. cupressina* and *S. Tamarisca*, particularly on the former.

Dublin bay; abundant.

* I have followed the Arrangement and Nomenclature given in Dr. J.'s admirable work on British Zoophytes.

S. pumila. On *Fucus serratus*, which it thickly covers, near low water mark.

Boosterstown.—Dublin bay; not rare.

S. Tamarisca. An inhabitant of deep water, on shells; rather rare. Blackrock, Dublin bay.

S. abietina. Frequently covered with small and elegant tufts of *C. eburnea*, which give to the polypidom a very beautiful appearance; it is sometimes found a foot in height, and of a bright pink colour, which it retains on drying. All the *Sertulariæ* are occasionally found coloured in this way.

Dublin bay; very abundant.

S. Filicula.—Dublin bay; rare.

S. operculata. Of this common species a very delicate variety is occasionally met with, attaining a much greater height than the ordinary kind, and having the shoots waved or zigzag.

Dublin and Killiney bays, on shells and fuci.

S. argentea. Independently of the differences to be observed in the form of the cells and vesicles, which are generally pretty constant, between this and the following species, there are many others pertaining to their general habit and appearances. The polypidoms of this species are frequently met with growing in closely aggregated clusters, and are sometimes even branched, a condition in which I have never found the other; it is also of a darker colour and more rigid texture, and never attains the same height. The polypiers also do not end in the beautiful spire so remarkable in *S. cupressina*, but terminate much more abruptly. The branches too are usually shorter, broader, and *not arched* as in the other species.

Dublin bay; abundant.

S. cupressina. This species sometimes attains an elevation of more than two feet. The polypidom is occasionally denuded of its branches for a short distance up the stem, but this is by no means a constant occurrence, as in some others.

Dublin bay; abundant.

ANTENNULARIA.

Antennularia antennina. The stems of this coralline sometimes exceed a foot in height, and are frequently clustered together to the number of thirty or forty. The number of branchlets in each whorl varies from five to nine, and in the same specimen the number usually remains the same throughout. I have a specimen in my possession from Brighton arising by a *single trunk*, which afterwards breaks up into eight or ten branches, these again subdividing; it well deserves, from its appearance, the appellation of *ramosa*. There is also in it an *absence* of the small tubular cells placed between the larger ones met with in *A. antennina*. See Plate V. From an examination of this specimen I am inclined to think that it is what Lamarck has described under the name of *Antennularia ramosa*, and that it is really and specifically distinct from the other species. I am far, however, from considering every branched specimen of *Antennularia* as the true *A. ramosa*.

Dublin bay; common.

PLUMULARIA.

Plumularia falcata. This common species is sometimes found branched, and attains a foot in height. The vesicles appear in spring. On stones and shells in deep water. Dublin bay; abundant.

P. cristata. On *Fucus siliquosus*; rather common. Dublin and Killiney bays.

P. pinnata.—Dublin bay; not common.

LAOMEDEA.

Laomedea dichotoma. Polypidom usually from eight to ten inches in height, but often more.

Blackrock; rather common.

L. geniculata. Parasitic on sea-weeds, particularly on *Laminaria digitata* and *F. siliquosus*. Dublin and Killiney bays; common.

L. gelatinosa.—Blackrock; not common. The stem of this species is ringed above and below the origin of each footstalk.

CAMPANULARIA.

Campanularia volubilis. This elegant microscopic species is furnished with a delicate joint or hinge, situated at the base of each little cup. This beautiful contrivance is designed, I imagine, to enable this frail zoophyte the better to elude the rude contact of the element by which it is surrounded, by permitting it to bend to a force which it cannot resist.

Dublin bay; not common.

C. Syringa. Parasitic, as in also the preceding, on other corallines, particularly on *S. abietina*. It is worthy of remark, that the more delicate species of zoophytes affix themselves either to sea-weeds or to others of a more robust nature. By so doing they receive the shock communicated by the motion of the surrounding water, as it were, second-hand—the force being first felt by, and partly expended on, the objects to which they are attached before reaching them. By this means also, a much wider range of motion is afforded them for the capture of their prey, than they could possibly enjoy were they rooted by their short pedicles to some fixed and unyielding support.

C. verticillata.—Blackrock; not very frequent.

C. ? dumosa. This is now ascertained to be the *Cornularia rugosa* of Cavolini, a figure of which is given in Dr. Johnston's 'British Zoophytes.' Vignette 27. p. 187.

Blackrock, on *P. falcata*, for which it manifests a decided preference; not common.

Order II. Z. ASTEROIDA.

ALCYONIDÆ.

ALCYONIUM.

Alcyonium digitatum.—On old shells, very common; Dublin and Killiney bays.

Order IV. Z. ASCIDIOIDA.

VESICULARIADÆ.

An undescribed zoophyte, belonging to this family, is occasionally found in Dublin bay, investing *Fucus senatus*. Dr. Johnston considers it to be new both in species and genus. As specimens of it are in Dr. Johnston's possession, I refrain from giving any detailed description; I may, however, remark, that the animal, which I succeeded in detecting in a specimen preserved in spirits, is apparently similar to that of *Flustra*, being doubled up in the cell in the same manner, and having the head encircled with about twenty tentacula.

VESICULARIA.

Vesicularia spinosa.—Dublin bay; common.

SERIALARIA.

Serialaria lendigera.—Dublin and Killiney bays; not common.

VALKERIA.

Valkeria uva.—On *Fucus siliquosus*, rare; Blackrock.

CRISIA.

Crisia cornuta.—On sponges, and various corallines; common in Dublin and Killiney bays.

C. chelata.—Blackrock; rare.

C. eburnea. Parasitic on sea-weeds and zoophytes, particularly on *S. abietina*.

Killiney and Dublin bays; common.

C. luxata.—Killiney and Dublin bays; frequent.

C. aculeata. Cells disposed in a double series, armed with a long spinous process; joints of an amber colour.—A. H.

Polypidom erect, bushy, about an inch in height, and beautifully posted; branches alternate; jointed at irregular intervals; internodes narrow at their commencement; cells subalternate, tubular, the majority being furnished with a long spine, which arises from the outer side. Vesicles much resembling a fig in shape, and dotted. See Plate VII. fig. 3, 4.

Brighton; not unfrequent.

NOTAMIA.

Notamia loriculata. The polypidom of this species sometimes attains a height of eight or nine inches.

Dublin and Killiney bays; common.

HIPPOTHOA.

Hippothoa catenularia.—Dublin bay; rare.

TUBULIPORIDÆ.

TUBULIPORA.

Tubulipora patina. The *Discopora verrucaria* of Fleming.

On shells and corallines, particularly on *N. loriculata*.

T. verrucaria. The *Tupulipora verrucaria* of Milne-Edwards has not been described as British; it is however of common occurrence in Dublin bay, adhering usually to *S. abietina*. It differs from *T. patina* in the cells not being placed in a cup, and from *T. serpens* in their not being arranged in transverse rows. The tubes are sometimes separate and sometimes united. In this latter state it bears a great resemblance to *Discopora hispida*, but may be known from it by the apertures of the tubes being plain. See Plate VI. fig. 3, 4. Is it not the small purple *Eschara* of Ellis?

T. serpens.—Not unfrequent; Dublin and Killiney bays.

DISCOPORA.

Discopora hispida.—From shells and corallines from deep water; not common; Dublin bay.

CELLEPORIDÆ.

CELLEPORA.

Cellepora pumicosa.—Dublin and Killiney bays; very common.

LEPRALIA. Johnston.

Berenicea hyalina.—Dublin bay; rare; on shells.

Lepralia variolosa.—Dublin bay; rare.

L. ciliata. Cells ovato-globose; aperture circular with a small excavation in its lower margin; spines from 5 to 7, not immediately surrounding the orifice of the cell, differing in this respect from *L. immersa*, in which the spines arise directly from the margin. By means of the indentation referred to, this species may always be distinguished from others, even in the absence of the spines.

On shells and fuci; not uncommon; Dublin and Killiney bays.

"*Lepralia 4-dentata*, Johnston's Manuscript." Cells immersed, arranged alternately; apertures quadrangular, and furnished with four short teeth, placed near each angle.—A. H.

This species was sent to Dr. Johnston some time ago by Mr. Forbes, and subsequently by myself as a new species. See Plate VI. fig. 5.

MEMBRANIPORA.

Membranipora pilosa.—On shells, fuci, and corallines; very common; Dublin and Killiney bays.

Var. dentata. Not common.

ESCHARIDÆ.

FLUSTRA.

Flustra foliacea. The varieties of this species are very numerous. Dublin and Killiney bays; very common.

F. chartacea. This is the *F. papyracea* of Ellis, which for a long time has been lost sight of. His description, however, is inaccurate, inasmuch as he makes no mention of the spines, one of which is placed at each distal angle of every cell. It is one of the most beautiful of the *Flustræ*, growing in bushy hemispherical tufts of

about an inch and a half in height ; each tuft is composed of numerous separate polypidoms, closely interwoven with each other, and dichotomously branched. The cells are of an oblong square form, slightly enlarged distally, and furnished with a globular operculum somewhat similar to that of *F. avicularis*.

F. avicularis. This species has four spines at the top of each cell. Parasitic on other corallines ; rare ; Dublin bay.

F. membranacea. On the frond of *Laminaria digitata* ; very abundant ; common.

F. Hibernica. Polypidom encrusting calcareous, white ; cells hexagonal, excavated, dotted on the inside.—A. H.

The only specimens I have obtained of this are parasitic on an *Ascidia* ; I have little doubt, however, of its being a new species. The *Flustra* to which it bears the closest resemblance is perhaps *F. carbacea*, but I have never met with it on this part of the Irish coast. See Plate VII. fig. 1.

CELLULARIA.

Cellularia ciliata.—Dublin bay ; rare.

C. scruposa. On the roots of most corallines and old shells ; abundant ; Dublin and Killiney bays.

C. reptans. Everywhere very common.

C. Avicularia. This species is, I think, misplaced ; it ought rather to be associated with *Flustra* than *Cellularia*.

Dublin bay ; rare.

ACAMARCHIS.

Acamarchis plumosa.—Dublin bay ; rare.

FARCIMIA.

Farcimia salicornia. “ Articulations cylindrical ; cells rhomboidal, plain.”

Farcimia sinuosa. Cells rounded above, excavated below for the reception of the head of the succeeding cell ; aperture semicircular, situated in the upper third of each cell.—A. H.

I have but little hesitation in pronouncing this to be a new species*. It differs from the ordinary species in the greater size of the cylinders, in the shape of the cells (too material to be the result of any accidental circumstances), and above all, in the position of the aperture, which in this is placed in the upper part of each cell, while in *F. salicornia* it is exactly *central*. This last I consider to be the most important distinction of all. The number of the cells on each cylinder is also much greater than in the preceding species. See Plate VI. fig. 1. 2.

* Among several specimens of *salicornia*, collected by Mrs. Alder and Miss Amelia Hunter, at Blackrock, Dublin bay, I observed some of *Farcimia sinuosa*, agreeing in every particular with my own previously obtained at Menion, about two miles from the former place. The authority for this new species does not now, therefore, rest upon the examination of a single specimen.

Dr. Johnston, to whom I wrote respecting this zoophyte, refers me to a figure in which the cells are shaped as in mine, given in Ellis's work (Plate xxiii. fig. D.), and suggests the possibility of Ellis having found the two forms of cells, viz. the rhomboidal and the rounded, upon one and the same species. This communication led me to make a careful examination of numerous specimens of *F. salicornia*, the results of which has been such as I had anticipated. In no one instance have I ever detected the two forms of cells upon one and the same portion, but have always found the differences which I have pointed out to be constant between specimens. Ellis's figure proves that he had seen my species; but it is also evident that he overlooked the material points of difference between it and the ordinary kind, an unusual error for him to commit, I acknowledge; but nevertheless possible. The circumstance of his having given two separate figures of *Farcimia* is in favour of my opinion of their distinctness as species.

There is one general and undeviating principle presiding over the form and arrangement of the cells of all cellular zoophytes, and operating with such mathematical precision as to give to each species a certain type or character by which it may be distinguished from all others, each having cells of but one shape, and arranged in a uniform and determined order. To imagine, therefore, the existence of two forms of cells so distinct in their character, upon one and the same species, and constituting a part of it, is to suppose an anomaly, of which I believe the whole range of zoophytical productions does not furnish a single example. The differences between the two species are not such as can be explained by a reference to any adventitious causes, such as exposure, the mode of drying, &c.; they are not those arising from mere magnitude; in a word, they are structural.

ALCYONIDULÆ.

ALCYONIDIUM.

- Alcyonidium hirsutum*.—Dublin bay; not common.
A. echinatum.—Dublin and Killiney bays; common.
A. parasiticum.—Dublin and Killiney bays; frequent.

MELOBESIA.

Melobesia elegans. This beautiful microscopic object, which received its name from Mr. Bean, is not more than the sixteenth of an inch in diameter. It is composed of numerous plates of irregular form and dimensions; these plates are inserted into a raised margin or framework, and each is perforated with minute tubular apertures. Whether it is furnished with polypi or not, I believe, is not determined. See Plate VII. fig. 2.

On Fuci; Dublin bay.

HALICHONDRIA*.

- Halichondria papillaris*, Fleming. *Spongia ureus*, Solander.
 Common, encrusting fuci; Dublin and Killiney bays.
H. palmata.—Dublin bay; not common.

* For an account of this genus, see Fleming's 'British Animals.'

GRANTIA*.

Grantia compressa ! *G. foliacea* of Montagu.

Adhering to the under side of rocks above low-water mark ; Monkstown.

G. Coronata.—Monkstown : same as the preceding.

MILLEPORA.

Millepora polymorpha, Linn.

Millepora informis, Lamarck.—Dublin bay ; not common.

Millepora lichenoides. “ This *Millepora* has slender semicircular plates which constantly grow horizontally.” Lamouroux makes this a *Melobesia* under the name *Melobesia pustulosa*. It ought, I think, to be considered a *Madrephyllia*, under which head Dr. Johnston has placed it. *M. byssoides*, Lamarck.

CORALLINA.

Corallina officinalis. There are several well-marked varieties of this *Corallina cylindrica*.

“ *Corallina rubens sive muscus marinus*.”—Park.

“ This coralline, when magnified, appears to grow in branches, always dividing into two parts, consisting of long cylindrical joints connected by small tubuli.”—Ellis.

C. rubens, var. *spenophecos*.

The above four corallines are found attached to rocks at Bray Head, near Dublin.

It is only by an extensive examination of catalogues similar to the foregoing, that we shall be able to arrive at any certain conclusions regarding the geographical distribution of zoophytes, and the changes in the growth and habits occasioned by the different localities in which they are met with. On reference to the preceding list, it will appear that many species common in the North of England and Scotland are either not to be found at all on this coast, or are so sparingly ; and on the other hand, many that are rare on the English coast are abundant on the Irish. Thus, *Thuiaria thuja*, common in the North of England, has never, I believe, been noticed on any part of the coast of Ireland, and certainly not on that embraced in the present catalogue.

Again, I have never met with *F. truncata* and *F. carbacea*, both very common on the coasts of Northumberland and Durham, and also occasionally found upon some parts of the Irish coast. Many species of *Plumularia*, and two or three of *Sertularia*, are wanting in these bays ; and the genus *Eschara* appears to be absent not only from this part but from the coast of Ireland generally ; while *Thoa Beanii*, *Discopora hispida*,

* See Grant in 2nd vol. of Edin. New Phil. Journ.

and *Alcyonidium parasiticum*, all more or less rare on the English coast, are tolerably abundant in these situations. I might enlarge upon this subject, but the data are at present too few to admit of our doing so with certainty.

Many species appear to attain a much greater height in Ireland than in England, as will be evident on a comparison of the sizes given in Dr. Johnston's elegant work and in this Catalogue: this is probably attributable to the mildness of the climate.

EXPLANATION OF THE PLATES.

PLATE V. *Fig. 1. Antennularia ramosa.*

Fig. 2. A portion of the same magnified.

Fig. 3. A portion of *A. antennina* magnified, showing the small tubular cells placed between the larger ones, and which are absent in *A. ramosa*.

PLATE VI. *Fig. 1.* A specimen of *Farcimia sinuosa*, of the natural size.

Fig. 2. A portion of the same magnified.

Fig. 3. and *4.* Specimens of *Tubulipora verrucaria*; in the one the tubes are separate, in the other united.

Fig. 5. Lepralia 4-dentata.

PLATE VII. *Fig. 1. Flustra Hibernica.* This is a very imperfect representation of the original, the exact appearance of which it is very difficult to represent in a drawing.

Fig. 2. Melobesia elegans of Mr. Bean, magnified.

Fig. 3. and *4. Crisia aculeata*, a new species.

XXII.—*A Synopsis of the Genera and Species of the Class Hypostoma (Asterias, Linnæus).* By JOHN EDWARD GRAY, Esq., F.R.S., Keeper of the Zoological Collection in the British Museum.

My intention in sending this paper to the press is not only to bring before the public a number of new genera and species which have been for several years in the collection of the British Museum, but also to attempt to divide what has hitherto been considered an intricate Class into natural groups, to subdivide these groups and the genera they contain into smaller sections, so as to facilitate the determination of the species, and at the same time to assist in making out the natural affinities of this much-neglected group of animals.

Hitherto very few persons have attempted to divide the Starfishes (*Asterias*, Linn.) into natural groups, and it is but recently that Nardo, and subsequently M. Agassiz, have paid any attention to the good groups pointed out by the first author of anything like a Monograph of these animals, I mean of Henry Linck, who published a separate work on the subject in folio, which he dedicated to Sir Hans Sloane and the members of the Royal Society. Nardo has done little more, as I shall presently show, than rename Linck's divisions; and M. Agassiz has followed in Nardo's footsteps, adding one or

two fossil genera which did not come within Linck's or Nardo's object. Mr. Edward Forbes has lately published a description of some Manx species, in which he has divided the *Stellonia* of Nardo into two genera, and added a genus which he calls *Luidia* for a species not known to Linck: he has also used the number of series of suckers (a character noticed by Müller and others) as a generic one.

Linck divides the Starfishes (*Asterias*, Linn.) into two great groups by the presence or absence of the ambulacra on the lower side of the arms, calling the first, which exactly agrees with the *Asterias* of Lamarck, the *Asteriadae* of this paper, "*stellis fissis*," and the second "*stellis integris*." The latter group he divides into three classes: viz.

1. *Stellis vermiformibus* = the *Ophiura* of Lamarck.

2. *Stellis crinitis?* = the *Comatula* of the same author.

3. *Astrophyton*, which is the *Euryale* of the same. Thus we see, that he distinguished all the natural groups, which were afterwards thrown together into a single genus to be artificially divided into sections by Linnæus and his followers. Linck's groups were not again recognized until nearly half a century after the publication of his valuable work.

In dividing the fissured Starfishes, or *Asteriadae* as we call them in modern nomenclature, into genera, Linck began badly by paying too much attention to the number of the rays, though it is evident, by the names he has given to the different species in his genera, that he was aware that some which he separated on this account were very nearly allied to each other. Overlooking the genera which are formed solely on this character, such as *Trisactis*, *Tetractis*, *Hexactis* and *Heptactis*, which are all formed on varieties or distortions of other species, we shall find that the others noticed by him are excellent genera, and such as are now acknowledged. His

1. *Pentanogaster* = *Goniaster* (*) *Agassiz*. *Scutasteries*, *Blainv.*

2. *Pentaceros* = *Goniaster* (**) *Agassiz*. *Asterina*, *Nardo*. *Platasteries*, *Blainv.*

3. *Astropecten* = *Stellaria*, *Nardo*. *Asterias*, *Agassiz*.

4. *Palmipes* = *Anseropoda*, *Nardo*. *Palmasteries*, *Blainv.*

5. *Stella coriacea* = *Stellonia*, *Forbes*. *Stellonia*, part, *Nardo*. *Pentasteries* and *Solasteries*, *Blainv.*

6. *Pentadactylosaster* = *Cribella*, *Agassiz* not *Edwards*. *Linckia*, *Nardo* not *Agassiz*.

7. *Octactis*,

8. *Enneactis*,

9. *Decactis*,

10. *Dodecactis*,

11. *Triskaidecactis*,

} = *Solaster*, *Forbes*. *Stellonia*, part, *Nardo*
and *Agassiz*.

Nardo, in the *Naturforscher* for 1833, and in the *Isis* for 1834, p. 716, gives the following arrangement of the European species, which he divides into five genera:—

1. *Stellaria* = *Astropecten*, *Linck*.

2. *Stellonia* = *Stella coriacea*, *Linck*, and his other genera above enumerated.

3. *Asterina* : Linck only knew one species which he put at the end of his *Pentaceros*.

4. *Anseropoda* = *Palmipes*, *Linck*.

5. *Linckia* = *Pentadactylosaster*, *Linck*.

M. Agassiz, in the Memoirs of the Neufchatel Society, published a new arrangement of the *Echinodermata*, which has been abridged into the *Annales des Sciences Naturelles*, and from thence translated into the *Annals of Natural History*, i. 440, in which he has changed the names of some of Nardo's genera, and added some others for extra-European and fossil species, as follows :—

1. *Asterias* = *Astropecten*, *Linck*. = *Stellaria*, *Nardo*.

2. *Cœlaster*, fossil.

3. *Goniaster* = *Pentagonaster* and *Pentaceros*, *Linck*.

4. *Ophidiaster*, a new species.

5. *Linckia* = *Cribella* = *Pentadactylosaster*, *Linck*.

6. *Stellonia*, *Nardo* = *Stella coriacea*, *Linck*, &c., as above.

7. *Asterina*, *Nardo*.

8. *Palmipes*, *Linck*. = *Anseropoda*, *Nardo*.

9. *Culcita*, *Agassiz*, for *Ast. discoidea*, *Lam*.

M. Agassiz generally quotes for the type of his European genera the same species as those cited by Nardo.

Class HYPOSTOMA, *Gray, Syn. Brit. Mus.*

Having a bag-like stomach, with a single opening serving as mouth and vent. The ovarial pores are placed round the mouth. The body is inclosed in a hard skin and supported by variously shaped calcareous pieces.

It should be remarked, that the hard parts of these animals, whether they are in the form of *tesseræ*, as in the *Echinida*, or of *ossicula*, as in the *Hypostomata*, or in that of spines, as in either, are evidently the hardening of certain parts of the cellular substance or skin, and these hard parts retain their organization and vitality during the life of the animal ; consequently they are not inorganic secretions, like the shells of mollusca, as they have generally been considered, but have far more relation to bones and coral, and like them form a peculiar kind of body intermediate between shells and the skeletons of vertebrata. " These pieces," as I have observed in the Synopsis of the British Museum, " are formed by the earthy particles being deposited round certain definite spots in the skin, and as they are developed they assume a definite arrangement into certain distinct shapes peculiar to the different kinds : although these are strongly united together by the skin, and have a kind of organization during the life of the animal, they may easily be separated from each other after death, and then appear like separate bones. This structure allows the animal to increase both the size and the number of the pieces that compose its protecting case as the body grows, and also to repair, by the deposition of fresh calcareous particles on the skin of the healed part, any injury which the animal may have received from external accidents during its life."

This structure is not so easily demonstrated in the internal bones
Ann. & Mag. Nat. Hist. Nov. 1840.

of the Starfishes as it is in the external tesseræ of the Sea Eggs, and in the spines of both these kinds of animals, as they are often to be found broken and repaired during their growth, and this repair does not take place by any secretion applied to their surface, but by a healing of the part, which leaves a scar on the surface. Nevertheless, the entire similarity which exists between the external spines and the internal tubercles at once shows that they are of the same structure; and this is further proved by the examination of the tubercles of those kinds which are in great part exposed on the surface, as is the case with the different kinds of *Pentaceros*, where the development of these hard parts can often be observed during the process of reproducing an arm that has been accidentally injured or destroyed.

The specimens described in this synopsis are either in the collection of the British Museum or in that of the Zoological Society, which includes the specimens discovered by Mr. Cuming during his residence in South America, and presented by him to the Society.

Order 1. ASTEROIDA.

Body free, star-shaped, with distinct small ambulacra (or walks) of double pores on the oral surface, from the mouth to the ends of the rays; dorsal wart distinct.

These animals have the faculty of reproducing the arms or such parts as may be accidentally broken off; and if an entire arm be separated, provided part of the body be attached to it, other arms are reproduced, and a fresh perfect animal formed.

SECT. 1. *The Ambulacra with four rows of feet; dorsal wart simple.*

Family 1. ASTERIIDÆ, Gray, *Syn. Brit. Mus.* 62.

1. ASTERIAS.

Skeleton netted with a single mobile spine at each anastomosis of the ossicula; body covered with more or less prominent elongated mobile spines*.

a. *Rays 12 or 13, slender, tapering, with small elongated spines.*

1. *Asterias Aster*, Gray. Rays 3 times as long as the diameter of the body; back with 7 series of spines, the labial spine at the angles of the arms very long.

Inhab. —. Brit. Mus.

* Some continental zoologists have objected to the shortness of my generic and specific characters; and I therefore think it right to observe, that it does not seem to me either necessary or desirable to give more than the essential distinguishing marks, in a monograph founded on the complete analysis of a large collection of species. On the other hand, it appears to me to be quite right, in the publication of a single supposed new genus or species, or of a limited number of them, where the author either wants the materials or the time for a rigid examination of the entire group, to give all the assistance that can be derived from a detailed description. No naturalist will doubt which is the easier process; and few, I think, will hesitate as to which is the most advantageous to science.

b. Rays 6 or 8 cylindrical.

2. *Asterias calamaria*, Gray. Arms four times as long as the diameter of the body, with 7 ridges of spines; the 5 dorsal ridges equidistant.

Inhab. Isle of France, New Holland. Brit. Mus.

c. Rays 5—8, elongated, subcylindrical, with 5 or 7 series of spines, the 2 lower series close together and near the ambulacra.

3. *Asterias glacialis*, Linck, t. 38, 39. *A. spinosa*, Pennant. Rays 4 or 5 times as long as the diameter of the body; spines acute. Var. 1. 8-rayed; var. 2. shorter rayed; Madeira.

Inhab. English coast, Mediterranean.

4. *Asterias rustica*, Gray. Rays 6, flat, broad; spines short, thick, truncated.

Inhab. Valparaiso, in sandy mud, *H. Cuming*, Esq. This species has a series of small triangular plates, pierced with a central triangular hole, within the marginal ambulacral spines.

5. *Asterias echinata*, Gray. Rays 8, twice as long as the width of the body, five-sided; central ridge of spines interrupted.

Valparaiso, on mud, about 4 to 6 fathoms. *H. Cuming*, Esq.

d. Rays 5, tapering; the ambulacral series of spines crowded, as if 2 or 3-rowed; back netted with a ridge of two or three rows of spines next the ambulacral series, and then a single series of spines.

6. *Asterias Holsatica*, Retz. Ast. 22. & 26. *Asterias violacea*, Müller, Z. D. ii. t. 46. *A. glacialis*, John. Rays tapering, nearly 3 times as long as the width of the body.

Inhab. Northern Europe. Colour very variable.

7. *Asterias rubens*, Linn. Rays broad, more than twice as long as the width of the body, with scattered blunt spines, spinulose at the tip.

Inhab. European ocean. Is not this only the female with eggs of the former?

8. *Asterias Katherineæ*, Gray. Rays 6 or rarely 5, nearly 3 times as long as the width of the body; back with scattered and crowded blunt rough-tipped spines.

Inhab. North America, mouth of the Columbia river. *Lady Katherine Douglas*.

9 *Asterias Wilkinsonii*, Gray. Rays 5, nearly three times as long as the width of the body; back with about 7 irregular interrupted series of rather blunt rough spines,

Inhab. Northern Africa. *Sir J. G. Wilkinson*.

See also *Ast. tenuispinosa*, Lam.; *Ast. hispida*, Penn.; *Ast. Savaresi*, Chiaje. t. 18. f. 6; and *Ast. spongiosa*, Fab.

e. Body discoidal, divided at the edge into numerous short tapering rays; the series of spines near the ambulacral series rather crowded, large and elongated. *Heliaster*, Gray.

10. *Asterias Helianthus*, Lam. 20. E. Meth. t. 108. 109. Arms

33 or 34, about $\frac{1}{4}$ the length of the width of the body, with three equidistant series of short blunt spines.

Inhab. Guasco, Chili, *Say*. Valparaiso, *H. Cuming, Esq.*

11. *Asterias Cumingii*, Gray. Arms 30 or 31, very short, not $\frac{1}{10}$ as long as the diameter of the body, conical, with blunt spines.

Inhab. Hood's Island, on rocks at spring tide. *H. Cuming, Esq.*

12. *Asterias multiradiata*, Gray. Arms 22 or 24, cylindrical, elongated, tapering at the ends, $\frac{1}{3}$ longer than the diameter of the body; the dorsal series of spines rather longer and more compressed.

Inhab. Hood's Island. *H. Cuming, Esq.*

2. TONIA, Gray.

Skeleton netted with a series of crowded small blunt mobile spines on the sides of each ossiculum; ambulacra bordered with a crowded series of subulate spines, and without any triangular pierced pieces within them.

1. *Tonia atlantica*, Gray. Rays 5, more than twice as long as the width of the body; back with 9 series of cross bands.

Inhab. Valparaiso, on rocks at low water. *H. Cuming, Esq.*

SECT. 2. *The ambulacra with only two rows of feet.*

Fam. 2. ASTROPECTINIDÆ.

Back flattish, netted with numerous tubercles, crowned with radiating spines at the tip, called Paxilli.

A. *The margin of the rays ciliated with a series of simple elongated spines, the paxilli or crowned tubercles regularly radiating.*

a. *The rays edged with a series of large regular tubercles, which increase in number as the animal grows.*

1. NAURICIA, Gray.

The ambulacral spines broad and ciliated; 2 series of tesseræ between the angles of the arms and the mouth beneath. Asiatic.

1. *Nauricia pulchella*, Gray. Seba, iii. t. 8. f. 7. a. b. not good. Rays 5, half as long as the width of the body, gradually tapering, lower series of marginal tubercles with a series of broad flat spines on the upper margin of each.

Inhab. China? Japan?

2. ASTROPECTEN, Linck. Fringed Star Fish.

Ambulacral spines simple, linear, without any tesseræ between the marginal tubercles near the mouth and angles of the arms.

1. *Body pentagonal; rays short.*

1. *Astropecten corniculatus*, Linck. t. 27. & t. 36. f. 63.

Inhab. ———. Perhaps a variety of the next.

2. *Astropecten polaris* = *Asterias polaris*. *Sabine, Append. Parry's Voy.* 223. t. 1. f. 2, 3.

Inhab. North Sea.

2. Body 5-rayed, arms depressed; the upper series of marginal tubercles broad, rounded or shelving towards the edge.

a. The dorsal tubercles between the angles of the arms on the centre of the back and on the lines down the centre of the arms the largest.

3. *Astropecten stellaris*.

Inhab. ———.

b. The dorsal tubercles subequal, with fasciculated spines.

† The oral series of marginal tubercles produced beyond the dorsal ones.

* The upper marginal tubercles with a single series of spines at the angle of the base of the rays, and with another series at the end of the rays, which together make a double series near the base of the rays.

4. *Astropecten duplicatus*, Gray. Rays three times as long as the diameter of the body, slender; marginal spines elongated, depressed, linear.

Inhab. St. Vincent's. Rev. L. Guilding.

5. *Astropecten aurantiacus*. *Asterias aurantiaca*, Linn. Rays three times as long as the diameter of the body, slender; marginal spines subulate, elongated.

Inhab. Mediterranean.

6. *Astropecten stellatus*, Gray. Rays more than twice as long as the width of the body. The central area of the arms is about as wide as one series of the marginal tubercles.

Inhab. Coast of South America?

** The upper series of marginal tubercles with a continued single series of spines on the angle of the arms.

7. *Astropecten armatus*, Gray. Rays elongate, regularly tapering; upper marginal tubercles narrow, with a continued series of erect, elongated, subulate spines. Var. 2. *Pulcher*, the under series of marginal tubercles not produced, and the spines more slender.

Inhab. Puerto Portrero, South America, on sandy bottoms, 9 fathoms. H. Cuming, Esq. Var. 2.

8. *Astropecten echinatus*, Linck, 29. t. 8. f. 12. 12. Rays rather more than twice as long as the width of the body; upper series of spines large, lower series depressed, acute.

See also *Astropecten bispinosa* = *Asterias bispinosa*, Otto.

*** The upper series of marginal tubercles spineless, the lower series much produced.

9. *Astropecten marginatus*, Gray. Rays nearly three times as long as the width of the body; lower marginal tubercles linear, depressed.

Astropecten fimbriatus, Linck, is probably this species with the marginal spines lost.

10. *Astropecten regalis*, Gray. Rays one-fourth longer than the diameter of the body, broad, tapering; spines broad, blunt, depressed.

Inhab. St. Blas. H. Cuming, Esq.

Like *A. marginatus*, but the arms are shorter and broader.

**** *The upper series of marginal tubercles with 2 series of spines at the base and 1 along the edge of the arms.*

11. *Astropecten erinaceus*, Gray. Arms gradually tapering, twice as long as the width of the body; upper marginal tubercles rather narrow, with a series of small short spines, and a series of 6 or 8 larger ones.

“St. Elena, sandy mud, 6 fathoms.” *H. Cuming, Esq.*

†† *The under or oral series of marginal tubercles rounded and not produced beyond the dorsal ones.*

* *The upper series with a series of short spines.*

12. *Astropecten Mauritianus*, Gray. Rays broad; lower spines broad, strap-shaped.

Inhab. Isle of France.

** *Upper series spineless.*

13. *Astropecten mesodiscus*, Linck, 29. t. 4. f. 16. Rays elongate, slender, tapering; upper marginal tubercles narrow, with 2 series of short small tubercles like granules, one on each of the margins; lower spines broad, elongate.

Inhab. —.

14. *Astropecten gracilis*, Gray. Rays elongate, slender, gradually tapering; upper marginal plates rather broad, granular with fine spines on the suture between them; lower spines small, blunt, depressed.

Inhab. —. Like the former, but arms narrower.

15. *Astropecten irregularis*, Linck, 27. t. 6. f. 13. *A. aurantiaca*, Muller, Z. D. t. 83. *A. Johnstoni*, Chiaje? Rays rather broad, tapering; the upper tubercles rather broad, with a series of 1 or 2 scattered tubercular spines near the tip; lower spines depressed, acute.

Inhab. Pembrokeshire, *Linck*.

16. *Astropecten dubius*. Rays broad, tapering; upper marginal tubercles rather broad, granular, spineless? lower spines broad, depressed.

Inhab. West Indies.

*** *Upper and lower margin spineless, serrated?*

17. *Astropecten regularis*, Linck, 26. t. 8. f. 11. *Asterias petalodea*, Retz, *Aster*. 16. n. 14?

Inhab. —. I have never seen this species.

3. *Body 5-rayed, the arms high, narrow; upper marginal tubercles very narrow and erect; the line of dorsal tubercles down the centre of the arms the largest. Astropectus*, Gray.

18. *Astropecten longipes*, Gray. Rays long and narrow; the upper marginal tubercles minutely granular, and 1 or 2 of them often furnished with a short broad conical spine; lower with a broad depressed blunt erect addressed spine; monstrosity 4-rayed.

Inhab. “Isle of France,” *Leach*.

See also *Ast. pentacantha*, *Ast. spinulosa*, *Ast. platycantha*, *Ast. subinermis*, Philippi, (but this author considers the number of the marginal tubercles, which increase with the age of the specimen, as a specific character,) and *Asterias calcitraba*, Lam.

b. *The rays without any large tubercles on the margin.*

3. LUIDIA, Forbes.

Margin of the 5 flat rays erect; the dorsal surface crowded with regular paxilli.

1. *Luidia fragilissima*, Forbes in Wern. Trans. 1839, 14.—*Asterias rubens*, Johnston in Mag. H. N. 144. f. 20.

Inhab. North Sea.

2. *Luidia Savignii*, Gray. *Ast. Savignii*, Audouin in Savigny, Egypt, Echinod. t. 3.

Inhab. Red Sea.

3. *Luidia? ciliaris*. *Asterias ciliaris*, Philippi in Wiegmann. Arch. 1837, 19.

Inhab. Sicily.

4. PETALASTER, Gray.

Margin of the rays shelving; the dorsal surface with equal paxilli placed in longitudinal and cross series. Asiatic.

1. *Petalaster Hardwickii*, Gray. Rays elongated, rather slender, tapering at the end; the dorsal tubercles with small truncated spines, and a distinct series of rudimentary spines.

Indian Ocean.

2. *Petalaster Columbia*. Rays elongated, slender, gradually tapering; tubercles short, with crowded groups of rather large acute spines, and a fringe of very fine radiating ones.

Inhab. St. Blas. H. Cuming, Esq.

B. *The margin of the rays not edged with large tubercles, simple, or ciliated with short broad spines bearing tubercles.*

5. SOLASTER, Forbes.

The rays many, with 2 series of broad spines bearing tubercles near the ambulacra.

a. *Body 8 or 9-rayed, closely reticulated, rays rounded, ventricose below, tapering at the tip, with a second row of compressed tubercles on the under side of the arms near the ambulacral series.* Endecca, Gray.

1. *Solaster Endecca*, Forbes. *Asterias Endecca*, Linn. *Ast. aspersa*, Muller.

Inhab. European Ocean.

b. *Body 10 or 12-rayed, loosely reticulated; the rays depressed, with a series of large compressed tubercles crowned with a bunch of spines edging the oral ridge.* Polyaster, Gray.

2. *Solaster papposa*, Forbes. *Asterias papposa*, Linn. *Ast. stellata*, Retz.

Inhab. European Ocean.

6. HENRICIA, Gray. *Linckia*, Forbes not *Nardo*.

The rays 5, rounded, tapering, with rounded tubercles near the ambulacra; the dorsal wart obscure, few rayed, often hidden with small spines.

1. *Henricia oculata*, Gray. *Asterias oculata*, Penn. *Asterias seposita*, Penn.? Rays 5, closely reticulated with small spines.

Inhab. European Ocean.

[To be continued.]

XXIII.—*On the true Method of discovering the Natural System in Zoology and Botany.* By HUGH E. STRICKLAND, M.A., F.G.S., &c.*

It is probable that most naturalists at the present day have an instinctive belief in the existence of a natural system in Zoology and Botany, but there are very few who if questioned on the subject could give any clear explanation of the grounds of their belief, of the nature of that system, or of the mode by which a knowledge of it may be attained. The uncertainty which hangs over the subject is doubtless owing to the obscure and metaphysical nature of some of the principles involved, and still more to the vague conceptions and crude theories which have been promulgated on the subject.

This essay is contributed in the hope that, even if its own arguments are of little value, it may, at least, induce others to investigate the subject on more correct principles than have hitherto been followed.

The postulate with which I commence the inquiry is, to let it be granted that there are such things as *species*, distinct in their characters and permanent in their duration. This being admitted, we define the natural system to be *the arrangement of species according to the degree of resemblance in their essential characters*. In other words, the natural system is that arrangement in which the distance from each species to every other is in exact proportion to the degree in which the essential characters of the respective species agree. Hence it follows that the whole difficulty of discovering the natural system consists in forming a right estimate of these degrees of resemblance. For the degree in which one species resembles another must not be estimated merely by the conspicuousness or numerical amount of the points of agreement, but also by the physiological importance of these characters to the existence of the species. On this point no certain rules have yet been laid down; for though naturalists in general admit, for instance, that the

* Read before the Zoological Section at Glasgow, Sept. 21, 1840.

nervous system is superior in importance to the circulatory, and the latter superior to the digestive system, yet this subject is still in a very indeterminate state, and until our knowledge of physiology is much further advanced, disputes will always arise respecting the true position of certain species in the natural classification. Such differences of opinion, however, will continually diminish as our knowledge increases, and they are even now very few in comparison with the numerous facts in classification on which all naturalists are agreed. Much may be effected by education and habit, which impart to the naturalist a peculiar faculty (termed by Linnæus a "latent instinct") for appreciating the relative importance of physiological characters to the satisfaction of himself and others, even in cases where he is unable to explain the principles which determine his decision.

Granting, then, that by combining the *number* of points in which any two species agree, with an estimate of the *physiological importance* of those several points of agreement, the naturalist may, in practice, form a tolerably exact conception of the *degree of resemblance* between them; he will proceed in his construction of the natural system to place these species at greater or less distance from each other, in proportion to that degree of resemblance. If we suppose that by a repetition of this process every species is placed in its true position, we obtain a definition of those much-disputed terms, *affinity* and *analogy*,—the former of which consists in those *essential* and *important* resemblances which determine the place of a species in the natural system, while the latter term (analogy) expresses those *unessential* and (so to speak) *accidental* resemblances which sometimes occur between distantly allied species without influencing their position in the system. With *analogy*, therefore, we have no further concern in the present discourse, as it is a principle in no way involved in the natural system. *Affinity*, on the contrary, forms the chief element in this inquiry; and to place species in the order of their affinities is to construct the natural system*.

It appears from the above views that the natural system is an accumulation of facts which are to be arrived at only by a slow inductive process, similar to that by which a country is geographically surveyed. If this be true, it is evident how

* I am aware that by many naturalists analogy is considered to be as important an element in the natural system as affinity is. As the discussion of this question would lead us away from the present object, I will not enter upon it now, especially as my views respecting it are stated more at large in the Mag. of Nat. Hist. for May last, p. 222 *et seq.*

erroneous must be all those methods which commence by assuming an *à priori* system, and then attempt to classify all created organisms in conformity with that system. This, nevertheless, is a defect which exists more or less in many modern methods of classification. The greater part of these arrangements are based on an assumption that organic beings have been created on a regular and symmetrical plan, to which all true classifications must conform. Some naturalists have attempted to place all animal species in a straight line, descending from man to a monad. This theory assumes that each species (excepting the two extremes) has two and only two direct affinities; one, namely, with the species which precedes, and the other with that which follows it. Others, perceiving the existence in many cases of more than two direct affinities, have compared the natural system to a series of circles, or to the reticulations of network. Many authors have assigned the most mathematical symmetry to the different parts of the system by maintaining the prevalence throughout of a constant number, such as 2, 3, 4, 5, or 7. In applying these views to facts, they have of course found numerous exceptions to the regularity of their assumed formulæ; but by adducing the extermination of some species, and our ignorance of the existence of others, and by applying a Procrustean process to those groups which were either larger or smaller than the regulation standard, they have removed the most glaring objections to their theory, and have with wonderful ingenuity given their systems an appearance of truth*. But when the unprejudiced naturalist attempts to apply any one of these systems to Nature, he soon perceives their inefficiency in expressing the real *order of affinities*. The fact is, that they all labour under the vital error of assuming that to be symmetrical, which is in an eminent degree irregular and devoid of symmetry. I will now proceed to give my reasons for taking this view of the subject.

1. *A priori* considerations, so far from leading us to assume a *regular geometrical pattern*, or *numerical property* in the

* As these remarks may appear somewhat severe, it is right to substantiate them by a few examples. So long as these systems are admitted by their authors to be *artificial*, it would be as unjust to object to them, as to complain of the alphabetical arrangement of an encyclopædia, that it broke the connection of the subjects. The reply would of course be, that an encyclopædia does not profess to arrange subjects in their natural order, but merely aims at convenience of reference. The remarks in the text, therefore, merely apply to those *symmetrical* methods which profess to exhibit *The Natural System*. The examples are selected from Mr. Swainson's 'Classification of Birds,' in which work the *reality* of the quinary system is insisted on throughout. See Appendix.

groups of organized beings, appear to indicate the direct contrary; for the analogies of external nature all indicate the utmost variety and irregularity. Beautiful as are the examples of creative design exhibited in the universe, and admirable as are the adaptations of one part of nature to another, there is no department of the creation which is tied down to mathematical laws and numerical properties further than is sufficient for the due performance of its destined functions. There are indeed certain mathematical laws which regulate the motions of bodies and their chemical combinations, but these do not give to the face of nature that symmetrical and *artificial* appearance which is aimed at by the zoological systems above-mentioned. For example, the relative distances of the planets, their magnitudes, and the number of their satellites conform to no known numerical law. The fixed stars exhibit no regular arrangement, either in their magnitudes, distances, or positions, but appear scattered at random across the sky. To descend to our own earth, no symmetry is traceable in the forms of islands or continents, the courses of rivers, or the directions of mountain-chains. Organic life exhibits the same irregularity,—no two plants, and no two leaves of the same plant were ever perfectly identical in size, shape, colour, and position. In the “human face divine,” portrait-painters affirm that the two sides never correspond; and even when the external form of an animal exhibits an appearance of bilateral or radiate symmetry, nature departs from it in her arrangement of the internal structure. In short, variety is a great and a most beautiful law of Nature; it is that which distinguishes her productions from those of art, and it is that which man often exerts his highest efforts in vain to imitate. When, therefore, we find a system of classification proposed as the natural one which departs from this universal law of variety, and fetters the organic creation down to one unalterable geometrical figure or arithmetical number, there is, I think, a strong *à priori* presumption that such a system is the work not of nature but of art.

2. It follows from the irregularity of external nature, as seen on the surface of the earth, that the groups of organized beings *must* be irregular also, both in their magnitudes and in their affinities. In proof of this it must be granted that the final cause of the creation of every animal and plant is the discharge of a certain definite function in nature, and not the mere occupation of a certain post in the classification: in short, that the design of creation was to form not a cabinet of curiosities, but a living world. Few, I trust, would hesitate to admit this proposition. If, then, the different modifi-

cations of structure which constitute the characters of groups were given solely with reference to the external circumstances in which the creature is destined to live, it follows that the irregularities of the external world must be impressed upon the groups of animals and of plants which inhabit it. The supply of organic beings is exactly proportioned to the demand; and Nature does not, for the sake of producing a regular classification, go out of her way to create beings where they are not wanted, or where they could not subsist. Thus, for instance, the warm climate and varied soil of the tropics admits of the growth of a vast variety of flowers and fruits. The group of Humming-birds which feed on the former, and of Parrots which feed on the latter, are accordingly found to be developed in a vast variety of generic and specific forms; while the family of Gulls which seek their food in the monotonous and thinly inhabited regions of the north, are few in species and still fewer in genera. Again, the variety of plants in the tropics admits the existence of a great variety of insects, and the family of Woodpeckers is proportionately numerous; while the Oxpecker (*Buphaga*), which seems to form a group fully equivalent in value to the Woodpeckers, is limited to but one or two species, because its food is confined to a few species of insects which only infest the backs of oxen.

It follows, then, that the groups of organized beings will be great or small, and the series of affinities will be broken or continuous, solely as the variations of external circumstances admit of their existence, and not according to any rule of classification. If, indeed, we were to imagine a world laid out with the regularity of a Chinese garden, in which a certain number of islands agreeing in size, shape, soil, and form of surface, were placed at exactly equal distances on both sides of the equator, we might then conceive the possibility of a perfect symmetry in the groups of beings which inhabit them; but without some such supposition, I do not see how a class of animals or plants can be symmetrical in themselves, and yet be expressly adapted for conditions of existence which are eminently irregular.

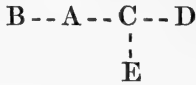
3. To pass from syllogism to induction, it is most certainly not the case that any definite number or geometrical property runs through the animal or vegetable kingdom. I do not wish on the present occasion to enter on any criticism of individual systems, but it would be easy to show that no *symmetrical* system yet proposed is a true picture of the real series of affinities. Without referring to the numerous gaps in these systems which are referred by their authors to species

being extinct or unknown, I could point out numerous examples in which natural affinities are violated, insignificant groups promoted, or important ones reduced to the ranks, in the vain endeavour to drill the irregular troops of Nature into the square, the column, and the phalanx*. And although in some cases we do find examples of the recurrence of a certain number in the subdivisions of natural groups, yet when we remember the ease with which groups may be extended or curtailed to support a theory, the numerous exceptions which occur to these numbers, and the variety of numerical theories which have been maintained with equal firmness by different authors, we cannot, I think, regard these occasional coincidences of number as otherwise than accidental.

If, then, the diversities of organic structure, being adapted to the varying conditions of the earth's surface, are, like them, full of irregularity and variety, it is plain that we can no more speculate theoretically as to what groups are likely to remain undiscovered, than we can predict the discovery of rivers, lakes or islands in any unexplored portion of the earth's surface. Both inquiries must be pursued in the same way, viz. by a careful induction of facts; and it will be found that there is much analogy between the process here recommended and that of a geographical survey. The plan proposed is to take any species, A, and ask the question, What are its nearest affinities? If, after an examination of its points of resemblance to all other known species, it should appear that there are two other species, B and C, which closely approach it in structure, and that A is intermediate between them, the question is answered, and the formula B A C would express a portion of the natural system, the survey of which is so far completed. Then take C, and ask the same question. One of its affinities, that of C to A, is already determined; and we will suppose that D is found to form its nearest affinity on the other side. Then B A C D will represent four species, the relative affinities of which are determined. By a repetition of this process, supposing our knowledge of the structure of each species to be complete, and our rules for determining the degrees of affinity correct, the whole organized creation might be ultimately arranged in the order of its affinities, and our survey of the natural system would then be finally effected. Now, if each species never had more than two affinities, and those in opposite directions, as in the above example, the natural system would form a straight line, as some authors have assumed it to be. But we shall often find, in

* See Appendix.

fact, that a species has only one direct affinity, and in other cases that it has three or more, showing the existence of lateral ramifications instead of a simple line; as shown in this example, where C, besides its affinity to A and D, has an affinity to a third species, E, which therefore forms a lateral ramification.



It was the observation of this fact which led some naturalists to adopt the circular instead of the linear theory, still adhering to the assumption of a symmetrical figure, but changing their notions of its form. Now although we find occasional ramifications in the affinities, and although these ramifications may occasionally anastomose and form a circle, yet it has been shown that the doctrine of a regular figure cannot be sustained, and therefore if even it be permitted to man to discover what the true figure is which will express all the affinities of organic bodies, it can only be effected by constructing it piecemeal in the way above proposed. All that we can say at present is, that ramifications of affinities exist; but whether they are so simple as to admit of being correctly depicted on a plane surface, or whether, as is more probable, they assume the form of an irregular solid, it is premature to decide. They may even be of so complicated a nature that they cannot be correctly expressed by terms of space, but are like those algebraical formulæ which are beyond the powers of the geometrician to depict. Without, however, going deeper into this obscure question, let us hope that the affinities of the natural system will not be of a higher order than can be expressed by a solid figure; in which case they may be shown with tolerable accuracy on a plain surface; just as the surface of the earth, though an irregular spheroid, can be protracted on a map. The natural system may, perhaps, be most truly compared to an irregularly branching tree, or rather to an assemblage of detached trees and shrubs of various sizes and modes of growth*. And as we show the form of a tree by sketching it on paper, or by drawing its individual branches and leaves, so may the natural system be drawn on a map, and its several parts shown in greater detail on a series of maps.

* If this illustration should prove to be a just one, the order of affinities might be shown in museums in a pleasing manner by constructing an artificial tree, whose ramifications should correspond with those of any given family of birds, and by then placing on its branches a stuffed specimen of each genus in their true order.

In order to show that the views here maintained are not chimerical, I will here present one or two *sketch*-maps of different families of birds, though I am well aware that our knowledge of natural history is as yet far too imperfect to pretend to accuracy*. Such sketches as these can be compared only to the rude efforts at map-making made by the ancients, of which the Peutinger Table is an example; and it is probably reserved for a distant age to introduce that degree of exactness into natural history which in modern geography is attained by a trigonometrical survey. For the sake of simplicity, in making these sketches I have omitted the consideration of *species*, but assuming that the genera of modern authors consist solely of closely allied species, I have proceeded to group them in what appeared to be their true position in respect of their affinities. In order to place these groups at their true distances, it is necessary to form a *scale of degrees of affinity*, to which the intervals between each genus shall correspond. I am aware that this scale must be, in some measure, arbitrary; but for this there is no remedy. The division of the fixed stars into *seven* magnitudes is arbitrary also, yet it is found in practice to answer the purpose. It is evident, from the complex ramifications assumed by the natural system, that it is impossible, in a zoological work, to describe each genus or species in the exact order of their affinities, but that leaps must often be made from one part of the system to another, just as in a geographical work we cannot describe the counties of Great Britain in their exact order of position, but must continually make lateral digressions, and then return to the main line of our route. So in anatomy, we not only cannot study or describe the several parts in the order in which they join each other in the human body, but each part must even be dissected out from the rest, and removed from its natural position, before we can comprehend its characters and functions. This is an inconvenience inseparable from the nature of the case, and it is therefore no just complaint to make against a systematic work, that it frequently makes diversions which break the order of affinities. We are therefore at liberty to consult our own convenience, and consequently, whatever may be the form which the natural system, on further survey, may assume, there will be no reason for departing widely from the usual custom of commencing with Mammalia, and proceeding through Birds, Reptiles, and Fish, to the Mollusca, Annulosa, Radiata, &c. Let it not then be objected to the

* See Plate VIII., which exhibits one of these attempts at zoological map-making.

method here proposed, that it is subversive of the arrangements now in use. No *linear* arrangement, whether adopted in a museum, a catalogue, or a descriptive work, ever *can* express the true succession of affinities: such an arrangement, therefore, is necessarily in great measure artificial, and, if sanctioned by custom, may still be adhered to. The true order of affinities can only be exhibited (if at all) by a pictorial representation on a *surface*, and the time may come when our works on natural history may all be illustrated by a series of *maps* on the plan of those rude sketches which are here exhibited.

Those symmetrical systems which are here combated are the natural result of that instinctive love of order which is innate in man, and which produces all the noblest works of art. It would doubtless have been more *convenient* for the arrangement of our museums, and more agreeable to our love of order, if the groups of organized beings *had* resolved themselves into a symmetrical plan; but if such is not the case, we must not sacrifice truth to convenience. My object in communicating these remarks will be gained if they induce naturalists to study Nature simply as she exists,—to follow her through the wild luxuriance of her ramifications, instead of pruning and distorting the tree of organic affinities into the formal symmetry of a clipped yew-tree.

It is needless to observe, that although the above remarks have been applied chiefly to the animal kingdom, yet that the principles here announced, if true at all, may be applied with equal correctness to botanical as to zoological systems.

APPENDIX.

In Mr. Swainson's 'Classification of Birds,' the Procrustean process is effected in *five* different ways. 1. By transferring the members of redundant groups to fill the blanks in those which are deficient. Examples: *Haliaëtus* is transferred from Aquilinæ, and made a subgenus of *Astur*; *Myophonon* is transferred from Merulinæ to Myotherinæ; *Cinclosoma* from Turdidæ, and made a subgenus of *Grallina*; *Irena* from Dicrurinæ, and made a subgenus of *Oriolus*; Querulinæ from Ampelidæ to Muscipidæ; Coracinæ from Ampelidæ to Corvidæ; *Carduelis* and *Linaria* are transferred from Fringillinæ to Coccothraustinæ; *Scythrops* from Cuculidæ to Rhamphastidæ; *Tichodroma* from Sittinæ to Troglodytinæ; *Orthonyx* from Crateropodinæ (where it comes next *Psophodes*) to Buphaginæ; *Hematopus* from Charadriadæ to Ardeadæ; *Eurypyga* from Ardeadæ to Scolopacidæ; *Phaëton* from Pelecanidæ to Laridæ; and *Dromas* from Charadriadæ to Laridæ.

2. By uniting together groups which are naturally distinct. Examples: *Harpyia* is united with *Morphnus*; *Ibycter* with *Daptrius*; *Corvinella*, Less. (*Lanius flavirostris*, Sw.) with *Lanius*; *Cyclarhis* with *Falcunculus*; *Psophodes*, *Sphenura*, and *Dasyornis* with *Timalia*; *Mecistura* and *Calamophilus* with *Parus*. The Iodinæ are united with Muscicapinæ; *Corydon*, Less. (*Coracias sumatranus*, Raff.) with *Eurylaimus*; *Cissopis* with *Pitylus*; the Furnarinæ with Certhianæ; the Phœnicophainæ with Crotophaginæ; *Dacnis* with *Nectarinia*; the Tamatiadæ with the Halcyonidæ; *Syrrhaptes* with *Pterocles*; the Chionidæ with the Columbidae; the Cracinæ and Psophinæ with Megapodinæ; *Gallinula* (*G. chloropus*) with *Fulica*; *Mergulus* and *Utamania* with *Mormon*; and *Puffinus* with *Thalassidroma*.

3. By dividing groups which are naturally united. Examples: the Philomelinæ are divided from the Sylvianæ, and the Agelainæ from the Icterinæ.

4. By raising subordinate groups above their natural station. Examples: *Budytes*, a subgenus of *Motacilla*, is made a genus equivalent to *Lessonia*, *Enicurus*, and *Anthus*; *Leptonyx* and *Plectrophanes*, subgenera of *Emberiza*, are made of equal value with the genus *Fringilla*; *Nyctiornis*, a subgenus of *Merops*, is put on a par with *Coracias*; *Lamprotila*, a subgenus of *Galbula*, is made a genus.

5. By degrading important groups below their natural station. Examples: *Circaëtus* is made a subgenus of *Gypogeryanus*; *Cossypha* of *Orpheus*; *Pomatorhinus* and *Timalia* of *Malacocercus*; *Securus* of *Accentor*; and *Blechropus* of *Fluvicola*: *Rhamphopsis* is made a subgenus of *Tanagra*; *Euphonia* of *Aglaia*; *Crithagra* and *Spermophila* of *Pyrrhula*; *Gymnophrys* of *Manorhina*; *Pterocles* of *Tetrao*; *Apteryx* of *Struthio*; *Aleththelia* of *Gallinula*; *Phalaropus* of *Scolopax*; *Recurvirostra* and *Totanus* of *Himantopus*; *Tachydromus* of *Glaucopis*; and *Phaëton* and *Rhynchops* of *Sterna*.

Without pretending to assert that in all the above instances my views of the affinities are right and Mr. Swainson's wrong, I will only ask any unbiassed naturalist to examine the objects themselves, without reference to books, and then say whether, in the majority of the above examples, the true order of affinities has not been violated for the sake of supporting a preconceived theory.

It may be added, that after all these efforts, the system of ornithology proposed by Mr. Swainson is very far from being a quinary one. Without referring to the very numerous instances in which his subdivisions *fall short of* the number five, there are several cases in which that number is *exceeded*.

Thus the group Fringillinæ has *six* subdivisions; Pyrrhulinæ has *six*; Meliphagidæ *nine*; Tetraonidæ *six*; Ardeadæ *six*, or including Grus (which is apparently omitted through inadvertence), *seven*; and Alcadæ has *six*.

I feel bound to state, that, notwithstanding these objections, the 'Classification of Birds' is an exceedingly useful manual of ornithology, and it must be regretted that the mass of original observations which it contains is intermixed with so much that is of a visionary nature.

Note.—The questions which are the subject of the above paper were discussed at much length in the Philosophical Magazine, in 1823 and 1825. The reader is referred to vol. lxii. p. 192, 255, 274; vol. lxv. p. 105, 183, 372, 428; vol. lxvi. p. 172: also to Phil. Mag. and Annals, New Series, 1830, vol. vii. p. 431; vol. viii. p. 52, 134, and 200.—ED.

XXIV.—*Catalogue of the Land and Freshwater Mollusca of Ireland.* By WM. THOMPSON, Vice-President of the Natural History Society of Belfast.

[Continued from p. 126.]

Class II. CONCHIFERA, Lam.

Fam. 1. CYCLADÆ.

Gen. 1. CYCLAS, Lam.

1. *C. cornea*† Lam. Gray, Man. p. 280. pl. 1. f. 2; Turt. Man. p. 13. pl. 1. f. 2.

C. rivalis, *Drap.* p. 129. pl. 10. f. 4, 5.

Cardium corneum, *Mont.* p. 86.

Commonly distributed over the island, occurring in small ponds, &c., as well as lakes and rivers—the var. β . of Jenyns and other varieties not unfrequent. In summer I find the *C. cornea* of all sizes abundant in masses of *Confervæ*, floating on the surface of the water.

2. *Cyclas lacustris*, Turt. Gray, Man. p. 281. pl. 1. f. 3.

C. calyculata, *Drap.* p. 130. pl. 10. f. 13, 14; Turt. Man. p. 14. f. 3.

Cardium lacustre, *Mont.* p. 89.

Is rare and local in Ireland—occurs in the east and south. To Mr. R. Ball of Dublin, I am indebted for specimens which were taken by him many years ago in a pond at Tallaght, a few miles from the metropolis; he has also procured some at Youghal—in Mr. Hyndman's cabinet is a specimen from another locality in the south. By Mr. T. W. Warren of Dublin, this *Cyclas* has been obtained in a pond in the Phoenix Park, and in the Grand Canal near that city, and by Dr. Coulter in Lord Roden's demesne, Dundalk. Mr. Hincks has lately procured it near Cork. As the *C. lacustris* is local in En-

† Mr. Gray's observation on the local distribution of *Cyclas rivicola* (Man. p. 34.) induces me to mention that I have obtained it in the canals about Leamington, Warwickshire. I have not seen any specimens that could properly be authenticated as Irish.

gland likewise, the additional habitat of Stow Pool, Lichfield, may be given, where I procured it in July, 1836.

Gen. 2. *PISIDIUM*, Pfeiffer.

1. *P. obtusale*†, Pfeiffer? Jenyns, Monog. p. 13. pl. 20. f. 1—3; Gray, Man. p. 282. pl. 12. f. 149.

This, with the exception of *P. Henslowianum*, would seem to be the rarest of the *Pisidia* in Ireland. In two localities in the county of Down it has occurred to me—in a drain cut through clay soil in a brickfield near Bangor, and in a pond at Portavo, the seat of D. Ker, Esq. M.P. A single specimen has been taken at Finnoe (county Tipperary) by Edw. Waller, Esq.

2. *Pisidium nitidum*, Jenyns, Monog. p. 16. pl. 20. f. 7, 8; Gray, Man. p. 283. pl. 12. f. 150.

Is somewhat generally distributed in Ireland. It is abundant in a cold turfy deposit conveyed by a mountain stream to a pond at Wolfhill‡ near Belfast; and on the *Utricularia vulgaris* growing in stagnant pools, excavated in brick-making close to the town—these places are of a very different nature, the pond at the former being supplied with clear spring water, and at an elevation of nearly 600 feet above the sea, the latter but a few feet above it, and supplied only with rain water. In the west, I have obtained this species in Lough Gill, county Sligo. From about Portarlinton it has been sent me by the Rev. B. J. Clarke, and from Finnoe by Edw. Waller, Esq.

3. *Pisidium pusillum*, Jenyns, Monog. p. 14. pl. 20. f. 4—6; Gray, Man. p. 283. pl. 1. f. 7.

Is the most common of the genus in Ireland, and universally distributed. It is generally to be met with in ponds, drains, &c.; but in marshy spots, both in this country and in Scotland, I have found it in company with, and adhering to, the same stones as land Mollusca which inhabit such places, as *Vertigo palustris*, &c. In the north and south of Ireland I have procured it among moss, which was kept moist only by the spray of the waterfall.

4. *Pisidium pulchellum*, Jenyns, Monog. p. 18. pl. 21. f. 1—5§; Gray, Man. p. 284. pl. 12. f. 151.

This handsome and well-marked species is generally distributed over the island. It inhabits stagnant and running water of the least as well as greatest extent, and at the same time and place may be found on various subaquatic plants, and buried in the mud—the largest and finest specimens I have procured were from the gently flowing river Main, near its junction with Lough Neagh.

† All the *Pisidia* about to be noticed, have been determined from comparison with English specimens favoured me by the Rev. L. Jenyns and Mr. Alder.

‡ A minute leech preys much on the *P. nitidum* and *P. pusillum*, which are found here in company.

§ All the varieties are found in Ireland—of var. δ , a single specimen has been obtained by the Rev. B. J. Clarke near Portarlinton. Mr. Jenyns is now inclined to consider this a distinct species. See Gray, Man. p. 285.

5. *Pisidium Henslowianum*, Jenyns, Monog. p. 20. pl. 21. f. 6, 7 ; Gray, Man. p. 285. pl. 1. f. 6.

Cyclas appendiculata, Turt. Man. p. 15. f. 6.

The addition of this species to our fauna is due to Edw. Waller, Esq., who has favoured me with the inspection of a few specimens which he procured at Finnoe, county Tipperary.

6. *Pisidium amnicum*, Jenyns, Monog. p. 21. pl. 19. f. 2 ; Gray, Man. p. 285. pl. 1. f. 5.

Cyclas amnica, Turt. Man. p. 15. f. 5.

Cardium amnicum, Mont. p. 86.

Cyclas palustris, Drap. p. 131. pl. 10. f. 15, 16.

Although not very common, is widely distributed over the island, and is known to me as occurring in every portion except the extreme south. Capt. Brown noticed as localities—"in a stream near Clo-nooney; in the Grand Canal, and in the Liffey, plentiful," p. 508.—in this river it attains a very large size. In the river Main, near its junction with Lough Neagh; in the rejectamenta of this lake near Toome; and in that of the river Lagan near Belfast, I have found the *P. amnicum*. Ballitore (county Kildare), Limerick, and Miltown Malbay are noticed by Mr. W. H. Harvey as localities—from the river Barrow near Portarlinton, the species has been sent me by the Rev. B. J. Clarke.

7. *Pisidium cinereum*, Alder, Supp. to Catal. in Newc. Trans. ; Gray, Man. p. 286.

Is not common, but is widely distributed in Ireland, being found in the north, east, west, and south. In Sept. 1833, I first met with it in a moist spot in the wood at Holywood House, county Down, and have since obtained a very few specimens in different parts of this county, and of Antrim. Among *Pisidia* collected at Youngrove near Middleton (county Cork), by Miss M. Ball; at Killereran (county Galway) and Portarlinton, by the Rev. B. J. Clarke; and in the neighbourhood of Dublin by T. W. Warren, Esq., is the *P. cinereum*.

Fam. 2. UNIONIDÆ, Gray, Man.

Gen. 1. ANODON, Oken.

- A. cygneus*, Turton, Man. p. 17. f. 8 ; Gray, Man. p. 289. pl. 1. f. 8.

Anodonta cygnea and *A. anatina*, Drap. p. 133, 134. pl. 12. f. 1, 2.

Mytilus cygneus, Mont. p. 170.

The *Anodon* is known to me as found in suitable localities all over the island, except in the extreme south. The *Anodonta intermedia*, Pfeiffer, l. 113. t. 6. f. 3, I have obtained in the rejectamenta of the Lagan Canal near Belfast. Specimens from the Grand Canal near Dublin, favoured me by Mr. R. Ball, are the *A. cygnea*, Pfeiffer, l. 111. t. 6. f. 4; and Rossmassler, fig. 342; and in Mr. Hyndman's collection is a very fine specimen $3\frac{1}{4}$ inches long and $6\frac{3}{4}$ broad from

the Moyntags, county Armagh. From the Grand Canal also and the river Shannon I possess specimens of the *A. anatina*, Pfeiffer, 1. 112. t. 6. f. 2; and from this last locality likewise I have the *A. cellensis*, Pfeiffer, 1. 110. t. 6. f. 1, and Rossmassler, fig. 280.—of this last I have had the advantage of a comparison with English specimens kindly sent me by Mr. Alder, and named "*A. cellensis*, Pf." From the *Anodon*, varying so much, not only according to locality, but in the same waters, I cannot coincide with the authors who make so many species. The four forms here noticed, I venture with Mr. Gray to consider but one species—of the Irish specimens which I have critically compared, none exactly agree with the *A. ventricosa* or *A. ponderosa* of Pfeiffer. W. R. Wilde, Esq. of Dublin, informs me that *Anodons* are thrown up in quantities on the shores of Lough Schur, county Leitrim, where they are eaten by the peasantry—*Sliggaun* is the common name applied to the *Anodon* in the north of Ireland †.

Gen. 2. ALASMODON, Say.

A. margaritiferus, Gray, Man. p. 293. pl. 2. f. 9.

Unio margaritiferus, Turt. Man. p. 19. f. 9.

Unio margaritifera, Drap. p. 132. pl. 10. f. 17—19. and pl. 11. f. 5.

Mya margaritifera, Mont. p. 33.

This has for a long period been on record as an Irish shell; from papers published on the subject in the Philosophical Transactions, &c., Pennant drew the information which appears in his 'British Zoology.' It is indigenous to several of the northern counties, and to the south. By Capt. Brown it is noticed as found "in the river Slaney, Enniscorthy," p. 505. In the cabinet of Mr. Hyndman of Belfast, are specimens from the river Bann and from the county of Donegal. This species inhabits some of the tributary streams of Lough Neagh, and is plentiful in the neighbourhood of Omagh, county Tyrone, where I have been informed it was taken in such quantity in 1839, that the prisoners in the jail were employed in breaking the shells for manure. Mr. Humphreys of Cork, notes it as abundant at Inchigeela, and as inhabiting the small rivers which run through Blarney and Glanmire (county Cork)—at Curraghmore

† The following note on the species of *Anodon* and *Unio*, which in the course of a forenoon in July, 1836, I obtained alive in the river Avon near Leamington, Warwickshire, may not be out of place here.

Anodon. A fine series of specimens, from nine lines in length to full size, does not agree exactly with any species as represented by Pfeiffer (3 Parts) or Rossmassler (10 Parts)—according to the views of these authors they would constitute two or three species. They do not correspond with any of my Irish specimens.

Unio pictorum, identical with specimens from the neighbourhood of London, presented by Mr. Alder.

"*Unio tumidus*, Pfeiffer," agreeing with shells from Belgium, so named, which I owe to the kindness of M. Michaud.

"*Unio rostrata*, Lam. Mich.," according to examples from the north of France, sent me under this name with the last. The number of species (so called) in the genus *Unio* is surely, like that in *Anodon*, quite too great.

(county Waterford), it is stated by Mr. R. Ball to be found¹. The form to which M. Michaud has applied the name of *Unio Roissyi* is common to several localities in Ireland.

The following Catalogue at the same time exhibits the number of British species which Ireland possesses, and according to the present state of our information, those likewise in which the country is deficient. In the Table, the columns headed "elsewhere in north," &c. are used only with reference to species *not* enumerated in the preceding column or columns, and to show that geographical position is not the cause of absence; thus, for instance, *Helix virgata* is not found about Belfast, but occurs in the north of the county of Antrim. The genera *Arion* and *Limax* were altogether omitted in most of the Catalogues supplied me. The Catalogue for Belfast² is on my own authority: Dublin, various; Limerick and Miltown Malbay, William Henry Harvey, Esq.; Cork, Mr. John Humphreys (1834) and the Rev. Thomas Hincks (1840)—the species added by the latter gentleman are marked thus †; Youghal (county Cork), Miss Mary Ball; La Bergerie near Portarlington (Queen's county), Rev. Benjamin J. Clarke; Finnoe near Burrisakane (Tipperary), Edward Waller, Esq.³

BRITISH ISLANDS.		IRELAND.	North.		East.	West.			South.		Central?			
			Belfast.	Elsewhere in North.	Dublin.	Elsewhere in East.	Limerick.	Miltown Malbay.	Elsewhere in West.	Cork.	Youghal.	Elsewhere in South.	La Bergerie.	Finnoe.
1	<i>Neritina fluviatilis</i>	1	...	...	*	...	*	...	...	*†	...	...	...	*
2	<i>Assimineea Grayana</i>													
3	<i>Paludina vivipara</i>	2	...	*										
4	— <i>achatina</i>													
5	— <i>tentaculata</i> (P. <i>impura</i>)	3	*	...	*	...	*	...	...	*†	*	...	*	*
6	— <i>ventricosa</i>													
7	<i>Valvata piscinalis</i>	4	*	...	*	...	*	...	...	*	...	...	*	*
8	— <i>cristata</i> (V. <i>spirorbis</i>)	5	*	...	*	...	*	...	...	*†	...	...	*	*
9	<i>Arion ater</i>	6	*	...	*	...	*	...	...	*	...	...	*	*
10	— <i>hortensis</i>	7	*	...	*	...	*	...	...	*	...	...	*	*
11	<i>Limax maximus</i>	8	*	...	*	...	*	...	...	*	...	...	*	*
12	— <i>flavus</i> (L. <i>variegatus</i>)	9	*	...	*	...	*	...	...	*	...	...	*	*
13	— <i>carinatus</i>	10	...	...	...	...	...	...	*	...	...	...	*	*
14	— <i>agrestis</i>	11	*	...	*	...	...	...	*	...	...	...	*	*
15	— <i>brunneus</i>													

¹ *Unio pictorum* is noticed by Dr. Turton, in his 'Catalogue of Irish Shells,' as found in "rivers about Cork." The species is not known as native to my correspondents in the south, and I am disposed to believe was erroneously inserted in the catalogue.

² All the species marked with an asterisk in the column headed "Belfast" have been obtained within four miles of the town.

³ The prevailing geological features of the neighbourhood of Belfast are trap, chalk, greensand formation, variegated marl formation and grauwacke; of Dublin, mountain and calp limestone, granite and quartz-rock; of Limerick, Cork, and Youghal, "limestone and old red sandstone" (Griffith); of Miltown Malbay, "coal-shale and sandstone" (Griffith); of La Bergerie and Finnoe, mountain limestone.

BRITISH ISLANDS.		IRELAND.	North.		East.		West.			South.		Central ?	
			Belfast.	Elsewhere in North.	Dublin.	Elsewhere in East.	Limerick.	Miltown Malbay.	Elsewhere in West.	Cork.	Youghal.	Elsewhere in South.	La Bergerie.	Finnoc.
72	<i>Vertigo alpestris</i>												
73	— <i>substriata</i>	55	*	..	*	..	*	..	..	..	..	..	..
74	— <i>palustris</i>	56	*	..	..	..	..	..	..	..	..	..	..
75	— <i>pusilla</i>	57	*	..	..	..	..	..	..	..	..	..	..
76	— <i>angustior</i>	58	..	..	..	..	..	..	..	..	..	..	..
77	<i>Balæa perversa</i>	59	..	..	*	..	..	..	*	..	..	..	..
78	<i>Clausilia bidens</i>	60	..	*	..	..	*	..	..	*	..	..	..
79	— <i>biplicata</i>												
80	— <i>Rolphii</i>												
81	— <i>dubia</i>												
82	— <i>nigricans</i>	61	*	..	..	..	..	..	..	..	..	..	..
83	<i>Carychium minimum</i>	62	*	..	*	..	*	..	..	*	..	..	..
84	<i>Acme fusca</i>	63	*	..	..	..	..	..	..	..	..	..	..
85	<i>Limnæus auricularius</i>	64	..	..	*	..	*	..	*	..	..	..	..
86	— <i>pereger</i>	65	..	..	*	..	*	..	*	..	..	..	..
87	— <i>stagnalis</i>	66	*	..	*	..	*	..	*	..	..	..	..
88	— <i>palustris</i>	67	*	..	*	..	*	..	*	..	..	..	..
89	— <i>truncatulus</i>	68	*	..	*	..	*	..	*	..	..	..	..
90	— <i>glaber</i>	69	..	..	..	..	..	..	..	..	..	..	..
91	— <i>involutus</i>	70	..	..	..	..	..	..	..	..	..	..	..
92	<i>Amphipeplea glutinosa</i>												
93	<i>Ancylus fluviatilis</i>	71	*	..	*	..	*	..	..	*	..	..	..
94	— <i>lacustris</i>	72	*	..	*	..	*	..	..	*	..	..	..
95	<i>Physa fontinalis</i>	73	*	..	*	..	*	..	..	*	..	..	..
96	— <i>hypnorum</i>	74	*	..	*	..	*	..	..	*	..	..	..
97	<i>Planorbis corneus</i>	75	..	..	..	..	..	..	..	..	..	..	..
98	— <i>albus</i>	76	..	..	*	..	..	..	..	..	..	..	..
99	— <i>lævis</i>	77	*	..	..	..	*	..	..	..	..	..	..
100	— <i>imbricatus</i>	78	*	..	*	..	*	..	..	..	..	..	..
101	— <i>carinatus</i>	79	..	*	..	..	..	..	*	..	..	..	..
102	— <i>umbilicatus</i> (<i>P. marginatus</i> , Drap.) ..	80	*	..	*	..	*	..	..	*	..	..	..
103	— <i>vortex</i>	81	..	..	..	..	..	..	..	..	..	..	..
104	— <i>spirorbis</i> ¹	82	*	..	*	..	*	..	..	*	..	..	..
105	— <i>nitidus</i>	83	*	..	*	..	*	..	..	*	..	..	..
106	— <i>contortus</i>	84	*	..	*	..	*	..	..	*	..	..	..
107	<i>Segmentina lineata</i>												
108	<i>Cyclostoma elegans</i>	85?	..	..	*	..	..	..	..	*	..	..	..
109	<i>Cyclas rivicola</i>												
110	— <i>cornea</i>	86	*	..	*	..	*	..	..	*	..	..	..
111	— <i>calyculata</i>	87	..	..	*	..	*	..	..	..	..	..	..
112	<i>Pisidium obtusale</i>	88	..	..	..	..	..	..	..	..	..	..	..
113	— <i>nitidum</i>	89	*	..	..	..	..	..	..	..	..	..	..
114	— <i>pusillum</i>	90	..	..	*	..	..	..	..	..	..	..	..
115	— <i>pulchellum</i>	91	*	..	*	..	*	..	..	*	..	..	..
116	— <i>Henslowianum</i>	92	..	..	..	..	..	..	..	..	..	..	..
117	— <i>amicum</i>	93	*	..	..	..	..	..	..	..	..	..	..
118	— <i>cinereum</i>	94	..	..	*	..	*	..	..	..	..	..	..
119	<i>Anodon cygneus</i>	95	*	..	*	..	*	..	..	*	..	..	..
120	<i>Alasmodon elongatus</i>	96	..	*	..	..	..	..	*	..	..	..	..
121	<i>Unio pictorum</i>												
122	— <i>tumidus</i>												
123	— <i>ovalis</i>												
124	— <i>Batavus</i>												

¹ For reasons stated in the text, p. 124, (No. XXV.) *P. vortex* and *P. spirorbis* are not marked separately in the catalogue.

Those acquainted with Mr. Gray's catalogue, will perceive that four of the species it contains are omitted,—the three *Conovuli* and *Dreissena polymorpha*, which is an introduced and not an indigenous species. Of the twenty-eight species which Great Britain and her islands would thus seem to possess over Ireland, it must be stated that Turton has enumerated four as Irish, viz. *Helix lapicida*, *H. Cantiana*, *Limneus glutinosus*, and *Unio pictorum*; but as he sometimes introduced species without sufficient reason, and as these are unknown to my correspondents and to myself, they are omitted—if correctly placed in our fauna by that author they will in all probability yet be found. *Paludina achatina* is included by Mr. Gray (Man. p. 34), but on what authority he could not recollect when I lately saw him at the British Museum. I have been told of the occurrence of a few species, which, in the absence of sufficient proof, are not included in the catalogue. Two of the *Helices*,—*H. aperta* and *H. revelata*,—have been introduced to the British list from Guernsey.

It appears from the foregoing catalogue, that four generic forms indigenous to England have not been found in Ireland, *Assimineæ*, *Azeca*, *Segmentina*, and *Unio*; these comprise seven species, if four *Unios* be admitted as distinct.

It may be desirable to dwell for a moment on the distribution of those species in Great Britain which have not been found in Ireland. Of these, *Assimineæ Grayana* is confined to the south-east of England, and is "seldom found out of the reach of brackish water." *Paludina achatina* and *P. ventricosa* are not generally distributed in England, and are unknown in Scotland*. *Limax brunneus* has been observed only at Newcastle and Berwick. *Helix aperta* (*H. naticoides*, Drap.) and *H. revelata* have not been found in Great Britain, but only in the island of Guernsey. *H. obvoluta* would seem to be confined to Hampshire, as *H. limbata* is to one quarter of the neighbourhood of London. *H. Pomatia* is found chiefly in the chalk districts of the south of England. *H. Cantiana* now occurs from the south to Newcastle-upon-Tyne, but is believed to have been introduced to this northern locality with ballast. *H. Carthusiana* (*H. Carthusianella*, Drap.), is confined to the south-east; *H. lapicida* prevails in the south, and along the eastern portion of England—not one of the above *Helices* is found in Scotland. *Succinea oblonga* has been obtained only in three localities, North Devon, and in the neighbourhood of Swansea and Glasgow. *Bulinus Lackamensis* is a south of England species—to Scotland it is unknown. *Azeca tridens* is widely distributed over England, and is also indigenous to the south of Scotland. *Pupa Juniperi* would appear to be chiefly confined to the south of England and South Wales. *Vertigo cylindrica* is very rare, and has been found but in three British localities—the neighbourhood of Bristol, of Edinburgh, and in the isle of Skye. *Vertigo alpestris* has been procured only in two stations—in Lanca-

* A manuscript catalogue of the land and freshwater mollusca of Scotland, favoured me by my friend Edward Forbes, Esq. is my authority.

shire and Northumberland. *Clausilia biplicata* is confined to the south of England; *C. Rolphii* to one or two localities in the south-east; *C. dubia* is, I believe, as yet known only to the north of England. *Limneus glutinosus*, *Cyclostoma elegans*, and *Cyclas rivicola*, are somewhat widely diffused in England, but are unknown to Scotland. *Segmentina lineata* is noticed by Mr. Gray as a south of England species, but is included in Mr. Forbes's list of Scottish mollusca. The genus *Unio*, as now restricted, becomes rare towards the north of England, and is not found in Scotland. The species of land and freshwater mollusca indigenous to Ireland, assimilate with those of Scotland much more nearly than those of England. About one-half of the species in which Ireland is deficient prevail chiefly in the portion of England which lies to the south of Ireland.

I should, perhaps, in conclusion, have ventured to offer some remarks on the causes which appear to influence the distribution of our Irish species, but the views put forward in my friend Mr. Forbes's excellent 'Report of the Distribution of Pulmoniferous Mollusca in the British Isles,' published in the volume for 1839 of the Report of the British Association for the Advancement of Science, renders unnecessary anything I could say upon the subject.

APPENDIX.

My notice of the genera *Arion* and *Limax* at the beginning of this article is so scanty, that I here avail myself of very full and interesting observations on the species appertaining to them, since favoured me by Mr. Clarke, who much more than any one in this country has bestowed attention on the subject.

Arion ater.

A. Empiricorum, Férus., t. 2.

La Bergerie, Queen's county; county Galway. Too abundant in both places, varying from the light yellow-coloured variety through all the shades of brown or ochre to deep black. The brown variety seems to predominate in Killereran (county Galway) meadows and woods, but I have repeatedly observed the two colours indiscriminately mixed together in precisely the same localities, both in fields and gardens. The yellow, which I have never taken of the full size, is mostly confined to the decaying pieces of wood found among damp moss. I have not noticed the variety with the scarlet foot, as in fig. 2. t. 2. Fér. I have seen two individuals busily engaged devouring a snail (*H. aspersa*), both their heads being introduced within the shell; the snail appeared to be fresh killed.

Arion hortensis.

A. des Jardin, Férus., t. 2. f. 4—6.

Var. *a.* f. 6. Fér.

Var. *β.* Pfeiffer.

La Bergerie and county Galway. By no means scarce. Férussac's figures agree accurately with mine, but are represented of larger dimensions than any I have seen. I have taken the young of a very minute size with the orange foot, and the colours equally as

deep as in adult individuals. Var. *a. f. 6.* Férus., is not more abundant here than the orange-footed one, which I have never succeeded in finding at Killereran, where the variety is common in violet beds. The following from Férussac agrees curiously with my habitat: "Elle se cache le jour sous les tiges de violettes de fraisiers et des autres plantes touffues." Mr. Alder remarks of the variety, "The variety only, if such it be, has yet been noticed in this country." I have never discovered even the rudiment of a shell in any of them.

N.B. I have before me at present an *Arion*, found along with *A. hortensis*, var. *β.* Pfeiff. The only character it possesses in common with it, is in the position of a yellow-coloured fascia running round the body, which is of a dusky brown, the sides greenish-yellow, the fascia becoming indistinct on the shield. It differs materially in colour from any variety of the *A. ater* I have met with; and what might characterize it as belonging to this species, is the shape and colour of the tentacles and head, the former being much more elongated than in *A. hortensis*, and of a shining black colour. The edge or side of the foot is likewise similar to *A. ater*, being greenish-yellow, marked with the peculiar transverse black lines. Its mucus is yellow-coloured, whereas that of *A. ater* is whitish, or colourless. Since writing the above, I have obtained a second specimen, similar in every respect to the former, except the fascia, which is not so distinct.

Limax maximus.

L. antiquorum, Férus., t. 4.

La Bergerie. Killereran and Monivea, county Galway. I have taken in each locality mentioned, one of the three varieties of Férussac, t. 4. Fig. 1. var. *β.* (var. *a.* Drap.), among violets, Killereran; his figure is good, "sans tache distinctes," &c. Fig. 7. var. *ν.* Férus., is the La B. variety. Fig. 8. var. *ζ.* Férus., closely resembles specimens taken in Monivea churchyard, beautifully and distinctly spotted, the ground colour not so light as in Férussac's figure*.

Limax agrestis.

Limax agreste, Férus., t. 5. f. 7—8.

L. filans, Young, var. *ν.* Fér.

Queen's county, and county Galway. Common, of all shades and degrees of colour and markings, from the pale yellowish-white of *L. filans* to the darkest variety of reddish-brown. *L. filans* is equally abundant. Yesterday, July 21st, I had the gratification of seeing them repeatedly let themselves drop down to the table from the lid

* I have recently met with a very remarkable variety of this species in the Spire hill, Queen's county, and which I do not find described; it is as follows:—The entire animal of a deep shining black, with the exception of the keel and central band of the foot, which are white. A casual glance at this variety would scarcely suffice to recognise it; but the shape of the animal, the shell, and the keel, at once determine it as *L. maximus*. In one individual there were a few indistinct blotches of a lighter colour on the sides.

of a tin box, where, for the purpose of taking some drawings of the different varieties, they were held. A similar feat was performed by the full-grown and dark varieties, which were on the same box with *L. filans*, but they did not appear to possess the same facility, and were more reluctant in resorting to this expedient for escaping from the confined space on which they were placed. Turton, in his description of the shell of this species, makes no mention of the membranaceous margin. I have now eight specimens before me, taken from the animals this morning; the following is an attempt at their description: shell rather variable, in shape usually oblong oval, somewhat larger than those found in *L. Sowerbii*, but much thinner, and without the same abrupt thickening in the centre, with a membranaceous edge, all of them concave, as much so in proportion to size as in *L. parma*.

I have not been able to recognise the *Limax brunneus* of Drap., in either county, or elsewhere.

Limax variegatus ?

L. flavescens, var. ν . Fér., t. 5. f. 3. ?

La Bergerie; Monivea; county Galway. Common on beech and other trees in moist woods; they somewhat resemble in colour var. ν . f. 3. *L. flavescens*, Férus. All the Queen's county and Galway specimens have the yellowish dorsal streak, both in young and adults. I have not as yet found it in such a locality as is ascribed to it by Férussac: he observes, "Elle infeste les caves où elle se tient ordinairement contre les murailles." I have never taken it elsewhere than on the trunks of trees (particularly beech), in the crevices and under the moss. The remarkable transparency of this species does not appear to be noticed as a specific character. After rain, I have seen them in numbers gliding down the smooth bark of the beech from feeding on the higher foliage, their bodies appearing between the light like pellucid jelly, through which their internal organization can be indistinctly traced.

While these notes on the *Limacidae* were passing through the press, I felt desirous of consulting M. Bouchard's memoir; and no sooner was this communicated to Mr. Gray (by Mr. Thompson), than he with great kindness forwarded his copy of it to Ireland for that purpose. I suspected that the *Limax*, here doubtfully introduced as "*L. flavescens*, var. ν . Fér.," might perhaps be referred to *L. arborum*, on account of its possessing certain characters and habits differing from what is contained in any description of *L. variegatus* and its varieties. I consequently have compared my specimens carefully with M. Bouchard's description of *L. arborum*, and was much gratified to find a perfect agreement in the specific distinctions, as well as in the peculiar habits of the animal. This *Limax* is so well marked as to leave no doubt on my mind of its identity with that species. I have recently obtained unquestionable specimens of *L. variegatus* in La Bergerie garden, which are referable to "*L. variegatus*, Fér., var. α . t. 5. f. 1. Luteus aut succineus." They are precisely similar to specimens taken by R. Ball, Esq., in a garden at Youghal, and now in his collection. In spirits the yellow colour disappears.

Limax carinatus.

Limax Sowerbii, Férus. ?

La Bergerie; Monivea; county Galway, under stones in fields, and in tufted plants in gardens. There is not any figure in Férussac to which I could refer the La B. varieties (if they are varieties). Nor does Mr. Gray's description agree well with them; the word "teselated" does not accurately describe the distribution of their colours. Their head and tentacles are never "black," but always gray, or blueish-gray. The usual colour is yellowish-brown, often approaching to dusky, sides pale, gray clouded with light yellow, head and tentacles blueish-gray.

Variety. Deep dusky or nearly black, sides pale gray, head and tentacles blueish-gray.

The young have the keel yellow-coloured, which in adults is generally the same colour as the back. The extreme dark colour of the variety led me at first to confound it with the *L. gagates* of Férus. He remarks of one of the varieties of *L. gagates*, "Elle est d'un gris bluatre ou nouratre. . . . plus pale lateralement." I have seen but a single individual in Monivea; it was identical with the variety.

The internal shells are a size smaller than those of *L. agrestis*; they have no membrane on the edge, are opaque, much thicker, and not concave; the peculiar thickening process in the centre gives them the appearance of having a marginal zone, or as if a smaller sized shell were placed on the top and centre of the larger, leaving a rather broad margin, which is usually of a rufous colour towards the top.

I find that this species is capable of forming a slimy thread in the same manner as *L. filans*. Having placed one on a laurel, I was surprised by seeing it forthwith make use of this means for conveying itself in safety to the ground. I have since succeeded in making other individuals act in a similar way. The spinning limaces may be easily forced to do so by leaving them on an evergreen or other tree which may not be congenial to their tastes, when they will speedily effect their escape in this manner.

[Mr. Clarke has favoured me with living specimens of this *Limax*, from La Bergerie, and judging from descriptions and figures, I should not hesitate to consider it *L. Sowerbii*. A species, similarly keeled from the shield to the tail, and of which a very few specimens were obtained near Clifden, Connemara, during a tour made to the west of Ireland, in July 1840, by Mr. R. Ball, Mr. E. Forbes, and myself, corresponds more nearly with the *L. gagates*, as described and figured by Draparnaud, than with the British descriptions of *L. Sowerbii*. They are from half an inch to an inch in length, the head, back and sides blackish, the foot pale gray; in one individual the dorsal keel was narrowly margined with yellow. They were all found under stones in wet places.—W. T.]

Note.—On looking over the Appendix to Mr. Gray's edition of Turton, I find he quotes M. Bouchard Chantreux, in observing, that "the young of *Arion ater* is dull brown, with yellowish sides."

The *Arion* described above may probably be only such; but the youngest specimens I have ever taken of *A. ater* (and I have obtained them very young), were entirely of a light yellow, or greenish-yellow colour, in one or two instances having very obscure and similarly placed dusky fasciæ on the shield only. M. Bouchard supposes the *L. filans* of Hoy to be the young of his *L. arboreus*; from my experience, I feel assured of its being the young of *L. agrestis*, as I have almost always found it under stones, generally accompanying the full-grown *L. agrestis*, and very rarely "on trees."

BENJAMIN J. CLARKE.

La Bergerie, Aug. 5, 1840.

Additional localities may here be given for the following species: *Helix lamellata* (*H. Scarburgensis*). Wood near the bridge of Errif, county Mayo, between Westport and Killery harbour.—W. T.

Helix radiatula. With last.

Helix lucida, Drap. Near Clifden, Connemara.—W. T.

Helix virgata.

When the first part of the paper was printed, I was unable to give a western locality for this species, but specimens collected within a few miles of Roundstone, on the coast of Galway, have since been sent me by Mr. William McCalla, of that place.

Helix hybrida.

The examples of this *Helix*, before alluded to in the present paper (p. 22), differed only from the ordinary *H. nemoralis* in having the lip of a rose colour or brown, and in its being margined with a white line. By R. Leyland, Esq., of Halifax (Yorkshire), I have lately been favoured with a number of specimens of *H. hybrida*, which bear much the same relation to *H. hortensis* that the former do to *H. nemoralis*. They are all yellowish-brown, with the lip varying from a rose colour to white. Mr. Leyland remarks, in reference to them, "The situation in which this *Helix* is met with, is on the banks of the canal between Keighly and Bingley, and about two miles from each place. The extent to which it is confined is not more than thirty paces in length, beyond which only an occasional straggler could be met with, and even then at no great distance from the principal station. *H. hortensis* and *H. nemoralis* are both found in the same place as *H. hybrida*, but are common along the whole line of the canal so far as I have examined, while the last seems confined to the small space before-mentioned, and is there rather numerous. The vegetation of this spot consists of the common grasses, *Rubi*, a few of the most common *Umbelliferae* and nettles; upon the last of these a majority of the specimens were found."

In the south islands of Arran, situated near the entrance to Galway bay, the few following species were, in June, 1834, obtained by Mr. R. Ball and myself: *Helix nemoralis* (extremely large), *H. cellaria*, *H. crystallina*, *H. umbilicata*, *H. ericetorum* (one pure white), *H. hispida*, Mull.; *Clausilia nigricans* (*rugosa*), one of crystalline transparency, as were nearly all of *Pupa umbilicata*, which is here abundant.

XXV.—*On some Objections to the Theory of attributing the Natural Terraces on the Eildon Hills to the action of water.*
By J. E. BOWMAN, F.L.S. & F.G.S.

MY attention having been directed, during the late meeting of the British Association at Glasgow, to an account of a series of very interesting natural Terraces on the hills round Galashiels in Selkirkshire, in a late Number of Chambers's Edinburgh Journal*, I took the opportunity of returning through that district to ascertain, by personal inspection, how far they agreed with the description. As my time was limited, I did not attempt a detailed examination, and was unprovided with any instruments for verifying the relative heights and levels of the terraces, so circumstantially given in the above article. As that valuable publication is in every one's hands, I shall at once refer to the article in question, merely saying, that my own observations will be much better understood if the reader will previously consult it; that the number of the terraces is sixteen, and that they run along the sides of many of the hills round Galashiels, Melrose, Abbotsford, &c., in perfectly horizontal lines, and parallel to each other; and are, in the opinion of their discoverer, so many different ancient beaches or land-levels, at which the sea must successively have stood for long periods. The staple of the article is from Mr. Kemp's own notes; and I am satisfied, from the opinion I formed of his ability, geological knowledge, love of truth and unpretending diffidence, that full reliance may be placed upon what he has so carefully and perseveringly worked out. I regret that I could not altogether agree with his conclusions; and I offer the following observations with considerable diffidence, because I had only a single opportunity, and that a hurried one, of seeing a small part of the appearances he has so repeatedly and attentively studied. Having seen the Parallel Roads of Glen Roy some years ago, I was naturally led, from the description of these terraces, to expect something of the same appearance and character; though a moment's reflection would have convinced me, that had this been the case, they would long ago have attracted general notice, and could not have escaped the searching eye of Sir Walter Scott, from whose windows at Abbotsford, the Eildon hills, on which some of the clearest examples occur, form a prominent feature of the scenery †. The fact is, that neither when viewed

* No. 444, for 1st August, 1840.

† Not wishing to trust to my own recollections, I wrote to an old and talented friend, (J. F. M. Dovaston, Esq. M.A., West Felton, Shropshire,) whose intimate acquaintance with, and enthusiastic admiration of the

from a distant point, nor when standing upon or near them, do they anywhere exhibit to the eye the continuity, the parallelism, or the perfect horizontality, either of level or of surface, so strikingly displayed in those of Glen Roy. Indeed, they are for the most part so broken and interrupted, and the detached portions often so obviously deflected from the horizontal plane, notwithstanding a general parallelism, that it is difficult to conceive them to have been formed by water. I think that most geologists would pass through the district, and even walk over them, without being aware of anything peculiar, unless their attention were specially directed towards them. This obscurity naturally led me to a more close examination of the limited portions I had the opportunity of visiting; and as some of the appearances did not strike me as being the result of tidal action, I have thought that in the present state of our knowledge of them, the cause of truth might be advanced by directing the attention of geologists towards those points which seem to be still obscure, notwithstanding the conclusion at which we must arrive from the general coincidence of the levels across intervening valleys.

I first ascended the northern flank of the Eildon hills from the valley of the Tweed at Melrose, passing from the old red sandstone, which forms the general surface of the district, to the greywacke, and from it again to the red compact felspar, which has burst through both, and forms the greater portion

writings of Sir W. Scott, are surpassed by none, to ask if he could point out any passage showing that he was aware of the existence of these terraces. I quote a portion of his reply:—"I believe I can answer you with positive certainty, and, as you say, '*at once*,' (for my memory, as honest Parson Evans says, was always pretty '*sprag*,') that though he very frequently, up and down, makes particular and fond mention of the Eildon hills, and places about Melrose, I am very sure he never notices any particular geological formation in those mountains, or surely it would have struck me, especially when similar to the Parallel Roads of Glen Roy, which I viewed with such intense interest in your society. In the '*Monastery*' he gives a very minute and beautiful description, at some length, of a narrow valley above Melrose, there called Kennaquhair, down which a small river falls into the Tweed; but not one word of stone-ology, or any part of natural history, in which poets in general are miserably ignorant. From this censure, I must, however, except our matchless Shakspeare, and old father Chaucer," &c. &c.

Had Sir W. Scott been aware of these terraces, he would surely have interwoven some notice of them with the story of Mary Avenel. How much to be regretted that his fine spirit should have passed away in ignorance of the most interesting natural feature of a district he has so well immortalized! But "*non omnes omnia possumus*;" and to use his own nervous language in another place, "they have a' their different turns, and some can clink verses,—and some rin up hill and down dale, knapping the chucky stanes to pieces wi' hammers, like sae mony roadmakers run daft,—they say it is to see how the warld was made!"

of the whole group. The eastern hill is for the most part covered with sward to the summit; so is the lower half of the middle one, the upper portion being nearly all naked rock. On the ascent to the uneven plain, or shoulder that connects the eastern with the middle hill, above mid-height, I perceived two or three of the terraces* upon the face of a great spur that shoots out from the latter above the beautiful ruin of Melrose Abbey. They seemed to range at about equal distances from each other, and to be from 80 to 100 yards wide; the upper being about three-fourths of a mile long, and nearly of equal width throughout. As I successively reached the level of each, I found the surface to be covered with vegetation, and to be far too uneven to have been formed or modelled by water. On attaining the plain or connecting shoulder just alluded to (which I took to be No. 10 of Mr. Kemp's series), I found the same inequality of surface, and also an evident general slope, not outwards from the hill towards the valley, but at right angles to that direction, and from a horizontal line that would have formed the beach when the water stood at that level.

On ascending the eastern hill the terraces between it and the middle hill were so obscure and broken up, and the intermediate slopes so irregular, that I could not trace them for any distance, or even in some places satisfy myself that they existed at all. It appeared (admitting they had once been there) that portions of them had subsequently slipped down, dividing horizontally into two or three, and then had rested in irregular and slanting positions on the intermediate spaces. The average slope of the hill here was 30 to 35 degrees, and the average deviation of the surfaces of these detached portions from the horizontal line, about 5 degrees; but this deviation was sometimes in one direction and sometimes in another; so that supposing a person were to walk along them, he would sometimes ascend, and sometimes descend. The diameter of the surface was also uneven, generally sloping outwards, but in one place inwards, the width being various, mostly from ten to twenty yards. In no one spot is the surface horizontal; yet, at the same time, it is necessary to say that, viewing them as a whole, they seem too uniform and regular to be accidental slips of detritus from above, and at first sight appear more like the remains of rude earthen entrenchments than the effect of any great natural cause. It

* I adopt this word for the whole series, though some of them are more properly shelves, or slight projections; and are so obscure, that Mr. Kemp told me he only discovered one half of them by turning the spirit level to those places on the opposite hills where he expected to find them.

would not affect the general truth of the formation of terraces by tidal action, to find occasional and slight inequalities of level; even if originally horizontal, such inequalities might be easily produced in the process of upheaving; and the real ground of surprise is that they should retain the uniform and perfect parallelism they do, as those of Glen Roy. But the deflections and discrepancies I now speak of are relative to the general surface of the terraces, and to each other, on the detached portions where they occur; and therefore, admitting them to have been sea-beaches, they must be occasioned by slips from increase of gravity of the mass, when raised out of the water.

On reaching the summit of the hill, the terrace No. 1 seems best developed on the S.S.E. side, and is extended into an irregular shaped plateau, whose surface, though approaching to a rude horizontality, is far too rounded and uneven to have been formed by the action of water. In one place, where the terrace can scarcely be traced, and where the deficiency might be attributed to a subsequent slip, there is no apparent accumulation below; but, on the contrary, a hollow or depression in the surface. On looking downwards on the S.E. side of the hill, I could see no other terrace below it.

The upper terraces of the middle hill may be comprehended in the above general description; their surfaces have many elevations and depressions, and for the most part slope outwards from the mountain. On both the hills, all that I examined consist of the same material, viz. a mass of angular fragments of the red compact felspar rock from above, the only difference being, that on the eastern hill they are mixed with a stiff red clay and covered with vegetable sward, while the upper ones of the middle hill have no such covering. I looked carefully on both, wherever I had the opportunity, for rounded pebbles, gravel, sand, or other drift, but without seeing a vestige of either. In the sequel I shall again allude to this peculiarity.

Looking back upon the group of the Eildons from the road between Melrose and Abbotsford, and all the way to Gala-shiels, several of the terraces on their northern face, which rises above Melrose and the broad valley of the Tweed, may be seen stretching in true horizontal lines of considerable length, the minor inequalities of level being lost in the general effect. This is an important fact in favour of their origin from water. I looked in vain for similar appearances on the opposite or north bank of the Tweed, on Cowden Knows, and up the valley of the Leader, in all which places the hills are lower and smoother, and for the most part covered with

diluvium containing angular fragments of greywacke and trap rocks.

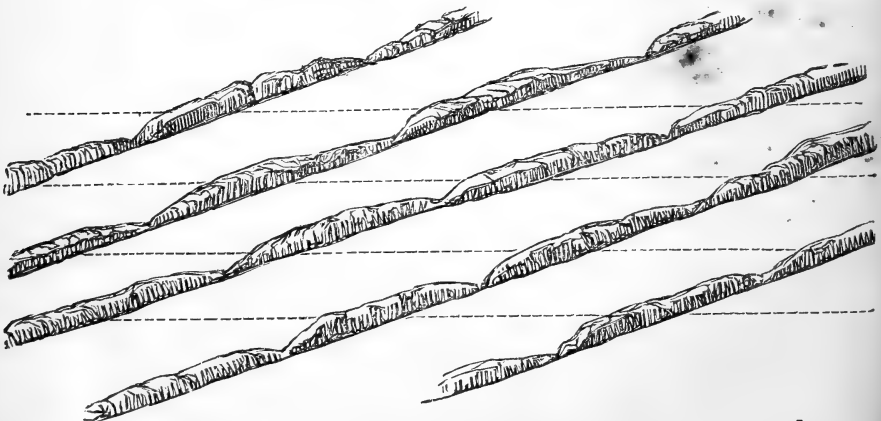
In the afternoon, Mr. Kemp kindly accompanied me on a hasty visit from Galashiels to Williamlaw. My time being limited and the evening advancing, he selected this hill as offering the best example of the terraces in the neighbourhood, for he had traced, more or less distinctly, detached portions of no less than eight of the whole series, between the summit and the base. Two or three of the lowest of these (7, 8, and 9 of his series,) are the broadest and most continuous, averaging 100, 120, and 130 feet wide respectively about the middle, where they appear to be swollen out, narrowing irregularly on each side till they are lost in the general slope of the hill. These occur on the south side of the hill, and front the valley of the Gala. On one of them the surface is raised in the middle or widest part, and declines each way towards the narrower extremities at an angle of 3 to 6 degrees, a vertical longitudinal section having this form:—



At first sight it appeared that both the greater width and the raised surface of the middle portion, might be caused by an accumulation of detritus from above; but on examination it was composed of the solid rock. On another, the central accumulation is so situated under a projecting rock, that it could not have found a lodgement there in falling from above; nor was there any trace of a furrow or ancient water-course which might have brought down diluvium, when this spot marked the level of the water. The natural slope of the hill in the neighbourhood of these lower terraces, forms an angle varying from 30 to 40 degrees.

A little to the westward of these, and higher up the hill, the series of inclined projecting ridges of hard greywacke rock, which are named in the article referred to as apparently contradictory, but are really confirmatory of the theory advanced, may be seen to greater advantage than either nearer the summit or the base. Regarding these, or rather the protuberances and intermediate indentations by which they are stated to be marked, as the *experimentum crucis* of the whole theory, I was anxious to satisfy myself of the coincidence of level between these points and the horizontal terraces; but after the best attention I was able to give, I regret to say, that whether from the unfavourable point from which I viewed them, with regard to perspective, or from the general ruggedness of the

outlines, and unaided by any instrument, my eye failed to recognize the points of intersection. The ridges themselves follow the slope of the hill to the west, and have an apparent dip of about six or eight degrees; but as the true dip of the beds composing them averages from 50 to 60 N.N.W., it is evident that their superficial outline has been determined by the slope of the hill, which intersects the beds diagonally and exposes their basset edges. In some parts they are very rugged and uneven, and project considerably above the general face of the hill; while the intervening spaces, which are so many sunken furrows, have a smooth covering of diluvium and sward, and an uniform and gradual slope corresponding with that of the ridges. As it is not easy by description alone to convey a correct idea of their combined form and character, I have constructed the following diagram of the appearance they should exhibit in perspective, according to the theory; but it shows them much more regular and uniform than they exist in nature, and marks the protuberances which Mr. Kemp says "range horizontally across them, and correspond in their respective levels with the terraces on the neighbouring hills." The shaded diagonal rows are the sloping ridges which rise out of the hollows, their curved tops showing the protuberances, and the dotted horizontal lines mark the supposed levels of the terraces; which, however, it must be remarked, do not appear here, but at corresponding heights in other places, and are only introduced to show the horizontal strike of the protuberances and intermediate indentations. This arrangement, as I have already observed, I failed to re-



cognize; and I must confess that both the protuberances and depressions appeared to me far too irregular and obscure to

support the opinion of their having been caused by the action of water, unless corroborated by being at corresponding levels with the terraces. I assume, however, on Mr. Kemp's authority, that such is the case. But as the terraces are believed to have been formed by tidal action, that cause, if it produced any effect at all upon the hard greywacke ridges, must have cut away those parts which appear as *indentations* (see the diagram), and which must therefore be considered as successively the actual lines of beach; whereas Mr. Kemp states, "that the *protuberances* correspond in their respective levels with the terraces on the neighbouring hills." Again, the broad inclined slopes between the elevated ridges, are covered with green sward, and form inclined planes with pretty uniform surfaces. Though I could nowhere cut through the sward to the rock below, I think it probable that these inclined hollows do "indicate the situation of softer intermediate beds which the action of the sea has washed away, leaving the harder beds comparatively bold and prominent*." But here another difficulty meets us: if the tidal action was sufficient to produce so marked an effect upon the projecting hard greywacke ridges, the softer intermediate beds must have been washed away to a much greater extent than they have been, and would have shown greater inequalities of surface; whereas they are generally smooth and uniform, and but a few feet below the ridges.

Again, wherever, either on the terraces or the intermediate slopes, fragments of the rock were exposed, they were angular and rough, with sharp edges, and did not show the least appearance of having been rounded or acted on by water. I could not find on Williamlaw, or on either of the Eildons, a single pebble, or gravel, or sand of any kind, indicative of the former presence of water. All were sharp angular pieces of the same rock as that of the hills respectively, to the exclusion of all foreign material. Now, if the water remained long enough at any single level to have left manifest and permanent indentations upon the hard ridges, it must have had ample time to convert the loose angular fragments which

* In a little quarry above the road, at the foot of these inclined hollows, the hard greywacke is divided in different directions by a system of joints, one set of which inclines from 6 to 8 degrees to W.S.W., coinciding with the dip and direction of the hollows. This made me think at first that their surfaces might have been modelled by these joints; but they are too uniform and continuous, and other appearances do not support this view. In another adjoining quarry the dip is 80 N.N.W., with a W.S.W. and E.N.E. strike, which nearly coincides with that of the inclined hollows. This can only be seen in one spot, where a few thin beds of soft shale intervene, the bulk of the rock being a coarse greywacke without bedding or cleavage, but with strong joints, and assuming here and there a rude columnar structure.

would be ground against each other by every tide, into smooth pebbles and shingle. Nor is it easy to conceive how terraces of 100 or 120 yards broad, as on the Eildons, formed of angular stones detached and precipitated from above, could have been made to assume by the action of water, even the irregular horizontality they do actually possess, when falling upon a slope having an angle of thirty or forty degrees; and this, without the stones showing any marks of attrition. On a gently inclined beach, where the tidal wave is ever and anon rolling such fragments over a considerable area, they would soon be converted into rounded pebbles; but on a steep rocky shore they would fall at once into deep water and assume the shape of a conical talus or "scree," where the tide would have comparatively little effect upon them. Their rough angular surfaces would lock into each other, and prevent them from being scattered over so broad a space as we see them on the Middle Eildon. It must also be borne in mind, in reference to the terraces on the eastern hill, which appear to have slipped down from their original situation, that the probability of their having done so is much weakened by their being composed of angular stones.

It struck me as singular, that all the terraces I examined, should be found on the sides of the respective hills most exposed to the strong currents that may be assumed to have been then in action; those on the north side of the Eildons, facing the great valley of the Tweed; those on Williamlaw, overhanging the more circuitous one of Gala water. Of course I conclude they do exist on the retired sides of some of the hills. One should have supposed, *à priori*, that the currents would have swept away the fragments of rock as they fell from above, and would have prevented them from accumulating into projecting shelves. Indeed, several of the best developed are *widest* precisely at the point where they project into the valley, and would come in contact with the current. I was also surprised to find no trace of terraces in other situations, apparently more favourable to their production. Immediately to the west of Williamlaw, and seen to advantage from its summit, is a wide and deep circular amphitheatre, formed by the smooth grassy sides of several neighbouring hills which environ it with very uniform slopes, except on the side that connects it with the valley of the Gala water. If the sea ever occupied the latter, it must also have filled this hollow, and converted it into a spacious, though sheltered and tranquil bay, round whose encircling sides, well-developed terraces might be expected to be found. Their total absence, therefore, from so favourable a locality, leaves room to inquire whether those which occur in more equi-

vocal situations do really indicate the lines of ancient beaches.

On the north or highest of the two points of Williamlaw, and near the summit, are two broad indistinct terraces, whose surfaces slope considerably towards the southern or lowest point, and also to the west. The crest between the two points is a succession of low eminences and intermediate furrows, which have no connexion with any of the terraces, but are formed of the basset edges of the harder beds. As the dip and strike of these correspond in the main with those of the slanting ridges below, and as they are separated by similar smooth grassy hollows, there can be no doubt but the cause assigned by Mr. Kemp for the latter, is the true one.

At the south foot of Williamlaw, on the opposite bank of the Gala, is a broad level grassy plain, formed of diluvium at the time the whole valley was under water, and subsequently cut through by the existing stream. It reminded me strongly of the true terraces near the head of Glen Roy.

Having now stated, as clearly as I can, the observations that occurred to me on a hasty view of these terraces, I have only to express a hope that more competent geologists may be induced to examine them in greater detail. Whether the theory proposed by Mr. Kemp be the true one or not, the merit of having first discovered, and then worked them out with such ability and perseverance, will ever be his own. No one will rejoice more than myself to see my objections answered, and a cause assigned that shall explain the difficulties and harmonize with all existing appearances. Nor is this all; the complete explanation of any set of natural phænomena, lessens the difficulty of comprehending others, still obscure, to which they are allied; and is another step in advance towards the future solution of the grand problem, the aggregate causes that have produced the existing state of things upon our globe.

J. E. BOWMAN.

Manchester, October 10, 1840.

BIBLIOGRAPHICAL NOTICES.

The Flora of Yorkshire. By Henry Baines, Sub-curator to the Yorkshire Philosophical Society. 8vo. pp. 160. London, Longman and Co.; Leyland and Son, Halifax.

We have here a very interesting work—the Flora of an important district, carefully investigated by an industrious and intelligent practical botanist, who has been enabled, by peculiar circumstances, to combine with his own the valuable labours of others to a very unusual extent. A preliminary essay, by Professor Phillips, on the Physical Geography of Yorkshire, in relation to the distribution of

plants, adds much to the value of the book. Mr. Baines's list of species, and of the stations of the rarer ones, is no doubt still imperfect; but its publication, such as it is, will be a great help to the cultivators of botany within the district, and not less important to those in other parts who want to know where the rarer species may be procured, or who study the geographical distribution of plants over the country, and the connexion of particular species with particular rocks, soils, or local circumstances.

On these points the information given is no doubt accurate; but conclusions drawn from the mere circumstance of species not having been noticed in particular districts are seldom to be relied upon until the statements have been some time before the public without being called in question. For example, *Rosa rubiginosa* is quoted by Professor Phillips in the introductory essay as confined in Yorkshire to the north-eastern or oolitic hills, but a supplement to the work returns it as occurring at Conisbro' in the south-western district, and we have ourselves found it truly wild within a few miles of York, in the great central vale. Speaking of this latter district, Professor Phillips remarks, "that receiving from numerous streams the detritus of the uplands lying east and west, the vale of York is full of plants which seem derived from these districts, as well as others more commonly found in lower ground. Its flora is consequently very rich, and plants supposed to characterize different soils grow here near together." It is, indeed, very striking to see in low moist fields over this plain plants usually stated to be peculiar to limestone or chalk, and to see them here attaining a magnitude and luxuriance, which they seldom approach in their more appropriate stations; but the soil will be found everywhere to abound with lime, so that the fact confirms the opinion (could it be supposed to need any confirmation) that certain plants require the presence of this substance for their healthful growth. *Campanula glomerata*, *Orchis ustulata*, which attains to remarkable size and beauty, and *Poterium Sanguisorba*, here growing abundantly in moist fields subject to frequent overflows, (though only mentioned by Mr. Baines as appearing on limestone rocks and the chalk wolds) are instances of proper limestone plants which abound in this district.

When Professor Phillips speaks in his essay of *Dryas octopetala* as peculiar to Yorkshire, he, of course, means in England, which should have been expressed, as most floras include plants of Scotland and Ireland, and the *Dryas* occurs in both countries. Even with respect to England, the statement is not strictly accurate, as Mr. Harriman found it in Durham.

Arabis hispida (*petraea* of DeCandolle) can only be said to be peculiar to Yorkshire, speaking of England, exclusively of Wales as well as Scotland, and *Juncus polycephalus* belongs to the highlands of Scotland. The presence of these plants shows that Yorkshire has a more alpine character than any other district of England, not even excepting the Cumberland and Westmoreland mountains.

Among the plants which attain their southern limit in Yorkshire is mentioned *Saxifraga umbrosa*. This plant, in fact, is hardly found in England, except in Yorkshire; but it is not a northern plant, the

Scotch stations, near Edinburgh and Glasgow, being suspected by Sir W. Hooker to be escapes from cultivation; whilst the species is exceedingly abundant in the west and south-west of Ireland in as mild a climate as any part of the British Islands affords.

Among the plants added on the authority of Mr. Gibson of Hebdensbridge, we observe *Stipa pennata*, the feather-grass, said to be found on Rumbald's Moor. We are not aware that this plant has been found wild in Britain, since its alleged discovery in Long Sleedale, Westmoreland, by Dr. Richardson, published by Dillenius; and as nobody has met with it since, though it is so remarkable and conspicuous, either in the station given or elsewhere (and we have ourselves, like many other botanists, searched Long Sleedale with great care expressly with this object in view), it has generally been concluded that Dr. Richardson fell into a mistake. The present discovery is very interesting, if liable to no doubt, but it requires to be supported by good evidence. Not inferior to this in interest is the addition of *Cinclidium Stygium*, a moss previously known as a native of the north of Europe and America, and very lately announced as British, which here, we believe, for the first time takes its place in a native flora.

Mr. Baines has arranged the plants according to the Natural Order, adding an alphabetical and a Linnæan index. The stations given of the rarer species are often very numerous, and with the assistance of Professor Phillips's admirable sketch of the physical geography of Yorkshire, will furnish interesting data to inquirers into the distribution of our flora. Remarks are often added respecting the insects that feed on particular plants.

On the whole, the volume, which is very neatly printed by Mr. Leyland of Halifax, himself well known as an intelligent and zealous naturalist, and furnished with two illustrative maps, will be found a useful and pleasing addition to the Botanical library, and does much credit to the worthy author, in whose diligence, accuracy, and fidelity all who know him will confide.

A Flora of Shropshire. By W. A. Leighton, Esq., B.A., &c. 1 vol. 8vo. 1840. Shrewsbury.

We look upon the appearance of this work (which is now completed by the publication of the 3rd part) as being a great step in advance in the progress of British indigenous botany; for although it is professedly confined to the description of the plants of a single county, yet as clearly showing the incorrectness of the idea "that a new Flora in the true sense of the term has become impossible," it is indispensable to every botanist who desires to obtain a thorough knowledge of our native plants. Since the publication of the 'English Flora' no work has appeared in which all the species are carefully and originally described; nor does any British book exist in which the descriptions are sufficiently detailed for the present wants of systematic botany; for in this latter respect, the celebrated work of Sir J. E. Smith is (from the date of its publication) necessarily deficient.

In the work before us, Mr. Leighton has accurately, and in most cases very fully, described the plants of his county; and from having used several of the continental Floras, in conjunction with that of Smith, he has in numerous cases introduced the description of parts which that excellent author has overlooked: we would particularly mention the seeds, a minute attention to which was not requisite when botanists almost entirely confined themselves to the elucidation of the Linnæan system alone, but which are now considered of great value in determining the natural affinities of plants, as well as in certain tribes affording excellent specific characters.

The book under our notice is arranged according to the Linnæan system, but care appears to have been taken that the generic and specific characters should be such as will serve for any classification. In some of the more difficult genera outline sketches are given of those parts from which the characters have been derived, and these, although deficient in artistical beauty, are deserving of the highest praise for clearness and accuracy of detail: they include a complete series of drawings for the *Cyperaceæ*, *Potamogeton*, *Valerianella*, *Rumex*, &c.

In looking through the volume, we observe that the account of the *Cyperaceæ* is so full as almost to constitute a monograph of the British species; *Viola* is very fully illustrated by new observations; *Chenopodium acutifolium* and *polyspermum* are proved to form only one species. In the genus *Rubus*, we have a series of very valuable observations from the pens of Nees ab Essenbeck, Borrer, and Lindley, causing the introduction of the names of several new forms (we will not venture to call them species) into the British lists; in the genus *Carex* valuable characters, illustrated by a complete series of figures, have been drawn from the form of the ripe nut; and as the author's observations are manifestly original, he is no doubt ignorant of (or perhaps been unable to obtain) the rare work of Schkuhr upon this genus, in which a similar, though to our mind, less satisfactory series of figures of nuts is given. The species of oak are illustrated by the valuable notes of Professors Graham and Don, three forms being distinguished; we must, however, confess, that our own opinion is against there being really more than one species in Britain, although three varieties maybe easily pointed out. We are acquainted with no permanent character by which the oaks can be specifically distinguished from each other; for although in their extreme forms they abundantly differ, yet the intermediate forms, both in shape of leaf and length of peduncle, do not appear to allow of any marked line of separation being drawn.

The following plants appear for the first time as English plants in the present work:—

Atriplex deltoidea, Bab.
Ballotta ruderalis, Fries.
Callitriche platycarpa, Kütz.
Cardamine sylvatica, Link.
Cerasus austera, Leight.
Dianthus plumarius, Linn.

Myriophyllum alterniflorum, DC.
Quercus intermedia, Don.
Scrophularia Ehrharti, Stev.
Senecio erraticus, Bert.
Spergula vulgaris, Bnng.

In conclusion, we must observe, that the specific characters are often far longer than is desirable; that in making alterations in the nomenclature, the author has in some cases not sufficiently pointed out the reasons which have induced him to adopt different names from those employed by Smith and Hooker; we must, however, add, that in most instances we are acquainted with causes fully authorizing the change. A more frequent reference to foreign authors would also have added much to the value of the book.

We must again express a hope that this work will soon be in the hands of all British botanists.

Tijdschrift voor Natuurlijke Geschiedenis en Physiologie; edited by Professors Van der Hoeven and de Vriese; Vol. VI., Part IV. Leyden, 1839.

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Bulla albocincta, N. Sp. described by Dr. Van der Hoeven; with a plate. The following is the Spec. Char. "B. testâ ovato-subglobosâ tenui, pallide brunneâ, spirâ, fasciis tribus et aperturâ albis; spirâ retusâ." From China*.—Contribution to the Natural History of Man: By Dr. Van der Hoeven.—Additional remarks upon the Negro race; two plates.—Botanical Communications: By Dr. J. F. Hoffmann, of Breslau.—On the Nerves of Sensation and the Connexion between the Nerves of Sensation and of Motion: By J. Van Deen.—Prodromus of the Fauna of Homer and Hesiod: By G. P. F. Groshans.—Remarks on a noxious Insect on *Pinus Larix*, in a letter from A. Brants.—Reviews and Literary Notices, and Translations.—On the Lepidosiren.—Notices of the following works:—TREVIRANUS, Beobachtungen aus der Zootomie und Physiologie. KRÖIJER's Natur-historisk Tidsskrift. HUECK, De Craniis Esthonomum. H. SCHLEGEL, Abbildungen neuer oder unvollständig bekannter Amphibien. Horticulteur universel. LEMAIRE, Flore des Serres et Jardins d'Angleterre. ENDLICHER, Grundzüge einer neuen Theorie der Pflanzenzeugung. LINK, Ausgewählte anatomisch-botanische Abbildungen. LINK, Icones Plantarum rariorum Horti Berolinensis.

PROCEEDINGS OF LEARNED SOCIETIES.

ZOOLOGICAL SOCIETY.

January 14, 1840.—William Yarrell, Esq., V.P., in the Chair.

Mr. Ogilby exhibited the skull of the Mangabay Monkey (*Cercopithecus Æthiops*, Auct.), and called the attention of the members present to the fact that this species, like the *C. fuliginosus*, differs from other Cercopithecids in possessing a fifth tubercle to the last molar of the lower jaw.

A variety of the common Hare (*Lepus timidus*, Auct.), shot in Sussex, and presented to the Society by Augustus E. Fuller, Esq.,

* [The *Bulla* here described is only a variety of *Bulla Velum*, which often has one, two, or three white bands.—J. E. GRAY.]

was exhibited: it differs chiefly in being of a smaller size, and in having the fur somewhat mottled with whitish and in parts rust colour.

Mr. Waterhouse exhibited a new species of Rodent from the river Gambia, constituting a most interesting link between the genera *Mus* and *Cricetus*: like the first of these genera, it has a long scaly tail, but it resembles the Hamsters in possessing large cheek-pouches. In the number of its molar teeth and the form of the skull it presents all the most common characters of the *Muridæ*, as defined by Mr. Waterhouse in the 'Magazine of Natural History*.'

The skull compared with that of the Common Rat (*Mus decumanus*, Auct.) differs chiefly in having the nasal portion more elongated: the anterior root of the zygoma, as in that animal, is in the form of a thin plate, but this plate is less extended in its antero-posterior direction, is directed obliquely outwards and upwards, and leaves a tolerably large and nearly round ant-orbital opening, thus differing from the Common Rat, in which the lower portion of this opening is in the form of a vertical slit: the zygomatic arch is less extended in the longitudinal direction, the incisive foramina are much smaller, and the auditory bullæ are rather smaller in proportion. The molar teeth are rooted; the foremost of these teeth in either jaw is the largest, and the posterior one the smallest: in the upper jaw, as in *Mus*, the molars present a central row of larger, and two lateral rows of smaller tubercles; and the molars of the lower jaw have two principal rows of tubercles; there are however some slight modifications in the structure of these teeth, which should be noticed. The front molar of the upper jaw has three central tubercles, three smaller ones on the outer side and two on the inner side, and besides these there is a small ninth tubercle on the posterior part of the tooth, which is not observed in the Black and Common Rats; the second molar has two small extra tubercles, one in front and one behind; the crown of this tooth therefore presents eight instead of six tubercles, as in *Mus* proper, and the last molar possesses one extra small tubercle, which is placed on the anterior and outer part of the tooth. The molars of the lower jaw very closely resemble those of *Mus decumanus*.

In the form of the lower jaw the present animal differs from that last mentioned, chiefly in the greater breadth of the descending ramus or angle, which is moreover somewhat raised, and so far approaches the Hamsters.

The name *Cricetomys* was proposed for this new subgenus, and that of *Gambianus* to distinguish the species, and to indicate the locality in which it was first discovered. The principal characters may be thus expressed:—

Subgenus ad genera *Cricetus* et *Mus* dicta affine, et inter hæc medium locum tenens. Criceto simile quoad saccos buccales, Muri simile quoad formam corporis et caudæ; hâc perlongâ et pilis brevibus vestitâ, inter quos squamæ in more annulorum positæ videntur. Pedes ut in Mure.

Dentes fere ut in Mure. Incisores compressi; molares radicati,

3—3
3—3

* Vol. iii. p. 275.

CRICETOMYS GAMBIANUS. *Cri. magnitudine corporis duplo, vel plus, majore quàm in Mure decumano: colore ferè eodem: auribus mediocribus, pilis minutis vestitis; caudâ corpus cum capite æquante; pedibus mediocrè parvis; vellere brevi, adpresso, et sub-rigido; colore cinerescenti-fusco; pedibus partibusque inferioribus sordidè albis; caudâ ad basin, pilis intensè fuscis, ad apicem, albis, obsitâ.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin	16	0
————— basin auris	2	9
————— tarsi digitorumque	2	6
————— auris	0	11
————— caudæ	15	0

The Gambia Pouched-Rat is about double the size of the common Rat (*Mus decumanus*); in its colouring and proportions it greatly resembles that animal; the fur is rather harsher, and more scanty; the general colour of the upper parts of the body is a trifle paler than in *Mus decumanus*. The head is tolerably long, and pointed; the ears are of moderate size and rounded form; the feet are of moderate size; the tail is nearly equal to the head and body in length, thick at the base, covered with small adpressed harsh hairs; but these are not sufficiently numerous to hide the scales; about one third of the tail at the base is of a deep brown colour, the hairs covering the remaining portion are pure white, and the skin itself has evidently been of a paler hue than on the basal part of the tail. The fur on the body is somewhat adpressed, and the hairs are glossy on the back; they are of an ashy-gray colour at the base; the apical half of each is brownish-yellow, but at the points many of them are brownish; many longer hairs intermixed with the ordinary fur of the back are almost entirely of a brownish-black colour. The whole of the under parts of the head and body and inner side of the limbs are white; the hairs on the belly are rather scanty, and of an uniform colour to the root: the fore feet are whitish, and the tarsi are white, but clouded with brown in the middle. The ears are but sparingly clothed with short hairs, which on the inner side are whitish, and on the outer brown.

January 14 and 28th, 1840.—William Yarrell, Esq., Vice-President, in the Chair.

Mr. Ogilby read his paper entitled ‘A Monograph of the Hollow-horned Ruminants,’ of which the following is an abstract:—

“In revising the history of the *Ruminantia*,” says Mr. Ogilby, “the zoologist who, like myself, has made a special study of these animals, must be forcibly struck with the confusion of synonyms, the carelessness and inaccuracy of description, the vague and indefinite limits of the generic and subgeneric groups, the trivial and confessedly empirical principles of classification, and, as a consequence, the great number of nominal species, and the general disorder which still prevail in this department of Mammalogy.” He proceeds to show that the views of the modern writers on this subject are no

more philosophical than those of their predecessors, and that as regards their generic distribution, the Ruminantia remain at present in very nearly the same state as that in which Ray left them a hundred and fifty years back.

The history of the classification of this group next comes under the consideration of the author, and the views of the various writers are given and commented upon, commencing with the publication of the 'Synopsis Methodica' of Ray, published in 1693. The genera *Ovinum*, *Bovinum*, and *Caprinum*, established by that author, Mr. Ogilby regards as strictly natural groups, but the characters by which they are distinguished, derived principally from the curvature of the horns, the existence of a beard or dewlap, the number of teats, and the woolly or hairy nature of the covering, he considers trivial, arbitrary, and uninfluential.

The 'Systema Naturæ' is next considered; and although arbitrary and empirical, the generic definitions of Linnæus (the author of the paper states,) possess all the logical correctness and simplicity which so peculiarly characterize the genius of that great man. Though neither natural nor scientific, his distribution was, at all events, exclusive and diagnostic, in reference to the small number of Ruminants then known. But whilst the zoology of the *Ruminantia* remained thus almost stationary in the hands of Linnæus, it was making rapid and brilliant progress under the auspices of his great rival and cotemporary, Buffon: even as early as the year 1764, two years before the publication of the 12th edition of the 'Systema Naturæ,' the French philosopher had described new forms, and indicated important relations among the hollow-horned Ruminants. The article 'Gazelles,' contained in the 12th volume of his great work, was the most important addition which had been made to the generic distribution of the Ruminants since the time of Ray, and must be considered as the first monograph of the genus two years afterwards founded upon it, and more formally proposed by Pallas under the name of *Antilope*.

The works of Pallas, Pennant, Allaman, Gmelin, Erxleben, Shaw, Illiger, Lichtenstein, De Blainville, and Col. Hamilton Smith, next pass under the notice of the author.

The consideration of the muzzle and lachrymal sinus was first introduced by Illiger, and his principles were quickly adopted, in successive monographs by Lichtenstein, De Blainville, and Hamilton Smith, to subdivide the Antelopes into something more nearly approaching natural groups than the old principles admitted. The publication of Illiger's 'Prodromus' may be considered therefore as an epoch in the history of these animals.

The monograph of Dr. Lichtenstein contains descriptions of twenty-nine species, and these are distributed into four groups, characterized by the presence or absence of horns in the females, and of lachrymal sinuses, the existence or non-existence of dewlap, and the comparative length of the tail. But the author was in many cases ignorant of the specific characters of the animals, and the composition of his groups is consequently faulty in proportion. The di-

visions, however, are exceedingly well imagined, and less encumbered with trivial characters than those of De Blainville and Hamilton Smith.

M. De Blainville, whose monograph of the genus *Antilope* was published in 1816, contented himself with separating from the main group successive detachments of what he conceives to be the most anomalous species, afterwards elaborating the characters of the sub-genera thus formed from those of their component species. By this means he has unquestionably succeeded in forming a few natural groups, to which no other objection can be made than that they are considered as subdivisions of a primary group which is not itself a natural genus.

To the eight genera established by De Blainville, Desmarest added three others, two of which, viz. the separation of the Antelopes proper from the Koodoo and Boshbok, and of the Oryxes, were decided improvements.

The principal merit of Col. Hamilton Smith's monograph, published in Griffith's translation of the 'Règne Animal,' consists in the resolution of the residual group of De Blainville and Desmarest, which he subdivides into eight minor groups, in all respects more definite and natural than the original.

The next section of the paper is devoted to the consideration of the characters hitherto employed in the generic distribution of these animals.

The genera *Bos*, *Ovis*, and *Capra*, represented by familiar and well-known types, observes Mr. Ogilby, carried with them clear and definite ideas, and represented to the mind of the naturalist distinct and determined forms; but the genus *Antilope* not being exemplified by any common domestic species familiar to the observation of the student, every thing connected with the genus was vague and indeterminate; the only conception it enabled him to form was, that the animal, whatever else it might be, was neither an ox, a sheep, nor a goat. The characters, moreover, upon which this genus is established, are in reality so many negative traits, and merely served to distinguish all other hollow-horned Ruminants from the oxen, sheep, and the goats respectively, but they limit no positive group, and consequently cannot be received as the definition of a natural genus. The genus *Antilope* in a short time became an asylum for the reception of all hollow-horned Ruminants that could not be associated with the known genera *Bos*, *Ovis*, and *Capra*; and consequently the most incongruous forms and opposite characters were associated in the same genus; till, independently of its unphilosophical structure, and total want of character whether natural or artificial, the practical inconvenience arising from its undue extension forced zoologists to devise the partial remedies detailed above, and which all proceeded upon one common principle, that, namely, of dividing the genus *Antilope* into such subordinate groups as were conceived best calculated to obviate the inconsistencies, and approximate those species which most nearly resembled one another in habit and conformation. In thus subdividing the genus *An-*

tilope it is assumed by every writer on the subject to be a natural group, even whilst they confess that it has not a single character either exclusively appropriate to it or even common to the generality of its component species: far, therefore, from being a natural, it is not even entitled to be considered an artificial group. The diagnosis proposed by M. Geoffroy St. Hilaire regarding the nature of the core of the horns, and that broached at a meeting of the Zoological Society by M. Agassiz, to the effect that these animals are distinguished from *Bos*, *Ovis*, and *Capra*, by having a spiral twist of the horns turning from left to right, instead of the opposite direction, are founded upon hasty generalizations, inapplicable to at least three-fourths of the species.

The form or curvature of the horns, the beard, the dewlap, the scopæ, the number of teats, and other such diagnoses hitherto employed to define the genera of Ruminants, according to the views of Mr. Ogilby, are purely trivial and accidental characters, which not only exercise no assignable influence on the habits or economy of the animals, but which may be modified to any extent, or even destroyed altogether, without in the slightest degree changing the generic relations.

Having demonstrated the imperfections of the actual distribution of hollow-horned Ruminants, Mr. Ogilby proceeds to the exposition of the principles which he proposes to make use of for that purpose, and to explain the nature and extent of his own researches. He insists upon the law of classification, that no generic characters should be admitted but such as are founded upon the necessary relations that subsist between the organic structure of animals and their habits and economy.

The next section of the monograph is devoted to the consideration of the horns of the *Ruminantia*. Under this head the author first treats of their substance; 2ndly, their permanent or deciduous character; 3rdly, their presence or absence in different genera and sexes; and 4thly, their number, forms, and flexures.

The distinctions between the horns of the stag tribe generally, and those of the hollow-horned Ruminants, are pointed out, and in the next place the various modifications observable in the horns and their core of the latter group. "In some cases the substance of this bony core is solid, or at least penetrated only by minute pores; in others, and they are by far the greater number, it is partially hollow, or filled with large cancelli, which communicate with the frontal sinuses. These variations are not confined to any particular groups, but are equally common to solid and hollow-horned genera. The giraffe, for instance, has very extensive cancelli; so likewise have the oxen, sheep, goats, and all the larger species hitherto classed among the antelopes: nor have I found the solid core, so much insisted on by MM. Cuvier and Geoffroy St. Hilaire, in any of these animals, except the *A. Cervicapra*, the *Dorcas*, and their allied species."

Speaking of the raised ridges and annuli on the horns, Mr. Ogilby states that the number of these added in a given time appears to be

very variable. "The common cow is generally supposed to acquire one ring on the horn every year after the third, but this is far from being a general law. Between the 20th of July and the 31st of October, 1833, the horns of a young Indian Antelope (*A. Cervicapra*), which I had marked for the purpose in the gardens of the Society, acquired an addition of no fewer than three rings, and an increase of length of a full inch and a half; and I have observed a similar phenomenon in other species."

The permanent or deciduous character of the horns is said to depend upon their hollowness or solidity; and the author, moreover, states that it is not correct to suppose that hollow horns are, strictly speaking, permanent; the hollow horn is shed, as well as the solid, but in a different sense. "Buffon has been much ridiculed for asserting this fact with regard to the domestic ox, but Buffon was a much better observer than his critics; and I have myself verified his observations on many other Ruminants. If the horns of any young animal be examined, it will be found that they are of a coarse, scabrous, spongy texture, very thick and blunt in proportion to their length, and hollow nearly to the point: let the same individual be examined when it arrives at maturity; the horns, especially towards the extremity, have a close, compact, and polished surface; they are much attenuated, end in a very fine point, and have the terminal third perfectly solid. These changes do not arise from the mere rubbing and polishing of the horn, as is commonly supposed. That hypothesis does not account for the difference of texture and solidity which distinguish the old and young horns; but the truth is that, as in the case of the second dentition, the permanent organ is developed under, or rather within the other, and by its growth gradually carries it upwards, and supports it like a sheath or scabbard. The young horn thus severed from the vessels which formerly supplied it with nutriment, dries up, bursts from the expansion of the permanent horn within it, and exfoliates in large irregular stripes, leaving the latter with the finely polished surface, and solid, sharp, attenuated points which distinguish them. As far as my observations enable me to judge, this exfoliation takes place only once during the life of the animal, and that at the period of adolescence, immediately before the appearance of the first annulus. Though it does not take place all at once, nor absolutely deprive the animal of horns for a certain period, it is nevertheless a true and actual shedding of these organs, and accounts satisfactorily for many phenomena which I found inexplicable before making these observations. The horns of the Oryxes, for instance, which in the adult state are remarkable for their straightness and extreme sharpness, have the points very blunt, and bent backwards, almost at a right angle, in the young animal; and the Koba, or Sing-Sing, whose permanent horns are partially lyrate, has the young organs nearly straight, as may be observed in the specimen now in the Society's museum. It is only necessary to observe further, that the young horn, which afterwards exfoliates, appears to be entirely the growth of the first year, though it generally remains a much longer time before being cast. A young *Leu-*

coryx in the museum at Frankfort, with horns eighteen or twenty inches long, has the points still blunt, exactly as in another specimen, where they are only two inches long." "Now this permanence or deciduousness of the horns—for in a general sense, and especially as contrasted with the solid organs of the deer kind, the hollow horn may be considered as permanent—is a constant and invariable character, which has a direct and powerful influence upon the habits and œconomy of the animals. The deer kind invariably affect particular localities at the period of casting and renewing their horns; their manners then undergo a complete change; from bold and daring, they become irresolute; they lose their flesh, abandon the open hills and upland plains for the thick cover of the forests, and foregoing their gregarious habits, desert their companions, and pass the period of weakness in solitude and seclusion. As soon, however, as the new horn acquires strength and solidity, the stag resumes his usual habits, and regains his former confidence. Hollow-horned Ruminants present no such phenomena; the habits and manners of the same species are similar at all seasons, and the differences which we observe in different species depend upon other causes, which shall be developed in the sequel. The modifications of organic structure which produce these different effects are too permanent and influential to be neglected among the characters of a natural classification of the Ruminants. Nor have they been overlooked by zoologists; it may be said, indeed, with truth, that they constitute the only really important characters hitherto employed to distinguish the genera of these animals."

The presence or absence of horns in species or sexes has been partially employed by naturalists for the distinction of genera; the importance of this character, however, in the opinion of the author, has not been duly appreciated. Its effects on the habits and œconomy of the species of Ruminants is pointed out. The gentleness and timidity of those species which have hornless females, their being either perfectly monogamous, or residing in small detached families, composed of a single adult male and variable number of females, and the circumstance of the males adhering throughout life to the same female, are all phenomena which are traceable to the defenceless condition of the females. These phenomena are contrasted with those exhibited by Ruminants, in which there are horns in both sexes; they are said to be extremely bold, to reside generally in large herds, and to have a community of sexual intercourse, and rarely attach themselves to particular individuals.

The number, form, and peculiar curvatures of the horns are next considered; and the author arrives at the conclusion, that all the various flexures of the horns, as well as their number, form, and direction, have no assignable relation to the habits and œconomy of animal life; they should not therefore be selected for generic diagnoses. On the other hand, the form of the upper lip, as well as its hairy or naked character, having a very decided influence on the habits and œconomy of ruminating animals, ought by no means to be neglected in the classification of this group. Other important characters may

be derived from the crumens and other glands, or certain pits or sinuses which open externally, especially in different parts of the head in ruminating animals. The most remarkable, as well as the most common of these are the suborbital, sometimes called the lachrymal sinuses, or tear-pits, but which Mr. Ogilby distinguishes by the name of *crumens*, a term applied to them by Dr. Flemming. These are situated at a short distance below the inner canthus of the eye, and received into a cavity of the lachrymal bone; at their bottom is a gland, opening into the crumen by a number of small apertures, and secreting a viscous substance, of the consistence of ear-wax. The various modifications of the form of these crumens in different Ruminants being pointed out in the paper, the author proceeds to the consideration of their functions and uses: he observed that the Gazelles and Antelopes in the Society's menagerie frequently protruded this crumen, and rubbed its inner surface against the rails of the compartments in which they were confined, seeming to take a pleasure in smelling and licking it afterwards. A male and female Gazelle, occupying contiguous compartments, were changed, and it was found that they immediately discovered the viscous deposit, and became restless and agitated; the male Gazelle was some days after made to change places with an Indian Antelope, but neither animal appeared to take the slightest notice, or to be aware of the presence of its predecessor. "This, to be sure," says Mr. Ogilby, "is but a single experiment, but it countenances the idea, highly probable in itself, that the deposit which the animals leave behind them by rubbing the crumens against the shrubs or stones of their desert and mountain habitats, (for it is only the inhabitants of such localities that are furnished with these organs, at least among the hollow-horned family,) may serve to direct them in their wanderings and migrations, when the storms and fogs incident to such places obscure all visible landmarks. But whatever it may be, the principles of sound philosophy and the great doctrine of design forbid us to entertain the notion that so remarkable an organ has been formed without some special and appropriate function in animal œconomy."

A superficial slit, situated in a depression of the maxillary bone, on either side, called by the author the maxillary sinus, is found in certain Ruminants hitherto classed among the Antelopes; its secretion is of a thin watery consistence, and thus differs from the secretion of the crumens. The situation of these glands, and their peculiar secretion, induces the author to regard them as distinct organs, and he doubts their coexistence with the crumens, though M. F. Cuvier and Colonel Smith have reported such sometimes to be the case.

The membranous sac which opens behind the ear of the *Chamois*, and the large gland which Mr. Hodgson describes in the nose of the *Chiru*, are of too partial occurrence to be made available in generic characters; there are, however, two large and deep sacs, situated one on each side of the udder, which are of pretty general occurrence, but their function does not appear to exercise sufficient influence over the animal œconomy to entitle them to be considered among the

generic characters. "The same observation may be applied to the odoriferous bags attached to the prepuce of the *Musk* and *Antelope gutturosa*; so that, upon the whole, the crumens, maxillary and facial glands, are the only organs of this nature which appear entitled to the rank of generic characters."

The modifications of the feet are considered as scarcely definite enough to be employed for generic definitions: "the glands or pores which open between the toes of many Ruminants afford much better characters for this purpose, and bear a very evident relation to the habits and geographical distribution of the animals. These glands are of greater or lesser extent in different genera, according to the nature of the localities which they frequent; in the *Gazelles*, *Antelopes*, *Bubals*, and *Oryxes*, which inhabit the burning deserts of Africa and central Asia, they are extremely large, and frequently occupy the whole interspace between the first and second phalanges; in the *Sheep*, *Capricorns*, and *Tragelaphs* again, which live on the open grassy downs and mountains of a less arid nature, they are of a much smaller size; whilst in the *Oxen*, *Calliopes*, &c., which inhabit the moist forests and swamps of tropical regions, or grassy meadows of temperate climates, they are altogether wanting.

After describing the uses of these digital pores, and pointing out the great influence they have on the œconomy and manners of the animals, the author observes that he is not aware of their having been noticed by any previous zoologists, and concludes by expressing the hope that the employment of this and other influential characters, which it is the object of this first part of his monograph to explain, will be found to establish a logical, scientific, and natural arrangement among the *Ruminantia*, instead of the prevailing arbitrary and artificial system.

LINNEAN SOCIETY.

April 7th.—Mr. Forster, V.P., in the Chair.

Dr. Farre, F.L.S., exhibited specimens of a singular form of gall on the leaves of a species of oak from Mexico. The gall consisted of an aggregation of hollow cylindrical tubes, nearly an inch in length, and furnished with a fringed orifice. The tubes were remarkable for their elegance and uniformity; their colour was white, suffused with red, especially towards the apex.

Mr. Yarrell, F.L.S., exhibited a specimen of a satin-like mass of *Conferva fluviatilis*, which grew in a water meadow near Totness. A spring, which flows only in winter, rises in the meadow, and this substance is taken from narrow gutters, from one of which, twelve inches wide, a piece was taken up which measured seventy-nine feet in length, so firm and tough was its consistence; and another piece broke off at thirty-nine feet. In consistence and appearance it bore considerable resemblance to a piece of cotton wadding, but of a firmer texture. A portion was carefully examined under the microscope, and found to consist entirely of an interwoven mass of filaments of *Conferva fluviatilis*. The plant was compared with the authentic

specimen of that species preserved in the Linnæan Herbarium, and was seen to differ only in the greater length of the articulations. The under surface of the mass was of a bright green colour, but the upper surface was white from the effects of direct exposure to the air and light, which had caused the death of the plant at that part.

Read, a continuation of Mr. Smith's "Arrangement of the Genera of Ferns."

April 21.—The Lord Bishop of Norwich, President, in the Chair.

Read, a paper by John Blackwall, Esq., F.L.S., entitled "The Difference in the Number of Eyes with which Spiders are provided, proposed as the Basis of their distribution into Tribes; with the characters of a new Family and three new Genera of Spiders."

Mr. Blackwall begins by stating his objections to the bases of arrangement adopted by MM. Walckenaer and Dufour in the subdivision of the order *Araneidea*, and proceeds to give his reasons for preferring a division founded on the number of eyes; in conformity with which he proposes three tribes, viz. 1. *Octonoculata*; 2. *Senoculina*; 3. *Binoculina*.

In the first tribe he proposes three new genera, two of them belonging to a family which he characterizes under the name of *Cinifloridæ*: these genera he also characterizes under the names of *Ciniflo*, founded on the *Clubiona atrox* of Latreille, and *Operaria*, comprising the *Theridion benignum*, Walck., *Drassus exiguus*, Blackw., and *Drassus viridissimus*, Walck. The third genus characterized by Mr. Blackwall, is referred by him to the family of *Agelenidæ*, under the name of *Cavator*: it is founded on the *Clubiona saxatilis*, Blackw.

May 5.—The Lord Bishop of Norwich, President, in the Chair.

Read, "Additional Observations on some Plants allied to the natural order Burmanniaceæ." By John Miers, Esq., F.L.S.

These observations have reference chiefly to the relative position of the parts of the flower in the tribe of plants above-mentioned. The author remarks, that the stamina, placentæ, and stigmata in these plants, are disposed in the same line, and opposite the inner series of the perianthium. The placentæ are always invariably double; and the stigmata in such cases as the present are to be regarded as being made up of the confluent margins of the two adjoining carpel-leaves, as suggested by Mr. Brown in his learned Memoir on *Cyrtandrea* lately published.

May 25.—The Lord Bishop of Norwich, President, in the Chair.

This day, the Anniversary of the birth-day of Linnæus, and that appointed in the Charter for the election of Council and Officers; the President opened the business of the meeting, and in stating the number of Members whom the Society had lost during the past year, gave the following notices of some of them:—

George, Duke of Marlborough, one of the Honorary Members, was distinguished for his botanical taste, and for his zeal in the cultivation of exotic plants; and the magnificent collection formed by him at White Knights was long one of the finest in this country, both in

regard to its extent, and the rarity and beauty of the specimens. His taste for Botany continued unabated to the last, and the collection established afterwards at Blenheim was chiefly cultivated under his own immediate superintendence.

John Bartlet, Esq.

John, Duke of Bedford, K.G.—This amiable and accomplished nobleman was a most munificent patron of the arts and sciences in general, and especially of Botany, in the cultivation of which he took great delight. We are indebted to him for several splendidly illustrated works, abounding in valuable practical remarks, on particular tribes of plants, of which he had formed extensive collections at his magnificent seat of Woburn Abbey.

William Beetham, Esq.

William Christy, Jun., Esq.—Few persons cultivated Botany and Entomology with more ardour than Mr. Christy, who, to the regret of his friends, and to the loss of science, was cut off at an early age. His zeal and success in the pursuit of science were only equalled by his readiness and liberality to impart to others a portion of the stores which he had collected. He had formed an extensive Herbarium of British and Foreign Plants, and for that purpose had made several extensive tours in the British Isles, and had also visited Madeira and Norway. His collection of dried plants, and books on Botany, he gave to the Botanical Society of Edinburgh, of which he was one of the institutors.

Lord Charles Spencer Churchill.

Richard Cotton, Esq.

Allan Cunningham, Esq.—This eminent botanist and traveller was born in the beginning of the year 1791, at Wimbledon, where his father (who was a native of Ayrshire) held the situation of gardener. His father took great pains with his education, and placed him, along with his younger brother, Richard, at an excellent academy at Putney, then conducted by the Rev. Mr. Adams. About the year 1808 both brothers were engaged in the office of the Royal Botanic Gardens at Kew, at the period when the second edition of the '*Hortus Kewensis*' was passing through the press. In the autumn of 1814, having been appointed a Botanical Collector for the Royal Gardens, he left England, in company with Mr. James Bowie (who had also received a similar appointment), for the Brazils, where they remained two years, and among many other plants transmitted by them, were *Gloxinia speciosa*, *Cereus speciosissimus*, *Jacaranda mimosifolia*, and *Calathea zebrina*, then new to the Gardens. The two companions now separated, Mr. Bowie having received instructions to proceed to the Cape of Good Hope, and Mr. Cunningham to New South Wales, where he arrived in 1817, and shortly after joined the expedition into the interior of that colony, under Mr. Oxley, the Surveyor-General. On his return to Sydney he embarked as botanist in the voyage of survey under the command of Lieutenant, now Captain Philip Parker King, of the Royal Navy. The survey continued four years, and during that period they circumnavigated Australia several times, and visited Van Diemen's

Land, Timor, and the Mauritius, at all of which places Mr. Cunningham formed extensive collections. After the conclusion of these voyages, Mr. Cunningham made several journeys into the interior of New South Wales, and subsequently visited Norfolk Island and New Zealand, where he remained several months. The fruits of his researches in the latter country are given in the 'Companion to the Botanical Magazine,' and 'Annals of Natural History.' After an absence of seventeen years, Mr. Cunningham returned to his native country, and continued to reside in the vicinity of Kew, until the melancholy tidings arrived of the death of his brother Richard, whom he was appointed to succeed in the quality of Colonial Botanist in New South Wales, where he again arrived in February 1837. In the following year he revisited New Zealand, and remained there during the whole of the rainy season, which produced serious effects upon a constitution already greatly debilitated, and on his return to Sydney his health visibly declined until the period of his death, which took place on the 27th of June last, at the age of 48. He was distinguished for his moral worth, singleness of heart, and enthusiastic zeal in the pursuit of science.

Davies Gilbert, Esq., F.R.S.—Mr. Davies Gilbert was distinguished by his high attainments in science and literature, his simple and gentle manners, and his amiable purity of heart. He was the son of the Rev. Edward Giddy, and was born on the 6th of March, 1767, at St. Erth, in Cornwall.

Davies Giddy was a child of early intellectual promise, but his health was feeble, and he received not only the rudiments but almost the whole of his education under the paternal roof, guided and assisted by a father whose classical learning was of a high order. For about a twelvemonth he was placed under the tuition of the Rev. James Parken, Master of the Grammar School at Penzance, to which town his family removed for that purpose; but he soon returned to Tredrea, which was long afterwards his favourite abode, to pursue his studies in a manner more congenial to his feelings. He had by this time formed a taste for mathematical investigations, in which he was aided by the knowledge, freely and kindly imparted, of the Rev. Malachi Hitchins of St. Hilary, a man whose name is well known and respected by practical astronomers. In the year 1782 he removed with his family to Bristol, and continued to cultivate the severer sciences with undiminished ardour. On the 12th of April, 1785, he entered as a Gentleman Commoner of Pembroke College in the University of Oxford, and soon attracted the notice of many of its Professors and Senior Residents. He resided pretty constantly there from his matriculation, except during the long vacations, till the year 1789, when he became an Honorary Master of Arts, but still continued to make long visits to his old College.

In November, 1791, he became a Fellow of the Royal Society, and formed a connexion with Dr. Maskelyne, Sir Joseph Banks, Mr. Cavendish, and other eminent members of that body, which terminated only with their lives. Though the sciences dependent on and connected with mathematics were the chief objects of his

early studies, he was far from inattentive to the claims of Natural History on a portion of his leisure. He cultivated chiefly that branch of it which embraces the vegetable kingdom; and an acquaintance formed in Cornwall with Dr. Withering, as well as his friendship with Dr. Beddoes and Dr. Sibthorp at Oxford, contributed to the same end. He became a Fellow of the Linnæan Society in 1792, in which year he also served the office of Sheriff for his native county. In the year 1804 he was chosen one of the representatives of the borough of Helston, and in 1806 was returned in a new Parliament for that of Bodmin. In this seat he continued till the year 1832, when he ceased to be a member of the legislature. During the whole time of his continuance in Parliament, he was the encourager and indefatigable supporter of every measure connected with the advancement of science; and by his representations and exertions many services were rendered to various scientific societies and institutions, in promoting whose prosperity and usefulness he was incessantly and zealously occupied. He took a prominent part in the inquiry relating to the currency, and published in 1811 a plain statement of the bullion question; and he was also very active both in the House of Commons and out of it in the arrangement of the standard of weights and measures.

In 1806 he married Mary Anne Gilbert, and in 1817 he assumed the name of her family, in pursuance of the injunction contained in a will of her uncle, Charles Gilbert, Esq., of Eastbourne, in Sussex. By this marriage he had seven children, of whom only four survived him; John Davies Gilbert, Esq., the present Sheriff of Sussex, and three daughters.

He became a Fellow of the Society of Antiquaries in 1820, and was likewise Fellow of the Astronomical and Geological Societies. He continued to perform the office of Treasurer of the Royal Society, till in 1827 he became President of that distinguished body. In the year 1831 he retired from the chair, and was succeeded by His Royal Highness the Duke of Sussex. In 1832 he received from the University of Oxford the Degree of Doctor of Laws, by Diploma.

His last visit to his native county took place in 1839. On leaving Cornwall he came through Exeter and Oxford to London, and returned after a few days to Oxford. This last journey, which was attended by some untoward circumstances, was too much for his sinking strength. On his return to London he fell into a state of lethargy, from which, though he was enabled to reach his home, he never fully recovered, but after lingering in this state for some time he expired, on the 24th of December, 1839, and in the 73rd year of his age.

The Rev. Joseph Goodall, D.D., Provost of Eton College.—Dr. Goodall was ardently devoted to the study of Natural History, but more especially to Conchology, with which science he was thoroughly acquainted, and his collection in that department was regarded as one of the most valuable in this country. He was ever a warm and zealous friend of this Society.

The Reverend Patrick Keith.—Mr. Keith long and successfully

cultivated the interesting department of Vegetable Physiology, to which he published an Introduction in 1816, under the title of 'System of Physiological Botany,' in two volumes, 8vo. The work contained the fullest and best account of the subject at that time in the English language, and was, moreover, enriched by numerous original remarks. Mr. Keith was likewise the author of a Botanical Lexicon, published in 1837, and three separate Memoirs, printed in the 11th, 12th and 16th volumes of the Society's Transactions; the first on the Formation of the Vegetable Epidermis, the second on the Development of the Seminal Germ, and the third on the Origin of Buds. Several papers on botanical subjects, from the pen of Mr. Keith, occur also in the Philosophical Magazine and Annals of Natural History.

Mr. Keith had long been suffering from severe illness, which terminated in his death on the 25th of January last, at the age of 71, at the parsonage of Stalisfield, in Kent, of which parish he had been for many years vicar. He was a native of Scotland, and received his education at the University of Glasgow.

William Kent, Esq.—Mr. Kent was a zealous botanist and horticulturist, and formerly possessed an extensive garden at Clapton, where, among many other choice plants, he successfully cultivated the beautiful *Nelumbium speciosum*, and other tender aquatics, of which he was a liberal distributor to his friends. His health obliging him to retire to Bath, he lost the means of indulging his inclination to horticulture on so large a scale; but of his garden on Bathwick Hill, it might truly be said that there never perhaps were so many rare plants cultivated together in so small a space. Notwithstanding he laboured under a painful complaint, he was also happily able to amuse himself by landscape painting; and at the same time he was ever active in promoting useful institutions, moral, scientific or literary.

Don Mariano Lagasca, Professor of Botany, and Director of the Royal Botanic Garden at Madrid, was a native of the province of Arragon, where his father followed the occupation of a farmer. He was sent at an early age to the Gymnasium of Tarragona, and after pursuing the course of study prescribed at that institution, he repaired to Madrid to complete himself for the medical profession, for which he had evinced a predilection. At Madrid he had the good fortune to attend the lectures, and to acquire the friendship, of the celebrated Cavanilles, at that time Professor of Botany in the Spanish capital, and these circumstances laid the foundation of the eminence to which he afterwards attained. In 1822, on the assembling of the Cortes, he was returned Deputy for his native province, and on the overthrow of the constitutional form of government in November of the following year, he was obliged to consult his safety by flight, first to Gibraltar, and afterwards to this country, where his high moral character, amiable disposition, and eminent talents, gained him universal esteem and respect.

Spain, long famed as the granary of ancient Rome, is known to surpass all other countries in the great variety of those grasses which are cultivated for human food, such as wheat, barley, rye and

oats : and many of those whom I am now addressing may remember the extensive and interesting collection of Spanish *Cerealìa* cultivated by Professor Lagasca in the garden belonging to the Society of Apothecaries at Chelsea. The publication of a 'Ceres and Flora Hispanica' had long been a favourite object with him, but which he did not live to accomplish. He departed this life in the 58th year of his age, on the 23rd of June last, at the palace of his early friend and school associate, the present Bishop of Barcelona, who hearing of his infirm state of health, had invited him to partake of his hospitality and kindness, in the hope that the milder air of Catalonia might be the means of restoring him. His remains were honoured with a public funeral, and an oration was pronounced over him by his friend Don Augustin Yanez, Professor of Natural History at Barcelona.

It was in Systematic Botany that Professor Lagasca had more particularly distinguished himself, and he has added greatly to our knowledge of various families of plants, such as *Umbelliferae*, *Dipsacae* and *Compositae*, of one of the groups of which, the *Labiatiflorae*, he may be regarded as the founder.

James Dottin Maycock, M.D.—Dr. Maycock is deserving of notice as the author of a Flora of Barbadoes, in which island he had long resided. The work forms a catalogue of the indigenous as well as cultivated plants of that island, and contains besides a number of interesting notices on their œconomical uses. The author has fully established the identity of the species which affords the Barbadoes aloes, with the *Aloe vulgaris*, accurately figured in the 'Flora Græca.'

William Mills, Esq.

Sir John St. Aubyn, Bart., F.R.S.—A distinguished cultivator of the science of Mineralogy, and who possessed one of the most extensive and valuable collections in that department of Natural History ever formed in this country.

James Sharpe, Esq.

The Rev. Thomas, Lord Walsingham.

Amongst the Foreign Members occur—

John Frederick Blumenbach, M.D., Professor of Medicine in the University of Göttingen, Foreign Member of the Royal Society of London, and Associate of the Royal Academy of Sciences of the French Institute, was pre-eminently distinguished by his important researches in General Anatomy and Physiology, which he continued to prosecute during a long life ardently devoted to the advancement of science. He was equally remarkable for the extent and variety of his knowledge and the philosophical sagacity of his views. Professor Blumenbach died on the 22nd of January last, at the advanced age of 88.

Joseph Francis, Baron Jacquin, Professor of Botany and Chemistry, and Director of the Imperial Gardens at Schönbrunn, near Vienna, to which appointments he succeeded on the resignation of his father, the celebrated traveller and botanist. He was author of *Eclogæ Plantarum*, a folio work, containing descriptions and coloured figures of the new and rare plants which flowered in the gardens under his care, and also of a valuable work on birds.

Baron Jacquin possessed an amiable and obliging disposition, and was distinguished for his urbanity and kindness, especially to strangers; and few cultivators of science visited the Austrian capital without partaking of his good offices and hospitality. He died at Vienna, on the 10th of December, in the 74th year of his age.

The President also announced that seventeen Fellows and four Associates had been elected since the last Anniversary.

It was then moved by the President, and unanimously agreed to by the meeting, That the cordial thanks of the Society be given to Dr. Boott on his retirement from the office of Secretary, for the incessant attention which he has shown to the duties of that office, and the ability, zeal, and urbanity with which he has discharged those duties.

At the election, which subsequently took place, the Lord Bishop of Norwich was re-elected President; Edward Forster, Esq., Treasurer; John Joseph Bennett, Esq., Secretary; and Richard Taylor, Esq., Under-Secretary. The following five Fellows were elected into the Council in the room of others going out; viz. Thomas Bell, Esq., George Loddiges, Esq., Gideon Mantell, Esq., LL.D., Richard Horsman Solly, Esq., and Sir George Thomas Staunton, Bart.

June 2.—Mr. Forster, V.P., in the Chair.

Mr. George Francis, F.L.S., exhibited a portion of the trunk of the *Lepurandra saccidora* (Graham Cat. Bomb. Pl. p. 193.), from Western India, of the bark of which sacks and bags are made.

Mr. Rauch exhibited a specimen of the fruit of *Salisburia adiantifolia*, which ripened last year in the Imperial Gardens at Schönbrunn, near Vienna.

Read, "On the reproductive Organs of *Equisetum*." By Mr. Joseph Henderson, Gardener to Earl Fitzwilliam, at Milton Park, communicated by the Rev. M. J. Berkeley, F.L.S. Mr. Henderson's observations were made on *Equisetum hyemale* and other species, and embrace the entire period of development of the sporæ and of the thecæ containing them. The theca is in the first instance filled with cells of extreme tenuity, in the interior of which the sporæ afterwards take their origin. After the appearance of the sporæ the containing cells gradually become thickened, and separate from each other; and at a still later period their walls are marked by spiral sutures, by means of which they are subdivided into two narrow bands with broad and rounded ends. As the sporæ approach maturity these bands separate at the sutures, and the containing cell is thus resolved into its component parts, the supposed filaments and antheræ of Hedwig. The sporæ, when ripe, have a double membrane, which is rendered evident by the addition of tincture of iodine. In the immature state of the thecæ, up to the time when the spiral lines become distinctly marked on the integument of the sporæ, they form transparent membranous reticulated bags, the meshes of which have different directions in different parts. When the sporæ have attained their full size, a new deposit of vegetable matter is added, and spiral vessels are formed within the flattened cells of which the membrane is composed, and the

outlines of which are indicated by the meshes on the surface. In some situations these vessels are true spirals, in others they partake more of the character of the annular.

While making these observations, Mr. Henderson was not aware that he had been in part anticipated by Treviranus, Bischoff and Meyen. They differ, however, in some particulars from the observations of those physiologists, who also differ from each other.

MISCELLANEOUS.

NOTE ON MR. HASSALL'S CATALOGUE OF IRISH ZOOPHYTES.

The following corrections upon the above communication, in our present Number, have been received from Mr. Hassall.

P. 169. "It is stated, that *Campanularia dumosa* is now ascertained to be the *Cornularia rugosa* of Cavolini—an opinion formerly held by Dr. Johnston and Mr. Gray. I have just been informed by the former that he is now assured it is *not* so."

P. 174. "Dr. Johnston considers *Melobesia pustulata* of Lamouroux, which is given, p. 174, as a synonym of *M. lichenoides*, to be this species in a *young* state; *Millepora lichenoides* Dr. J. also considers to be a condition of *Millepora polymorpha*, and that this again is nothing but the calcareous base of *Corallina officinalis*. To this I may further observe, that *M. lichenoides* is often found in situations in which the latter is, I believe, never met with; the one being usually adherent to fuci, the other always growing on rocks."—A. H. H.

OBITUARY:—PROF. WIEGMANN; MR. VIGORS.

We have the painful duty of recording the decease, during the past month, of N. A. Vigors, Esq., M.P., F.L.S., &c., whose exertions in the department of Zoology are well known;—and of Dr. A. F. A. Wiegmann, Professor in the University of Berlin, which sustains a heavy loss by his death. Our readers are aware of the great value of the 'Archiv für Naturgeschichte' conducted by him, of the contents of which we have often availed ourselves.

RED-BREASTED SNIPE.

We learn from Mr. J. H. Gurney that a specimen of the Red-breasted Snipe was killed near Yarmouth, early in October. Our informant adds, that it was a male, and had nearly completed its change from the summer to the winter plumage.

HOOPOE.—LITTLE STINT.

No. 7, Somerset Place, Stoke.

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

GENTLEMEN,—The following interesting facts are, I think, worthy of record in your *Annals*.

A very fine specimen of the Hoopoe was shot at Swansea the latter end of May last, and another specimen the latter end of last month; and yesterday, Sept. 7th, I was out shooting with a gentleman of this neighbourhood (the Rev. J. Hoar), when we succeeded in shooting no less than *ten* of the *Tringa minuta*, or Little

Stint; seeing a vast number more, which we were unable to get at, and invariably in company with the Dunlin or Purre. So many having been seen of this hitherto considered rare bird, is, I think, too interesting a fact not to be placed on record.—J. U. G. GUTCH.

FOSSIL FISH.

In a description of a Fossil Dragon Fly from the lias of Warwickshire, in the Magazine of Nat. Hist. for June last, p. 301, I stated that one of the fossil fish, found in the same locality, "appears to be a Cycloid, and furnishes an exception to the generalization of M. Agassiz, that no cycloidian fish occurs below the chalk." I have since had an opportunity of showing this fish to M. Agassiz, who proved to me, that although the scales of this fish bear much resemblance at first sight to those of a Cycloid, yet that it is in fact a Ganoid of the genus *Pholidophorus*. The above generalization of M. Agassiz, therefore, remains as yet without an exception.—H. E. STRICKLAND.

REMARKS ON A SPECIMEN OF KINGFISHER, SUPPOSED TO FORM A NEW SPECIES OF THE *TANYSIPTERA*.

The deception which is sometimes practised on naturalists by continental preparers of objects of natural history, is well exemplified by a specimen of a Kingfisher which was purchased in Paris, and is now before me. The specimen decidedly belongs to the genus *Tanysiptera*, of which there is but one species hitherto described, the *Tanysiptera Dea*, a bird rarely seen in collections, though the British Museum contains two good specimens. That to which I now wish to call the attention of ornithologists, differs much from the *Tanysiptera Dea*, both by the shortness of the central tail-feathers and by the richness of the several colours with which it is ornamented: and from these differences it was concluded to be a beautiful new species. But on examining the specimen carefully, some doubt arose as to the fact, whether it had not been, in part, at least, artfully dressed in its present showy plumage, from observing that the structure of some of the feathers was of a more downy nature, especially on the uropygium and beneath the body, than those usually covering the body of Kingfishers. This idea was rendered certain by the discovery that the wings were decidedly those of an *Alcedo Senegalensis*. The addition of wings and feet is not, however, uncommon in stuffed specimens of birds which come from New Guiana, as the natives prepare the skins without those parts, for use as ornaments, and from them the skins are procured and brought to Europe. A further examination proved that the downy feathers (which are of a rich salmon colour) of the uropygium, and most of those beneath the body, had been taken from a specimen of *Trogon Duvaucelii*; while on the sides these latter feathers are mixed with others from the neck of a young bird of *Alcedo leucocephala*, probably thus placed in order to diminish the probability of determining their identity. Having thus shown that all the under part is deceptively put together, it may reasonably be concluded that the feet

by which the specimen is attached to its perch, have also been added to complete it.

Thus far I have referred to the defective portions, which must be decidedly considered as made up from the plumage of various birds, artificially intermingled, to give the appearance of a perfect specimen. I will now pass to the more pleasing task of noticing the parts which I think are those belonging to a distinct species. I will first, however, mention, that on comparing the feathers of these parts, as far as regards their structure, with those of the same parts of a well-authenticated specimen of *Tanysiptera Dea*, one is readily satisfied with their identity of character and disposition. But the differences of colouring between those portions which are left of the original bird and the same parts in the old species, will be better explained by the following description.

The tips of the feathers that compose the crest, as well as the elongated central tail-feathers, are ultramarine in this bird; while in the *Tanysiptera Dea* these parts are of a rich cobalt; in both, however, the tail-feathers are tipped with white.

The back is deep shining black in the present bird; but in the *T. Dea* that part is of a dull black, with each feather margined with deep blue.

The outer tail-feathers have the inner webs brownish black, and the exterior webs ultramarine; while in the *T. Dea* they are white, margined narrowly on the exterior edges with cobalt.

The central tail-feathers are much shorter than those of the *T. Dea*, though the size of the bird is nearly the same.

From these differences I may venture to give the following short specific characters of the bird before me, under the name of *Tanysiptera Nympha*:—

Deep black above, margined with deep blue; the occipital crest and central tail-feathers ultramarine, the latter tipped with white; the lateral tail-feathers brownish black, with the outer webs ultramarine: beneath, &c.—?

I have two reasons for bringing this partly artificial bird before naturalists:—first, to call the attention of ornithologists to the fact that some of the continental preparers of objects of Natural History still continue the shameful practice of endeavouring to deceive the zealous collector by false means, as in bygone days, when several such were published in splendid works, that have since been discovered to be manufactured for the purpose of obtaining large sums of money from amateurs who were struck by their magnificent appearance: secondly, to point out, as far as such a specimen will admit, the existence, without doubt, of a second species of an extremely rare genus, and thus endeavour to lead to its further elucidation, in the hope of establishing the fact of the existence of more than one species. In further proof of the latter assertion, I may add, that I have seen another specimen, which differs in several respects from both those now mentioned, and may be an intermediate species between them, and which will be soon described by M. La Fresnage, of Paris.—GEORGE ROBERT GRAY.

FOUNTAIN GUM BOTTLE.

I have found that the fountain inkstand, sold for Stephens's ink (but those sold by Mordan are probably as good), are the best vessels to keep gum-water in for common daily use. The fluid part of the gum-water being considerably above the level of the surface of the gum which is exposed for use, prevents it from becoming dry, as is so constantly the case in other kinds of vessels.—J. E. GRAY.

CARINARIA VITREA, LAMARCK.

Three specimens of this very rare shell have lately been brought to this country by Mr. Reeve, who purchased them at a sale in Holland. The shell of the unhatched animal (as is shown by the shell remaining on the apex of one of the specimens) is smooth, polished, nearly discoidal, and formed of several (three or four) slowly enlarging whorls, so as exactly to resemble the shell of the *Helix lucida* in form and appearance. When the animal is hatched, it suddenly enlarges its shell, and changes its form. The keel is formed of two distinct laminæ, one belonging to each side of the shell. In both these particulars, which I believe have not been noticed before, it exactly agrees with the more common *Carinaria Mediterranea*.—J. E. GRAY.

METEOROLOGICAL OBSERVATIONS FOR SEPT. 1840.

Chiswick.—Sept. 1, 2. Fine. 3. Rain. 4. Cloudy: rain. 5, 6. Fine. 7, 8. Very fine. 9. Hazy. 10—13. Very fine. 14. Hazy: heavy rain. 15. Cloudy: rain at night. 16. Rain, with brisk S.W. wind: barometer exceedingly low. 17. Very fine: frosty at night. 18. Frosty haze: very fine. 19. Cloudy and cool. 20. Fine. 21. Fine: rain. 22. Heavy rain. 23. Rain: clear and fine at night. 24. Heavy showers. 25. Cold and wet. 26. Overcast: rain. 27. Cloudy and fine. 28. Heavy rain. 29, 30. Clear and fine.

Boston.—Sept. 1. Cloudy. 2. Fine. 3. Rain: rain early A.M. 4—6. Fine. 7. Cloudy. 8. Fine. 9. Cloudy: rain early A.M. 10. Fine: rain early A.M. 11, 12. Fine. 13. Fine: rain P.M. 14. Cloudy. 15. Fine. 16. Fine: rain early A.M.: rain P.M. 17. Cloudy: rain early A.M. 18. Fine: rain P.M. 19, 20. Cloudy. 21. Cloudy: rain P.M. 22. Stormy and rain: rain A.M. 23. Rain: rain early A.M. 24. Fine: rain early A.M. 25. Rain: rain early A.M.: rain A.M. 26. Fine: rain P.M. 27. Fine. 28. Cloudy. 29. Fine: rain P.M. 30. Fine.

Applegarth Manse, Dumfries-shire.—Sept. 1. Fine harvest day: air electric. 2. Rain from midday. 3, 4. Showery. 5. Fine and clear. 6. Fine but cloudy. 7. Fine: a few drops of rain. 8. Cloudy A.M.: rain P.M. 9. Wet: cleared up: wet again. 10, 11. Occasional heavy showers. 12. Moist, but moderate. 13. The same: one shower. 14. Fine and clear. 15. Cold and showery. 16. Rain A.M. 17, 18. Very fine. 19. Fine A.M.: moist P.M. 20. Fine A.M. 21. Fine A.M.: showery. 22. Fine and dry: thunder A.M. 23. Rain. 24. Fine and fair. 25—27. Very wet. 28, 29. Moist. 30. Showery.

Sun shone out 28 days. Rain fell 21 days. Thunder 1 day.

Wind north by east 1 day. North-east 3 days. East-north-east 3 days. East 3 days. South-east $\frac{1}{2}$ day. South 5 days. South-south-west 1 day. South-west $9\frac{1}{2}$ days. West-south-west 2 days. West 1 day. North-west 1 day.

Calm 6 days. Moderate 11 days. Brisk 5 days. Strong breeze 5 days. Boisterous 2 days. Variable 1 day.

Mean temperature of the month 50°·30

Mean temperature of September, 1839 ... 52·12

Mean temperature of spring water 50·90

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

XXVI.—*Zoo-Geological Considerations on the Freshwater Mollusca.* By EDWARD FORBES, Esq., M.W.S., For. Sec. B.S., &c.

THE Mollusca inhabiting fresh water are all testaceous; such as are univalve are either pulmoniferous or pectinibranchous Gasteropoda; such as are bivalve are Acephala Lamelli-branchia. The consideration of the effect of climatal influence on their generic and specific variations of form, and of the comparative geographical distribution of the existing species, leads to some conclusions which appear to bear importantly on certain points in geology.

The genera of Freshwater Pulmonifera exhibit few subgeneric groupings of species, and those few are not climatally centralized. Thus, the forms of *Limneus* are common to the whole world, and the distribution of species is proportionably extensive. The species of *Limneus* present near resemblances whether gathered in England, in India, in Australia or in America—they are often even specifically identical. *Planorbis* presents the same phænomena, and the variations of form in *Physa* can scarcely be regarded as exceptional. So also *Ancylus*. Nor are the two characters most subject to the climatal influence, those of size and colour, much affected by it, either as regards the species of the genera or the individuals of the species. Some of the largest forms of *Limneus* and *Planorbis* are northern, and in them colour never varies climatally. The negative influences which appear to affect the number of species as we go northwards are rather structural than climatal.

Not so however with the pectinibranchous Gasteropoda inhabiting fresh water. Among them we find the number of genera and of species increasing as we go south, and peculiar forms characterizing warm countries. A *Paludina* or *Melania* from the warmer regions of our earth has an eye-character

which enables us at once to name its fatherland. American forms and Asiatic forms differ; we find the minor groups centralized, and we might colour our maps variously, according to the centralization of those groups. Their colouring varies with the climate, and specimens of the same species from different localities may be distinguished by variation of size.

In the lacustrine and fluviatile genera of Acephala we see a similar influence of climate at work. The groups of Naiades and of Cyclades are concentrated in certain geographical localities, and the southern species are often more splendid in form and colouring than the northern. The old and new continents have few or no species in common, and the freshwater Acephala of the east and west are in most cases very different.

These facts may be stated *generally* in the form of two *probable* laws:—

1st. The variations of form, specific and generic, are not so dependent on climate in the freshwater pulmoniferous Gasteropoda as in the freshwater pectinibranchous Gasteropoda and Acephala.

2nd. In a genus independent of climatal influence the extension of distribution is correspondent with the non-variation of form, and *vice versâ* in a genus subject to the climatal influence.

The following inferences applicable to geology may be drawn from these considerations:—

1st. If these views be correct, and if the great differences between the animals of the primæval world and those of the present depend on climatal conditions as is usually admitted, the difference between the generic and subgeneric forms of the pulmoniferous Mollusca in the ancient strata and those now living, should not be nearly so great as that between the ancient and existing marine fauna. And so we find it. When we look over a collection of fossil freshwater Pulmonifera we are at once struck by the circumstance of the absence of extinct genera and of the near alliance between the fossil and extinct forms.

2nd. But there should be a difference either as to the distribution or as to the character and number of species between the pectinibranchous Gasteropoda and Acephala of the present and of the fossiliferous past. Thus, as climatal causes affect the distribution of their genera and species, if Britain had a warmer climate in the early ages of the world, these tribes should evidence it. And such is the case. *Melania* and *Melanopsis* and *Ampullaria* counted numerous subjects at one time in our lakes and rivers; *Paludina* were once

far more abundant than they are now; *Cyrena* has disappeared, and *Cyclas* has dwindled into insignificance; nor does our weather hold out any prospect of bettering itself so as to induce a return of the analogues of our ancient visitants.

3rd. In a fossiliferous bed formed during a period when the temperature of Britain did not exceed that of the warmer regions of our world at present, there ought not to be the same difference in the comparative number of species, extinct and existing, in the marine and freshwater faunas, and scarcely any in the case of the freshwater Pulmonifera. In such a bed the freshwater Mollusks should either be nearly allied to, or identical with, existing species of warmer climates. I would refer to this rule the phænomena of the shell-bed at Grays, Essex, described by Mr. Morris, in which we find the pectinibranchous Gasteropoda and the Acephala presenting thermal characters, while the Pulmonifera are identical with the existing British species. These phænomena should lead us to consider that bed as of pleiocene and not of pleistocene origin.

4th. When there is no positive but an evident negative difference from the existing fauna in a tertiary or post-tertiary freshwater deposit, our conclusions as to the climate of the period in which it was formed must mainly depend on the consideration whether the negation is of Pulmonifera or of Pectinibranchia and Acephala; for in the former case it *probably* depends on the action of secondary influences, and in the latter it *possibly* may be owing to the same cause.

5th. If in calculating percentages we deduce them from lists including both freshwater and marine species, we draw false inferences as regards the genera in the older rocks and the species in the pleiocene and pleistocene beds. To correct this error we should in the former case calculate separate percentages for the marine and freshwater species, and in the latter consider the freshwater Pulmonifera by themselves.

XXVII.—*A Catalogue of Shells from the Crag.* By S. V. WOOD, Esq., F.G.S.

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

GENTLEMEN,

THE following is part of a Catalogue of the fossil contents of the Crag Formation, including the Conchifera of Lamarck. I have endeavoured to make it as concise as possible, in order (should you think it worth publication) not to trespass too

largely upon the valuable space in your Journal; I have therefore introduced no more synonyma than I found absolutely necessary to make it intelligible. References are given where the species have been verified, and the new names are merely provisional, as they are affixed to specimens in my Cabinet: as it is my intention at some future period to give full descriptions of these, I shall defer my copious remarks till that time. Sutton (near Woodbridge in Suffolk) is given as the locality to the greater number of species, though many of them are not restricted to that parish; but as quarries of the red and coralline crag are there numerous and very rich in organic remains, a repetition of places is needless; where others are specified, they denote the species to have been there more peculiarly located; those for the mammaliferous crag I have taken from Woodward, with a few additional new discoveries given me by Capt. Alexander. The localities for the red and coralline shells I will guarantee, having *myself found every species* enumerated in this catalogue, with the single exception of the *Cyrena* at Gedgrave. The classification is according to Lamarck, and as it is the best known is best adapted to my purpose, the shells having been long thus arranged in my cabinet. Upon looking over the catalogue, it will be observed that several of the shells now living in the present seas are quoted as found fossil in the coralline crag, while they appear to be wanting in the red or newer formation; but in most of the instances the specimens are rare even in that deposit, which was formed either in deeper or more tranquil water than we have every reason to believe was the case with the gravelly covering that in some places rests upon it; but even where they are found in numbers their fragility might have been unable to withstand the agitation of a littoral deposit; they, of course, must have existed through the more modern period. The *Tellina donacina*, a shell whose solidity we might have imagined to have been a sufficient protection, has not hitherto been found in the red crag, though one of the most abundant in the coralline; yet its presence there is, as far as I know, confined to one spot, thus appearing to have been a very local species; further search, particularly in newly discovered localities, will probably bring to light many of these desiderata.

Yours, &c.

S. V. WOOD.

No. of Sp.	DESCRIPTION.	Coralline.	Red.	Mam.
CONCHIFERA.				
1.	<i>Teredo navalis</i> , <i>Linn. Syst. Nat.</i> p. 1267.	Sutton*.		
1.	<i>Gastrochæna pholadia</i> , <i>Turt. British Bivalves</i> , t. 2. f. 8, 9...	Sutton	Sutton, (tubes of.)	
1.	<i>Pholas latus</i> , <i>List.</i> pl. 279 † <i>P. crispata</i> , <i>Mont. T. B.</i> p. 23.	Sutton	Walton Naze.	Postwick, [n ^r Norwich
2.	— <i>cylindrica</i> , <i>Min. Con.</i> t. 148.	Sutton	Walton Naze.	
3.	— <i>papyracea</i> ? <i>Turt.</i> (fragments only)	Sutton.		
4.	— <i>candida</i> ? (dorsal valve only.) .....	.....	Walton Naze.	
1.	<i>Pholadomya candidoïdes</i> , n. s. ...	Ramsholt‡.		
1.	<i>Solen siliqua</i> §, <i>Linn. Syst. Nat.</i> p. 1113. ....	.....	Sutton	Bramerton.
2.	— <i>ensiformis</i> , n. s.	Ramsholt...	Walton Naze.	
1.	<i>Cultellus cultellatus</i> , n. s.	Sutton	Walton Naze.	
1.	<i>Panopæa Norvegica</i> , <i>Min. Con.</i> t. 610. ....	.....	Sutton.	
2.	— <i>Ipsviciensis</i> , <i>Min. Con.</i> t. 611.	Ramsholt.		
3.	— <i>gentilis</i> ||, <i>Min. Con.</i> t. 610...	.....	Alderton, near Bawdsey.	
1.	<i>Glycimeris vagina</i> , n. s.	Ramsholt...	Sutton.	
1.	<i>Mya truncata</i> , <i>Linn. Syst.</i> p. 1112.	Ramsholt...	Sutton.	
2.	— <i>arenaria</i> , <i>Linn. Syst.</i> p. 1112.	.....	Sutton	Bramerton.
3.	— <i>lata</i> , <i>Min. Con.</i> t. 81. ....	.....	Sutton	Bramerton.
4.	— <i>ovalis</i> , <i>Turt. Brit. Biv.</i> t. 3. f. 1, 2. ¶ <i>M. Pullus</i> , <i>Min. Con.</i> t. 531.	.....	Butley, near [Orford.	Postwick.
1.	<i>Sphenia Binghami</i> ? <i>Turt.</i> t. 19. f. 3.	Sutton.		
2.	— <i>cylindrica</i> ** , n. s.	Sutton.		
3.	— <i>angulata</i> , n. s.	Sutton.		
1.	<i>Anatina pretenera</i> , n. s.	Sutton	Walton Naze.	
2.	— <i>asperrima</i> , n. s.	Sutton.		
1.	<i>Thracia pubescens</i> <i>Mya pubescens</i> , <i>Mont. T. B.</i> p. 40.	Ramsholt...	Sutton.	
2.	— <i>convexa</i> †† ?	Ramsholt.		

* The river Deben separates this parish from Woodbridge, but the quarries from which the greater part of the shells were obtained are situated at the distance of two miles from that town.

† *Hist. Conch.*, fol. Lond. 1687. Lib. iii.

‡ Ramsholt is on the banks of the Deben, about four miles from Woodbridge.

§ I presume this to differ from *Solen genuis*, Nyst, in not being cylindrical: our shell is broader on the posterior than on the anterior side, a character not given in his description.

|| Until more specimens be found I think there is a doubt about this species.

¶ These *Myæ* present a variety of distorted forms, but all that are in my cabinet, and all that I have seen from the crag, may be referred to the above species.

** This is identical with a recent British shell not figured that I am aware of.

†† My specimens are compressed and broken; too imperfect for identification.

No. of Sp.	DESCRIPTION.	Coralline.	Red.	Mam.
CONCHIFERA.				
3.	<i>Thracia truncata</i> , n. s.	Sutton.		
1.	<i>Lutraria elliptica</i> , <i>Turt. Brit. Biv.</i> p. 65.	Ramsholt...	Sutton.	
	<i>Mactra lutraria</i> , <i>Linn. Syst. Nat.</i> p. 1126.			
2.	— <i>Listeri</i> .....	.....	Sutton	Bramerton.
	<i>Mactra Listeri</i> , <i>Gmelin, Syst.</i> p. 3261.			
	<i>Tellina lata alba</i> , <i>Lister</i> , t. 253.			
1.	<i>Mactra arcuata</i> , <i>Min. Con.</i> t. 160.	Sutton	Sutton	Postwick.
2.	— <i>solida</i> , <i>Linn. Syst. Nat.</i> p. 1126.	Sutton	Sutton	Thorpe.
	<i>M. dubia</i> et <i>M. ovalis</i> , <i>Min. Con.</i> t. 160.			
3.	— <i>glauca</i> , <i>Gmel. Syst.</i> p. 3260 .	.....	Sutton.	
4.	— <i>stultorum</i> , <i>Linn. Syst. Nat.</i> p. 1126. ....	.....	Sutton	Thorpe.
	<i>M. magna</i> , <i>Woodward, Geol. of Norf.</i> t. 2. f. 8.			
5.	— <i>subtruncata</i> , <i>Mont. T. B.</i> p. 93.	.....	Sutton	Thorpe.
	<i>M. cuneata</i> , <i>Woodward</i> , t. 2. f. 10.			
6.	— <i>crassa</i> ? <i>Turt.*</i>	Sutton.	
7.	— <i>deaurata</i> ? <i>Turt.</i> .....	.....	Sutton.	
1.	<i>Amphidesma album</i> , <i>Fleming, Brit. Ani.</i> p. 432.	Sutton	Bawdsey	Bulcham, near Southwold.
	<i>Mactra alba</i> , <i>Wood, Linn. Trans.</i> vi. 174.			
2.	— <i>prismaticum</i> , <i>Turt. Brit. Biv.</i> t. 5. f. 3.	Sutton.		
3.	— <i>obovale</i> , n. s. ....	.....	Sutton	Southwold.
1.	<i>Lepton squamosum</i> ? †, <i>Turt.</i>	Sutton.		
2.	— <i>nitidum</i> ? †, <i>Turt.</i>	Sutton.		
1.	<i>Corbula striata</i> , <i>Flem.</i>	Sutton	Sutton	Bramerton.
	<i>Cardium striatum</i> , <i>Walker, Test. minuta, rar.</i>			
	<i>Corbula nucleus</i> , <i>Turt.</i>			
	— <i>rotundata</i> , <i>Min. Con.</i> t. 572.			
2.	— <i>complanata</i> , <i>Min. Con.</i> t. 362. ....	.....	Sutton.	
3.	— <i>subrostrata</i> , n. s.	Sutton.		
4.	— ? <i>granulata</i> ‡, <i>Nyst, Bull. de l' Acad. Roy. de Bruxelles</i> , 1839, pt. 2. p. 398. pl. 3. f. 3.	Ramsholt.		
5.	— ? <i>sulcata</i> §, n. s.	Sutton.		

* Only one worn specimen, which is therefore doubtful.

† I have only two or three specimens, and those are not in good condition.

‡ Half a dozen specimens that I possess are unfortunately all the right valve, and I suspect it does not strictly belong to this genus.

§ An equivalved shell, somewhat resembling *C. striatella*, *Deshayes, Coq. foss. des Env. de Paris*, Pl. 8. f. 15.

No. of Sp.	DESCRIPTION.	Coralline.	Red.	Mam.
CONCHIFERA.				
1.	<i>Pandora margaritacea</i> , <i>Turt.</i> <i>Tellina inæquivalvis</i> , <i>Linn. Syst. Nat.</i>	Sutton	Walton Naze.	
1.	<i>Saxicava rugosa</i> , <i>Min. Con.</i> var. α . t. 466. <i>Saxicava pholadis</i> , <i>Turt.</i> var. β . t. 2. f. 11. <i>Hiatella minuta</i> , <i>Turt.</i> var. γ . t. 2. f. 12. — <i>oblonga</i> , <i>Turt.</i> var. δ . t. 2. f. 13. <i>Saxicava rugosa</i> , subequilateralis, <i>mih</i> i, var. ϵ	Sutton	Sutton	Thorpe.
1.	<i>Agina purpurea</i> ? <i>Turton</i> *	Sutton.		
1.	<i>Montacuta substriata</i> , <i>Turt. Brit. Biv.</i> t. 11. f. 9, 10. <i>Ligula substriata</i> , <i>Mont. T. B. Sup.</i> p. 25.	Sutton.		
2.	— <i>ovata</i> <i>Tellemya ovata</i> , <i>Brown's Conch. Illust.</i> pl. 14. f. 20, 21.	Sutton.		
3.	— <i>truncata</i> , n. s.	Sutton	Walton Naze.	
4.	— <i>pumila</i> , n. s.	Sutton.		
5.	— ? <i>donacina</i> , n. s.	Sutton.		
6.	— ? <i>cylindrica</i> , n. s.	Sutton.		
1.	<i>Kellia suborbicularis</i> , <i>Turt. Brit. Biv.</i> t. 11. f. 5, 6..... <i>Mya suborbicularis</i> , <i>Mont. T. B.</i> p. 39. <i>Amphidesma physoides</i> , <i>Lamk.</i> v. p. 493.	Sutton.		
2.	— <i>dubia</i> <i>Psammotea dubia</i> , <i>Desh. Coq. foss. des Env. de Paris</i> , pl. 10. f. 13, 14.	Sutton	Sutton.	
3.	<i>Kellia coarctata</i> , n. s.	Sutton.		
4.	— <i>transversa</i> , n. s.	Sutton.		
5.	— ? <i>deltoidea</i> , n. s.	Sutton	Sutton.	
6.	— ? <i>orbicularis</i> , n. s.	Sutton.		
7.	— ? <i>flexuosa</i> , n. s.	Sutton.		
8.	— ? <i>cycladia</i> , n. s.	Sutton.		
1.	<i>Cryptodon bisinuatus</i> , n. s.	Sutton.		
2.	— <i>rotundatus</i> , n. s.	Sutton.		
3.	— ? <i>Verticordia</i> , n. s.	Sutton.		
1.	<i>Loripes undularia</i> , n. s. † .....	.....	Sutton	Bramerton.

* Only one specimen.

† This is one of those shells covered externally with undulating or divaricating lines, but differs from all the numerous *Lucinæ* with those peculiar markings that I have seen, inasmuch as it has a semi-internal ligament, and may, perhaps, have had an inhabitant similar to that of *Lucina lactea*, which, on account of its peculiar foot, has been named *Loripes* by Poli. I have therefore placed it in that genus.

No. of Sp.	DESCRIPTION.	Coralline.	Red.	Mam.
CONCHIFERA.				
1.	<i>Lucina radula</i> , <i>Turt. Brit. Biv.</i> p. 116.	Ramsholt...	Sutton	Thorpe.
	<i>Tellina radula</i> , <i>Mont. T. B.</i> p. 68.			
2.	— <i>digitaria</i>	Sutton	Sutton.	
	<i>Tellina digitaria</i> , <i>Turt. edit. of Linn.</i> p. 196.			
3.	— <i>rotundata</i> , <i>Turt. Brit. Biv.</i> p. 114.	Sutton	Sutton	
4.	— <i>dilatata</i>	Sutton	Sutton	
	<i>Diplodonta dilatata</i> , <i>Philippi, Enum. Moll. Siciliæ</i> , t. 4. f. 7.			
5.	— <i>gyrata</i> , n. s.	Sutton	Sutton	Southwold.
6.	— <i>crenulata</i> , n. s.	Sutton.		
7.	— <i>costaria</i> , n. s.	Sutton.		
1.	<i>Tellina crassa</i>	Sutton	Sutton	Postwick.
	<i>Pectunculus planus crassus</i> , <i>List.</i> t. 136.			
	<i>Tellina obtusa</i> , <i>Min. Con.</i> t. 179. f. 4.			
2.	— <i>obliqua</i> , <i>Min. Con.</i> t. 161. f. 1.	Ramsholt...	Sutton	Postwick.
3.	— <i>ovata</i> , <i>Min. Con.</i> t. 161. f. 2....	.....	Sutton	Bramerton.
4.	— <i>prætenuis</i> , <i>Woodward, Geol. of Norf.</i> t. 2. f. 12. ....	.....	Sutton	Bramerton.
5.	— <i>fabula</i> , <i>Mont. T. B.</i> p. 61. ....	.....	.....	Southwold.
6.	— <i>donacina</i> *, <i>Linn. Syst. Nat.</i> p. 1118.	Sutton.		
7.	— <i>donacella</i> , n. s.....	Sutton.		
8.	— <i>ovaloides</i> , n. s... ..	Sutton.		
9.	— <i>Benedenii</i> , <i>Nyst. Bull. de l'Acad. Roy. de Bruxelles</i> , 1839, pt. 2. p. 399. f. 5. ...	.....	Sutton.	
1.	<i>Psammobia vespertina</i> , <i>Turt. Brit. Biv.</i> t. 6. f. 10.	Ramsholt.		
	<i>Solen vespertinus</i> , <i>Gmelin, Syst.</i> p. 3228.			
2.	— <i>Ferroënsis</i> , <i>Turt.</i> t. 8. f. 1....	Sutton.		
3.	— <i>scopula</i> , <i>Turt.</i> t. 6. f. 11, 12.	Sutton.		
4.	— <i>florida</i> , <i>Turt.</i> t. 6. f. 9.	Sutton.		
5.	— <i>solidula</i> , <i>Turt.</i> t. 8. f. 2. ....	.....	.....	Bramerton.
6.	— <i>laminosa</i>	Ramsholt...	Sutton.	
	<i>Petricola laminosa</i> , <i>Min. Con.</i> t. 573.			
1.	<i>Donax trunculus</i> , <i>Linn. Syst. Nat.</i> p. 1227. ....	.....	.....	Bramerton.
2.	— <i>truncata</i> , n. s. ....	.....	Sutton.	
3.	— <i>glabra</i> , n. s.	Sutton.		
1.	<i>Astarte borealis</i> .....	.....	.....	Bramerton.
	<i>Astarte plana</i> , <i>Min. Con.</i> t. 179. f. 2.			

* Although exceedingly abundant I have not yet found it in the red crag.

No. of Sp.	DESCRIPTION.	Coralline.	Red.	Mam.
CONCHIFERA.				
2.	<i>Astarte obliquata</i> , <i>Min. Con.</i> t. 179. f. 3.		Sutton.	
3.	— <i>bipartita</i> , <i>Min. Con.</i> t. 521. f. 3.	Ramsholt.		
4.	— <i>nitida</i> , <i>Min. Con.</i> t. 521. f. 2.	Ramsholt....	Sutton.	
5.	— <i>nitidula</i> , n. s.		Sutton.	
6.	— <i>mutabile</i> , n. s.	Ramsholt...	Sutton.	
7.	— <i>sulcata</i> , <i>Flem. Brit. Ani.</i> p. 439. <i>Venus sulcata</i> , <i>Mont. T. B.</i> p. 131.		Sutton.	
8.	— <i>compressa</i> , <i>Flem. Brit. Ani.</i> p. 440.		Sutton	Thorpe.
9.	— <i>pisiformis</i> , n. s.	Sutton	Sutton	Bramerton.
10.	— <i>gracilis</i> , <i>Goldf. Petrefact. t.</i> 135. f. 4. ...	Ramsholt...	Sutton.	
11.	— <i>parva</i> , n. s.	Sutton.		
12.	— <i>parvula</i> , n. s.	Sutton.		
13.	— <i>pygmæa</i> , <i>Goldf. Pet. t.</i> 135. f. 5, 6.	Sutton.		
14.	— <i>subtrigona</i> , n. s.	Sutton.		
1.	<i>Goodallia?</i> <i>crenatula</i> , n. s.	Sutton.		
2.	— ? <i>pygmæa*</i> , n. s.	Sutton.		
1.	<i>Cyrena trigonula</i> , <i>Wood</i>	Gedgrave †, near Orford.		
1.	<i>Cytherea Chione</i> , <i>Turt. Brit. Biv.</i> t. 8. f. 11. <i>Venus Chione</i> , <i>Linn. Syst. Nat.</i> p. 1131.	Ramsholt.		
2.	— <i>filosa</i> , n. s.	Sutton	Walton Naze.	
3.	— <i>lenticula</i> , n. s.	Sutton	Walton Naze.	
1.	<i>Cyprina maxima</i> †.....	Ramsholt...	Bawdsey	Southwold.

* The two shells placed in this genus by Dr. Turton will, I think, be found to belong to the genus *Astarte* and the *minutissima*, probably the immature shell of the *triangularis*.

† This is stated, upon the authority of Capt. Alexander, to have been found in the coralline crag, but from the appearance of the locality I think there is at present a doubt of its belonging to that formation: I found at the same place *Cyclostoma elegans*, and *Pupa marginata*. Capt. A. kindly sent me a specimen, which, by comparison, appears identical with that which is found so abundantly in the lacustrine deposit at Stutton, on the banks of the river Stour, seven miles south of Ipswich: whether this be the same as the common species from the Nile, *Cyrena consobrina*, I will leave others to determine; but there is one character in the fossil in which it appears to differ from the recent, although amongst some hundreds of specimens that I have procured, there is of course a great variety; the posterior side is always more angular than that of the recent, which in all those that I have seen is truncated. Our shell appears to agree with *Cyrena Gemmellarii*, *Phil. Enum. Moll. Siciliæ*, t. 4. f. 3.

‡ The umbo of this, from the coralline crag, is a little more produced, and appears to have been rather a thicker shell than the recent, which is the only difference that I can detect, while the specimens from the red crag preserve a sort of intermediate character in that respect.

No. of Sp.	DESCRIPTION.	Coralline.	Red.	Mam.
	CONCHIFERA.			
	Cyprina.			
	Pectunculus maximus, <i>List. t.</i> 108 A.			
	Venus islandica, <i>Linn. Syst. Nat.</i> p. 1131.			
2.	Venus equalis, <i>Min. Con. t.</i> 21.			
—	rustica	Ramsholt...	Sutton.	
	Venus rustica, <i>Min. Con. t.</i> 196.			
1.	Coralliophaga cyprinides, n. s. ...	Ramsholt.		
1.	Venerirupis Irus, <i>Flem. Brit. Ani.</i> p. 451.		Walton Naze.	
	Donax Irus, <i>Linn. Syst. Nat.</i> p. 1128.			
1.	Pullastra virginea		Sutton.	
	Venus virginea, <i>Linn. Syst. Nat.</i> p. 1136.			
2.	— perovalis, n. s.	Ramsholt.		
1.	Venus ovata, <i>Mont. T. B.</i> p. 120.	Sutton	Sutton.	
1.	Dosina turgida	Ramsholt...	Sutton.	
	Venus turgida, <i>Min. Con. t.</i> 256.			
	— Cytherea sulcata, <i>Nyst. Bull. de l'Acad. Roy. de Bruxelles</i> , 1839, pt. 2. p. 401. pl. 1. f. 9.			
2.	— fasciata	Sutton	Sutton	Bramerton.
	Venus fasciata, <i>Turt. Brit. Biv. t.</i> 8. f. 9.			
3.	— imbricata.			
	Astarte imbricata, <i>Min. Con. t.</i> 521. f. 1.	Ramsholt...	Sutton.	
1.	Mysia ornata*, n. s.	Ramsholt...	Sutton.	
1.	Artemis lentiformis.		Walton Naze.	
	Venus lentiformis, <i>Min. Con. t.</i> 203.			
2.	— sinuata, <i>Turt. Brit. Biv. t.</i> 10. f. 10, 11.	Ramsholt...	Walton Naze.	
1.	Venericardia senilis, <i>Min. Con. t.</i> 258.	Ramsholt...	Sutton.	
2.	— chamæformis, <i>Min. Con. t.</i> 490. f. 1.	Sutton.	Sutton.	
3.	— orbicularis, <i>Min. Con. t.</i> 490. f. 2.	Sutton	Sutton.	
4.	— scalaris, <i>Min. Con. t.</i> 490. f. 3.	Sutton	Sutton.	
5.	— anceps, n. s.	Sutton.		
6.	— corbis.	Sutton	Walton Naze.	Southwold.

* This is the name of a genus intended to have been established by Dr. Leach for the reception of such shells as *Venus undata*, Mont. Our shell corresponds both in its dentition and deep pallial scar, but differs in its exterior ornament and other specific characters.

No. of Sp.	DESCRIPTION.	Coralline.	Red.	Mam.
	CONCHIFERA.			
	Venericardia.			
	Cardita corbis, <i>Phil. Enum. Sici.</i> t. 4. f. 19.			
1.	Isocardia Cor., <i>Min. Con.</i> t. 516. f. 2.	Ramsholt...	Sutton.	
1.	Cardium Parkinsoni, <i>Min. Con.</i> t. 49.	.....	Walton Naze.	
2.	— edule, <i>Linn. Syst. Nat.</i> p. 1124.	.....	Sutton	Bramerton.
	C. obliquum, var. <i>Woodward, Geol. of Norf.</i> t. 2. f. 19.			
3.	— edulinum, <i>Min. Con.</i> t. 283. f. 3.	Ramsholt...	Sutton	
4.	— angustatum, <i>Min. Con.</i> t. 283. f. 2. ....	.....	Sutton.	
5.	— elongatum, <i>Turt. Brit. Biv.</i> t. 13. f. 8.	Sutton.		
6.	— Groenlandicum, <i>Turt. edit. of Linn.</i> p. 205 .....	.....	Bawdsey.	
7.	— echinatum ?*, <i>Linn.</i> .....	.....	Sutton.	
8.	— decorticatum, n. s.	Ramsholt...	Sutton.	
9.	— tenellum, n. s.	Sutton.		
10.	— nodosulum, n. s.	Sutton	Sutton.	
1.	Pleurodon miliaris, <i>Wood, Illust. Mag. of Nat. Hist.</i> May 1840, p. 231. pl. 13. f. 1. <i>M.</i> ...	Sutton.		
1.	Arca Noæ, <i>Linn.</i>	Sutton	Sutton.	
2.	— lactanea, <i>Wood, Illust. Mag. Nat. Hist.</i>	Sutton	Sutton.	
3.	— raridentata, <i>Wood, Illust. Mag. Nat. Hist.</i>	Sutton.		
1.	Pectunculus pilosus	Ramsholt...	Sutton	Thorpe.
	Arca pilosa, <i>Linn.</i>			
2.	— subobliquus, <i>Wood, Illust. Mag. Nat. Hist.</i> .....	.....	Walton Naze.	
3.	— pygmaeus, <i>Phil.</i>	Sutton.		
4.	— sublævigatus ?	Gedgrave.		
	— Trigonocœlia sublævigata, <i>Nyst. Bull. de l'Acad. Roy. de Bruxelles</i> , 1839, p. 404. f. 15†.			
1.	Nucula oblonga, <i>Min. Con.</i> .....	.....	Bawdsey.	
2.	— Cobboldiæ, <i>Min. Con.</i> .....	.....	Sutton	Bramerton.
3.	— lævigata, <i>Min. Con.</i>	Sutton	Walton Naze.	
4.	— minuta, <i>Mont.</i> .....	.....	Sutton.	
5.	— nucleus, <i>Wood, Illust. of the Mag. Nat. Hist.</i>	Sutton	Sutton.	
	Arca nucleus, <i>Linn.</i>			
6.	— tenera, <i>Wood, Illust. Mag. of Nat. Hist.</i> .....	.....	Bawdsey	Southwold.
7.	— oblongoides, <i>Wood, Illust. Mag. of Nat. Hist.</i> .....	.....	Butley	Bramerton.

* The spines of this appear to be set on angulated ribs, in which it differs from the recent, but I have unfortunately only two or three specimens.

† Our shell has obsolete longitudinal striæ.

No. of Sp.	DESCRIPTION.	Coralline.	Red.	Mam.
CONCHIFERA.				
8.	<i>Nucula pygmæa</i> , Goldf.	Sutton.		
9.	— <i>trigonula</i> , Wood, <i>Illust. Mag. Nat. Hist.</i>	Sutton.		
10.	— <i>semistriata</i> , Wood, <i>Illust. Mag. Nat. Hist.</i>	Sutton.		
1.	<i>Dreissina</i> ?*		Walton Naze.	
1.	<i>Mytilus antiquorum</i> , Min. Con. t. 275.	Sutton		Bramerton.
2.	— <i>edulis</i> , Linn. <i>Syst. Nat.</i> p.1157.		Bawdsey.	
3.	— <i>densatus</i> , n. s.?	Sudbourn,		
1.	<i>Modiola modiolus</i> ? (specimens imperfect)	[n ^r Orford. Ramsholt...	Sutton	
2.	— <i>discors</i> , Turt. <i>Brit. Biv.</i> t. 15. f. 4.	Sutton.	(cast of.)	
3.	— <i>hyalina</i> , n. s.	Ramsholt.		
4.	— <i>cylindroides</i> , n. s.		Walton Naze.	
5.	— <i>asperula</i> , n. s.	Sutton,		
1.	<i>Chama gryphina</i> ? Lam.	Sutton	Sutton.	
1.	<i>Pinna ingens</i> ? Mont. (fragments only)	Ramsholt...	Woodbridge.	
1.	<i>Avicula</i> (fragments only).....	Gedgrave.		
1.	<i>Lima fragilis</i> , Wood, <i>Mag. Nat. Hist. Pecten fragilis</i> , Mont. <i>T. B. Sup.</i> p. 62.	Sutton	Walton Naze.	
2.	— <i>exilis</i> , Wood, <i>Mag. Nat. Hist.</i>	Ramsholt.	Walton Naze.	
3.	— <i>oblonga</i> , Wood, <i>Mag. Nat. Hist.</i>	Ramsholt.		
4.	— <i>plicatula</i> , Wood, <i>Mag. Nat. Hist. Sub-Genus.</i>	Sutton.		
5.	<i>Lima limatula ovata</i> , Wood, <i>Mag. Nat. Hist.</i>	Sutton.		
6.	— <i>limatula subauriculata</i> , Wood, <i>Mag. Nat. Hist.</i>	Sutton.		
	<i>Pecten subauriculata</i> , Mont. <i>T. B. Sup.</i> p. 63.			
1.	<i>Pecten grandis</i> , Min. Con. t. 585.	Ramsholt...	Sutton.	
2.	— <i>complanatus</i> †, Min. Con. t. 586.	Aldb. ...		
3.	— <i>maximus</i> ?‡	Aldb. ...		
4.	— <i>Princeps</i> , Min. Con. t. 542... ..	Ramsholt.		
5.	— <i>opercularis</i> §, Linn. <i>Syst.</i> p. 1146.	Ramsholt...	Sutton	Southwold.
	<i>P. plebeius</i> , Min. Con. t. 393. f. 1.			
	<i>P. reconditus</i> , Min. Con. t. 575. f. 5, 6.			

* Only one fragment.

† I have not seen the lower valve of this species.

‡ Only one specimen, and that doubtful, perhaps the lower valve of *complanatus*.

§ This differs from the generality of the recent British specimens only in the rays being more imbricated, but Mr. G. B. Sowerby has furnished me some from the Mediterranean, in which they there correspond.

No. of Sp.	DESCRIPTION.	Coralline.	Red.	Mam.
CONCHIFERA.				
6.	<i>Pecten striatus</i> , <i>Min. Con.</i> t. 394. f. 2—4.	Ramsholt...	Sutton.	
	<i>Pecten limatus</i> , <i>Goldf. Pet. p.</i> 59. t. 94. f. 6.			
7.	— <i>gracilis</i> , <i>Min. Con.</i> t. 393. f. 2.		Sutton.	
8.	— <i>obsoletus</i> , <i>Min. Con.</i> t. 541... <i>Pecten obsoletus</i> , <i>Mont. T. B.</i> p. 149.	Sutton	Sutton	Bramerton.
9.	— <i>tumidus</i> , <i>Turt. Brit. Biv. t.</i> 17. f. 3.	Sutton.		
10.	— <i>subdiaphanus</i> , n. s.	Ramsholt.		
11.	— <i>scabrotus</i> , n. s.?	Sutton.		
12.	— <i>tumescens</i> , n. s.	Ramsholt...	Sutton.	
13.	— <i>pictatus</i> , n. s.	Sutton.		
14.	— <i>tetramerus</i> , n. s.	Sutton.		
15.	— <i>striaturus</i> , n. s.	Sutton.		
16.	— <i>exoletus</i> , n. s.?*	Sutton.		
1.	<i>Hinnus Dubuissoni</i> , <i>Min. Con.</i> t. 601.	Ramsholt.		
1.	<i>Ostrea edulis</i> , <i>Linn. Syst. Nat. p.</i> 1148.	Ramsholt...	Sutton.	
2.	— <i>spectra</i> , n. s. <i>Leathes' MS.</i> ...	Ramsholt...	Sutton.	
1.	<i>Anomia ephippium</i> . }	Sutton	Sutton.	
2.	— <i>undulata</i> } †	Sutton	Sutton.	
3.	— <i>aculeata</i> }	Sutton.		
1.	<i>Discina Norvegica</i> ? ‡, <i>Lamk. Syst.</i>	Sutton.		
1.	<i>Terebratula variabilis</i> , <i>Min. Con.</i> t. 576 §.	Ramsholt...	Sutton.	
2.	— <i>Gervillii</i> ? <i>Woodward.</i>	Sutton.		
3.	— <i>cistellula</i> , n. s.	Sutton.		
4.	— <i>Psittacea</i> , <i>Turt. Brit. Biv. p.</i> 236.			Bramerton.
1.	<i>Lingula fusca</i> , n. s.	Sutton.		

* This may be only a giant monstrosity of the *obsoletus*. I have only one specimen.

† These, like our recent British species, are not well defined; no dependence can be placed upon them.

‡ Only one valve, and that imperfect.

§ This is variable in shape, thin, often compressed and broken; my specimens vary in size from four inches longitudinal diameter to young ones of less than a line. Von Buch, in his Monograph of *Terebratula*, published in the Geol. Trans. of France, part 3, has at p. 222 given as syn. to *T. gigantea*, Schlott., *T. bisinuata*, Desh., Coq. foss. des Env. de Paris, t. 65, f. 1, *T. variabilis*, Sow., *Min. Con.*, t. 576, but I believe these two last to be different shells; reasons for thinking so shall be given in my general descriptions.

XXVIII.—*Carabideous Insects collected by Mr. Darwin during the Voyage of Her Majesty's Ship Beagle*. By G. R. WATERHOUSE, Esq.

[Continued from vol. iv. p. 362 of the *Magazine of Natural History**.]

Genus *CASCELLIUS*.

Mr. Curtis finds this genus upon two species brought by Capt. P. P. King, one from Chile, and the other from Port St. Elena, and described in the *Linnæan Transactions*, vol. xviii. part 2.

Sp. 1. *Cascellius Kingii*, Curtis, *Linn. Trans.*, vol. xviii. p. 183.

Mr. Darwin's collection contains four specimens of this species, three of which are from E. Chiloe, and the remaining one is from Yuche Island, Chonos Archipelago. They vary but slightly in colouring, being of a green hue, more or less brilliant, and faintly tinted with brass colour; the legs are sometimes of an uniform pitchy red tint, but more commonly, it would appear, the thighs are of a darker colour than the tibiæ: in three of Mr. Darwin's specimens they are pitchy black, obscurely tinted with reddish at the base. The antennæ being imperfect in Mr. Curtis's specimen, I may mention that they are short and rather thick; if bent backwards they would about reach to the base of the thorax; the basal joint is testaceous red, the three or four following joints are more or less suffused with brown, and the apical joints are pale testaceous in all the specimens.

Sp. 2. *Feronia (Creobius) Eydouxii*.—This insect, described by M. Guérin-Méneville in the '*Magazin de Zoologie*' for 1838, p. 4. of Class IX., no doubt belongs to the genus *Cascellius*, and is closely allied to the *C. Kingii*; but from the figure and description, it would appear that it may be distinguished by its larger size, and the uniform deep colouring of the legs and antennæ. It is found in Peru, near Lima.

M. Guérin-Méneville observes that his *Feronia Eydouxii* "a beaucoup d'affinités avec le *Carabus suturalis*," &c., "mais, suivant M. Chevrolat, qui a vu le *C. suturalis* de la collection de Banks citée par Fabricius, notre insect en est fort différent;" he might have

* At the end of this paper I intend giving a list of the species mentioned, with references to the pages in which they are to be found, for the convenience of those who may wish to refer to them; I shall then also correct any mistakes I may fall into,—provided I discover them. In the mean time I may remark, that the generic name *Odontoscelis*, proposed by Mr. Curtis and used by me in the first portion of this paper, had been previously employed by Germar for a genus of Hemipterous insects; I hope, therefore, Mr. Curtis will suggest some other name. I am informed that Mr. Curtis's generic name *Cardiophthalmus* has also been previously used, but cannot ascertain where. I find I had accidentally overlooked a specimen of the *Cardiophthalmus Clivinoïdes*, Curtis, in Mr. Darwin's collection. This specimen was "found dead in the sea, 40 miles off the Straits of Magellan."—Mr. Darwin's Notes.

added, that the insect last mentioned is a true *Carabus*, closely allied to the *Carabus Chilensis* of Eschscholtz.

Sp. 3. *Cascellius Gravesii*, Curtis, Trans. Linn. Soc., vol. xviii. p. 183.

In Mr. Darwin's collection are two specimens of this species, both of which were found in Yuche Island, Chonos Archipelago; they are both of a brassy black colour, and have a slight coppery hue: the basal joint of the antennæ is red, and the remaining joints are pitchy; the thighs are also pitchy, but slightly tinted with red, especially at the base, and the tibiæ and tarsi are pitchy red. The larger of the two specimens measures $5\frac{3}{4}$ lines in length.

Sp. 4. *Cascellius nitidus*.—New species.

C. viridis, nitore splendide æneo vel cupreo; corpore subtus, femoribusque piceis; antennis, palpis, tibiis tarsisque e piceo rubris; thorace longiore plusquam lato, subcylindrico, anticè latiore, posticè angustato, sulco dorsali mediocritè distincto, nec non, et ante et post foveam transversâ notato; elytris, ex elongato ovatis, posticè latioribus, ad apicem rotundatis, mediocritè convexis, substriatis, striis impunctatis.

Habitat apud Tierra del Fuego.

This species is rather smaller than the *C. Gravesii*; the thorax and elytra are rather less convex than in that insect; the antennæ are rather shorter and less stout, and the striæ of the elytra are more delicate.

The upper parts of the body are sometimes of a brilliant green colour, and sometimes brassy with cupreous reflections; the under parts are pitchy black; the mandibles and labrum are pitchy, and the palpi, as well as the legs, are either pitchy red or pitch-coloured; the tibiæ are usually rather paler than the thighs and tarsi. The head is rather narrower than the thorax, the eyes but moderately prominent: the thorax is rather longer than broad, moderately convex, broadest near the front and attenuated behind, and has the sides slightly rounded; the dorsal channel is moderately distinct, and does not extend either to the anterior or posterior margins; a transverse impression is observable near the anterior margin, and there is a faint trace of a similar impression on the hinder part of the thorax: there are no posterior foveæ, but the channels of the lateral margins become rather more deeply impressed in the posterior angles. The elytra are moderately convex, elongate-ovate (their length being about once and a half their breadth), and smooth; the striæ are rather indistinct, and do not extend to the apex of the elytra; those nearest the suture are the longest, and on the outer margins they are obliterated; they are impunctate and interrupted in parts: on the apical portion of each elytron are two or three large punctures. Length, from $4\frac{3}{4}$ to 5 lines; width, not quite 2 lines.

Four specimens of this species were brought from Tierra del Fuego by Mr. Darwin.

Sp. 5. *Cascellius æneo-niger*.—New species.

C. niger, suprâ indistinctè æneo splendens; thorace perlongo (elytrorum dimidiam longitudine æquante) suprâ paululum convexo, anticè latiore, posticè angustato; sulco dorsali mediocriter impresso; elytris elongato-ovatis, distinctè striatis; tibiis femoribusque piceo-nigris; tarsis palpisque e piceo rubris; antennis, articulo basali e piceo rubro, articulis duobus vel tribus proximis, piceo lavatis, reliquis fusco-testaceis.

Hab. apud Valdivia.

This species is about the same size as the last, but has the thorax more elongated, the elytra more distinctly striated, and the striæ, although deeper in some parts than others, are not interrupted: in *C. nitidus* but five striæ are visible, whereas in the present insect there are six or seven distinct striæ, and these extend almost to the apex of the elytra: on the sides of the elytra the striæ are not completely obliterated: the colouring, moreover, is different, being almost destitute of any metallic hue.

The head is elongated and narrower than the thorax, distinctly constricted, and has a puncture in the centre, a little behind the eyes; between the eyes are two shallow foveæ; the labrum and mandibles are black; the palpi are pitchy red; the basal joint of the antennæ is red, the two or three following joints somewhat pitchy, and the remaining joints brownish testaceous; the thorax is decidedly longer than broad; broadest in front, attenuated and cylindrical behind; its upper surface is moderately convex; the dorsal channel is tolerably distinct, and extends very nearly to the anterior and posterior margins (in one specimen the dorsal channel is interrupted on the fore part of the thorax and forms a series of punctures); the anterior and posterior transverse impressions can scarcely be traced, and the outer margins beneath are somewhat pitchy. The elytra are of an elongate-ovate form, distinctly striated, and the striæ, in parts, exhibit indistinct punctures; those nearest the suture extend almost to the apex of the elytra; near the outer margins of the elytra the striæ are indistinct: the interspaces of the other striæ are slightly convex; the apical portions of the elytra are pitchy at the margin, and have each three, more or less distinct punctures, two of which are placed near each other, and the third, which is most remote from the tip of the elytron, is widely separated from the other two. The legs are black or pitchy black, and the tarsi are pitchy red; the body beneath is black; the upper surface of the insect is black, but has an indistinct æneous gloss. Length, 5 lines; width, $1\frac{3}{4}$ line.

The two specimens from which the foregoing description is drawn up, are one from Valdivia, and the other from Cape Tres Montes. Two other specimens in the collection from Hardy Peninsula, Tierra del Fuego, differ in having the antennæ, palpi, and tarsi darker.

Genus *BARIPUS*, *Dejean*.

Baripus speciosus (Klug), *Dejean*. Spécies général des Coléoptères, vol. v. p. 703.

Two specimens of this beautiful insect were brought from Monte Video by Mr. Darwin.

Baripus rivalis (*Molops rivalis*, Germar), Dejean. Species Gen. des Col., vol. iii. p. 25.

Two specimens of this species from Monte Video, and one specimen from Maldonado La Plata, occur in the collection.

XXIX.—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. 3. On the Structure of the Hairs on the Pericarp of certain Plants. By M. DECAISNE. (Ann. des Sc. Nat. n. s. xii. p. 251.)

ONE of the characters of the genus *Ruckeria* is, that of having the pericarp covered with papillæ. These papillæ, when attentively examined in a dry state, are found to be of a club-shaped form, of a pearly appearance, and with a longitudinal line dividing them into two equal portions. Their base is dilated or curved, in the different species, so as to rest upon one of the cellules of the epidermis, in the organisation of which there is nothing unusual. On placing some of these papillæ or hairs in a drop of water, we immediately see them separate at the apex into two lips, and thence emit two tubes (*boyaux*) of a mucilaginous substance, which issues forth like wires spirally unrolling themselves, twisting about on themselves many times, and finally greatly exceeding in length the hairs into which they were apparently thrust.

These tubes are apparently formed by a very considerable number of filaments, united and placed one upon the other, in the manner of a skein of thread, of which the pieces adhered together by means of some gummy substance. When these hairs are moistened, we distinguish through their parietes in each of the two lateral moieties, two bodies more opaque, attenuated at both ends, and exhibiting striæ arranged in a regular series, but changing their direction at certain intervals.

If the hair, instead of adhering to the pericarp, as in the preceding example, is broken off at the base, the emission of the tubes takes place at that extremity, and the two are then seen to descend slowly, and to proceed parallel to each other for a short time in unrolling themselves, but afterwards to curve and twist one around the other in an irregular manner.

Sometimes when the hair is not broken off, the tube issues forth from the side, and almost constantly about the middle,

the internal substance presses against some point of the wall, rends it, and issues forth bent and folded upon itself. In this case, the emission of one of the tubes is frequently independent of that of the other.

The same phænomenon may be observed in *Trichocline*, *Euryops lateriflorus*, and *Mesogramma*. In this latter plant, the central line of each division of the corolla (considered as a nervure by DeCandolle), is formed by a series of utricles enclosing a red resinous substance, which is also found in the leaflets of the involucre.

In *Doria cluytiaefolia* the pericarp is covered with extremely fine, subulate, silvery-white hairs, which, when examined under the microscope, exactly resemble a thread of silk from the cocoon, viz. two tubes united to each other and curved upon themselves by desiccation. When moistened, they project outwards, as in the preceding case, two very fine tubes, which exhibit similar characters to those mentioned above. As these hairs are of considerable length, it is not difficult to cut them into pieces, and thus see the internal substance escape at the two extremities in opposite directions. These hairs are formed by two navicular valves applied together by their edges like those of a shell, and are destitute of a partition, as is ascertained by the examination of the transverse section, or by observing the hairs of *Oligothrix gracilis*, D.C. or those of *Mesogramma*, which occupy the angles of the fruit, and are of the form of small clubs. When moistened, they instantaneously open, not only at their upper extremity, but by separating throughout their whole length into two transparent colourless valves which continue united at the base, and eject two oblong, free, mucilaginous, striated bodies, which subsequently elongate, and sometimes present in the course of their spiral certain irregular, linear, yellowish transparent fragments, which however do not turn blue on the application of iodine, as has been likewise remarked of similar ones which escape from the utricles of the pericarp of *Dra-cocephalum Moldavica*.

In order to ascertain the structure of these hairs, it is expedient to examine them when the fruit is almost perfectly matured.

These hairs, in certain species, occupy a determinate situation, and those of the pappus to which they approximate do not participate in their characters, nor do the cellules of the epidermis itself, contiguous to those which produce these hairs, offer anything analogous in their organisation.

The two tribes of *Compositæ* in which these hairs have been hitherto observed are the *Labiatifloræ* and the *Senecionideæ*.

Note.—With a view of connecting the above with British Botany, it may be proper to remark, that I have observed a phænomenon similar to that described above as existing in the genus *Ruckeria*, in the hairs which clothe the achenia of the common Groundsel (*Senecio vulgaris*, Linn.)*. The achenia should be collected on a dry day, when fully matured, and before they have been wetted either by dew or rain. On placing them under the microscope, the silky hairs will be found to be very much adpressed and scarcely conspicuous. Immediately, however, on the application of a drop of water, the hairs become prominent and erecto-patulous, and will be perceived to be in form linear, emarginate or notched at the apex, having a darker longitudinal line communicating with the notched apex, and thus as it were dividing the hair into two cylindrical but attached tubes. On the continued application of the water for a short time, a spiral coil encircling a mucilaginous substance issues from each of the segments of the apex, and after twisting upon itself several times, becomes at length quiescent, extended in a nearly straight direction, and considerably longer than the hair from which it proceeded.—W. A. L.

Shrewsbury, Oct. 16, 1840.

No. 4. *Conspectus of the Genera and Species of the Lemnaceæ.* By M. J. SCHLEIDEN. (Linnæa, 1839, iv. p. 385.)

SCHLEIDEN purposes to publish a Monograph of the *Lemnaceæ*, founded on the results of a continued study of the plants during five years, aided by the experience of his uncle Horkel, a very skilful investigator of the tribe. In the mean time he presents the following as a Prodrömus of his intended work.

According to his observations these plants do not flower seldömer than other proliferous Phanerogama; the rarity of their detection in that state is consequently owing to our researches being conducted unadvisedly or at an unseasonable period. He has frequently examined in a complete state *Lemna minor*, *trisulca*, and *gibba* through all the stages of the development of their flowers, fruits, and germination.

In the arrangement of the genera, he has generally followed the principles so successfully applied by Schott, and later by

* [The structure and property of the hairs on the achenia of this plant have been previously observed by Mr. Brown.—ED.]

Blume, to the inflorescence of the *Aroideæ*, of which the *Lemnaceæ* are a tribe.

If it be at all proper to establish a genus on characters derived from the vegetation, he feels himself justified in the adoption of his genus *Spirodela*. For, if the whole of the *Lemnaceæ* be carefully examined, they will be found to constitute the lowest group of the *Aroideæ*, and a very slight sagacity will detect in them a series of well-defined developments proceeding from *Wolffia* (which is probably the simplest phanerogamic plant) up to *Spirodela*, which presents the highest state of organization, and is evidently the connecting link with *Pistia*. The sudden appearance of two stipular leaves which must be regarded as typical of the stipular sheath of *Pistia*, the surprising development of spiral vessels, without any visible change in the exterior form of the plant and of the axis which is easily distinguishable as a node with many roots, furnish in these simple plants characters sufficiently important to justify the establishment of a particular genus; and probably a more attentive examination of the female organs and of the fruit may elucidate other characters confirmatory of this genus on the above grounds, however arbitrary its adoption may at present appear.

AROIDEÆ.

Trib. LEMNACEÆ, DC.

Herbulæ liberæ, natantes vel submersæ, arrhizæ, vel 1-poly-rhizæ, radicibus calyptra* terminatis. Vasa spiralia rudimentaria transitoria (in pistillo) vel conspicua (in tota planta). Axis ad punctum reductus, cum foliis in frondem confluentibus. *Frons*: singula planta completa, ex rima una basilari, vel duabus lateralibus prolifera, prole nuda, vel stipulis duabus membranaceis aucta. *Hibernaculum*: bulbillus † autumno fundum aquæ, vere superficiem petens. *Inflorescentia*: spadix ob axim suppressum ferè nullus; spatha urceolata, membranacea: staminum evolutione irregulariter fissa. *Flores* monoici. *Masc.* 1—2, mon-

* The calyptra is not a loose portion of the epidermis, nor a distorted form of the radical spongiolæ, but is a proper and peculiar organ, which surrounds the apex of the root even whilst it lies concealed in the plant, although perfectly free and distinct both from that and from the parenchyma.

† Definition of a *bulbillus*: an axillary bud, the parts of which are more fleshy than usual, and connate, and which separates spontaneously from the parent plant for the purpose of propagating the species. A more fleshy frond, therefore, without roots, engendered in the autumn by plants of the *Lemnaceæ*, and on the death of the parent plant separating from it and seeking the bottom of the pit, the parent plant remaining on the surface of the water (as in *Lemna polyrhiza*); or becoming buried in the bottom of the water with its dead parent plant, and rising again in spring (as in the rest of the *Lemnaceæ*);—is truly denominated a *Bulbillus*.

andri. *Filamenta* filiformia. *Antheræ* biloculares, loculis subglobois, apice contiguis, basi remotissimis, bilocellatis, rima longitudinali laterali dehiscentibus. *Pollen* globosum, muricatum, rima unica (?) donatum. *Fæm.* 1. *Ovarium* uniloculare, uni- multi- (septem- in *L. gibba*) ovulatum. *Ovulum* anatropum vel hemianatropum vel atropum, in tegumentis binis. *Stylus* continuus; stigma expanso-infundibuliforme. *Fructus*: utriculus mono-polyspermus, indehiscens vel capsula circumscissa. *Semen* in tegumentis binis, externo coriaceo-carnoso, interno membranaceo; endostomio indurato (operculo) in germinatione embryostega. *Embryo* in axi albuminis carnosus rectus, monocotyledoneus, gemmula seorsim (radiculam) spectans in rima laterali, radícula supera, infera vel vaga*.

† *Vasa spiralia* transitoria, vel nulla. *Plantæ novellæ* nudæ.

A. *Fronde* rima una basilari hiantes. *Flores* in pagina frondis superiore erumpentes.

I. *WOLFFIA*, Horkel MSS. (*Horkelia*, Reich. non Schlechtend.)

Flos masculus unicus. *Filamentum* breve, crassiusculum. *Flos fæmineus* unicus. *Ovarium* uniloculare, uniovulatum, ovulo in recto, anatropo; *stylus* brevis; *fructus* utriculus monospermus; *semen* erectum; *embryo* turbinatus; *radícula* supera.

1. *W. Delilii*. *Fronde* ovales, tenuissimæ, geminatim oppositæ, arrhizæ; labium inferius rimæ basilaris productum, appensum, hyalinum. *Lemna hyalina*, Del. *Lemna* e Rosetta, *Herb. Willd.* no. 17144. *L. arhiza*, *Herb. Willd.* 17141.

The author is indebted to Dr. Ehrenberg for specimens of *Wolffia* in flower brought from Egypt; and he detected in Willdenow's herbarium specimens of the same plant in fruit, under the name of *Lemna*, from Rosetta.

B. *Fronde* rimis binis basilariibus hiantes. *Flores* e rima lateraliter prodeuntes.

II. *LEMNA*.

Flores masculi, altero in evolutione præcociori. *Filamenta* filiformia, recurva; *ovarium* uniloculare, uniovulatum, ovulo erecto, horizontali, hemianatropo; *stylus* elongatus, recurvus; *fructus* utriculus monospermus indehiscens; *semen* in fundo affixum, horizontale; *embryo* conicus; *radícula* vaga.

1. *L. minor*, Linn. *Fronde* obovato-subrotundæ, crassiusculæ, ternatim quaternatimque, rarius plures cohærentes, monorrhizæ; stipite frondis novellæ discreto fragili. *L. cyclostasa*, Ell. *L. minuta*, Kunth. *L. minima*, Chev. *L. conjugata*, Willd. *Herb.* 17143.

* Brongniart's description of the embryo in 'Archives de Botanique' is very far from being accordant with nature, nor can I possibly imagine what could lead him to the supposition of a canal pervading the upper portion of the embryo and nourishing a cordate plumule at its base.

I first collected *L. minor* in flower and fruit at Berlin in 1835, and since that time I have each year detected it again in the same state whenever I searched with care.

2. *L. trisulca*, Linn. Frondes lanceolatae, apice repando-dentatae, tenues, in stipitem elongatum persistentem attenuatae, ideoque multifariam aggregatae, exclusis floriferis submersae. *Staurogeton*, Reich. *L. intermedia*, Ruthe. *L. cruciata*, Roxb.

In 1836 I found *L. trisulca* in flower, and have since regularly detected the flowers wherever I encountered this species. The reason why this species has been so rarely found in flower, is that the search has been made at too late a period, as it generally flowers abundantly in April and the beginning of May. The flowers will be seen on those plants which are submerged near the surface; after flowering they multiply themselves laterally and are then submerged.

III. THELMATOPHACE.

Spadix brevissimus, sed discernendus. *Flores masculi* duo. *Filamenta* recurva, medio dilatata; *ovarium* uniloculare, bi-multi-ovulatum, ovulis erectis anatropis; *stylus* elongatus, recurvus; *fructus*: capsula membranacea, dehiscentia circumscissa, dipolysperma; *semina* erecta; *albumen* paucissimum; *embryo* ovatus; *plumula* maxima; *radicula* infera.

1. *T. gibba*. Frondes obovatae vel suborbiculatae, adultae inferne vesiculoso-convexae; stipite frondis novellae discreto, fragillimo, ideoque frondibus adultis subsolitariis. *Lemna gibba*, Linn.
 β. *trichorhiza*, fronde superne rubente, radice longissima. *Lemna trichorhiza*, Thuill.

In 1837 I first observed *T. gibba* in flower, and since frequently. It is the rarest species at Berlin.

†† *Vasis spiralibus in tota planta conspicuis; fronde novella stipulis binis (inferiori et superiori) membranaceis aucta, polyrhiza.*

IV. SPIRODELA.

Flores masculi duo; *filamentis* inferne angustatis. *Flores feminei*. *Ovarium* biovulatum, ovulis erectis anatropis; *stylus*.; *stigma*.; *fructus*.

1. *S. polyrhiza*. Frons planiuscula, nervis palmatis, polymorpha, orbiculari-ovata; apice obtuso vel acuto. *Lemna polyrhiza*, Linn. *L. bannatica*, Kit. *L. orbicularis*, Kit. *L. thermalis*, P. Beauv. *L. orbiculata*, Roxb.

Notwithstanding the most careful search I did not detect *S. polyrhiza* in flower until 1839, when I found at Werningerode the male flowers, or those in which the pistil is imperfectly developed. The only previous notice of the flowers of this species is in Wiggers *Prim. Fl. Holsat.*

APPENDIX.

Lemna arhiza, Mich. according to the observations of Hoffmann is a good species, but, as the flowers and fruit are still wanting,

is doubtful to what genus it should be referred; most probably to my genus *Thelmatophace*.

In Steudel's *Nomenclat. Bot.* there is a plant *Lemna punctata*, Meyer, of which I am ignorant.

Lemna obcordata, P. Beauv. and Vahl. as well as *Lemna dimidiata*, Rafn., are erroneously enumerated amongst the *Lemnaceæ*, since an inspection of authentic specimens from the authors themselves proves them to be species of *Riccia*.

XXX.—*Contributions to the History of the Development of the Decapod Crustacea.* By HEINRICH RATHKE*.

ONE of the objects which I had proposed to myself for my tour through Scandinavia and Denmark, was an investigation of the Crustacea as regarded their development. Of Decapods which might serve as subjects for this investigation, several, it is true, fell in my way; fewer, however, by far than I had expected: these were *Astacus marinus*, *Pagurus Bernhardus*, *Galathæa rugosa*, and a crab, which I consider to be *Hyas Araneus*. The details respecting these I design to make known, together with the results of the examination of various other animals, in a separate work; as, however, some time may elapse before its publication, I will here communicate the most essential particulars of what I have learned respecting the development of the above-mentioned Crustacea, in order, as soon as possible, to record a testimony to the correctness of Thompson's discovery, that even the Decapods, after they have already quitted the egg, undergo a very considerable metamorphosis.

1. *Astacus marinus*.—Embryos just on the point of hatching, possess already five pairs of feet, and these are similar in form to those of the full-grown specimens. But to the coxæ of each is attached a part representing a narrow and long appendage of the leg, proceeding down it on its outer side, little inferior to it in length, and composed of two larger members, of which the inferior one again consists of ten smaller articulations, and carries a number of long bristles. The same also is the case with the foot-jaws (Kieferfussen) of the second and third pair, of which, moreover, the hindermost is even at this period the largest of all, and it is evident from this that the above appendix represents the subsequent *palpus flagelliformis*. The four posterior foot-jaws and the ambulatory legs have also in general a resemblance to the legs of the Schizopoda, especially to those of *Mysis*. But this similarity afterwards

* From Wiegmann's Archiv. (Part III. 1840.)—Translated and communicated by Mr. W. Francis.

disappears in the ambulatory feet, the appendage which they bear subsequently falling off. The foot-jaws of the anterior pair are already like those of full-grown specimens. Branchiæ are already present on the legs and behind the foot-jaws, but they are still very small, and at the utmost merely provided with small low warts on their surface. The tail or abdomen possesses as yet no false feet, and the fan consists merely of a single almost triangular lamina of considerable size, the posterior margin of which has a slight incisure (ausschnitt), and whose lateral halves are so applied together inferiorly, that they, for the most part, touch each other. The front antenna consists, it is true, of several articulations, but is not yet separated into two branches. The posterior antenna is not much longer, but consists of two branches nearly equal in length, of which the one represents a pretty broad lamina (appendix), the other a cylinder (walze). In front a simple nearly subulate snout proceeds from the cephalothorax, which is, at least, as long as the front or smaller antenna, and curves between the eyes downwards.

2. *Pagurus Bernhardus*.—Embryos about to escape, have only three pairs of members that can serve for locomotion. The front pair is the longest, the central somewhat shorter, the hinder about half as long as the central. This hinder member consists of three articulations unequal in size, but is otherwise simple. On the other hand, each of the four other members consists of a rather long and thickish stem, and of two branches of nearly equal length, which originate near one another at the lower end of the stem, and one of which is situated exteriorly to the other; the outer one is (flat) compressed, and is composed of two articulations, the inner one is cylindrical and composed of five articulations. All these six members are not, as might be expected, true feet in a lower stage of development, but, as will appear hereafter, the foot-jaws; and indeed their maxillæ and mandibulæ are apparent, but they offer nothing particularly remarkable. Of true legs, and also of branchiæ, there does not yet exist a trace. The antennæ are similarly constituted to those in the mature embryos of the *Lobster*. In front a thin and moderately long snout proceeds from the cephalothorax. The tail is long, thin, and distinctly articulated. False feet are not yet observable. Only the central lamina of the fan is present, and represents a simple lamina narrow in front, posteriorly considerably broad, the two hind corners of which are somewhat rounded, and the posterior margin furnished with a slight incisure. In young, which are $1\frac{1}{2}$ lin. in length, and considerably larger than the mature embryos, the four anterior foot-jaws were of

the same form as in these, only their stem had become relatively much broader; but on the two posterior ones, which likewise had become relatively longer, an inner branch had already begun to form, but was not yet articulated. Close behind these organs appeared on the inferior side of the cephalothorax two to three pairs of very short but very thick cylindrical and uncinatè (hakenformig) much incurved (zusammengekrümmt) members, of which those of the front pair were slightly swelled at their extremity, and were there provided with a scarcely perceptible incisure; the others, however, appeared quite simple and obtusely rounded at their extremity. These minute organs were the first indications of true legs. There was no sign of branchiæ. The posterior antennæ had not changed considerably in form, they also were still but of slight length; but on the front ones a small ramification had already been developed, so that each terminated in two short branches, unequal in length. The snout was about as long as the antennæ, of considerable length therefore, and terminated very acutely. The tail had become thicker in comparison to its length. The lamina of the fan already present in the embryos was of considerable size, but represented an irregular square, which was somewhat broader behind than in front, and had a moderately deep incisure on its hinder margin. Near to the front end of this, a very small lamina, in comparison to the above plate, was moveably connected with the sixth joint of the tail on each side; it was divided by a deep narrow incision into two flaps of unequal size, but not jointed off from each other. These two small plates were the first traces of the lateral laminæ of the fan. There were still no false feet on the other joints of the tail.

In young, which were somewhat above two lines in length, five pairs of true feet already occurred. Although all these were still very small in comparison to the foot-jaws, yet a faintly indicated articulation may be recognized on them, especially on those of the three front pairs; moreover, the claws (chelæ) were already distinctly imprinted on those of the most anterior pair, and these pincers were even larger on the one than on the other. On the other hand, no branchiæ were yet decidedly evident. On the fan of the tail the side plates had become larger in proportion to the central plate, and the two unequally sized flaps of each were jointed off (abgegliedert). Only slight traces of false feet were perceptible. As to the rest, the organization of these young resembled that of those above-described.

In still older young, which however were not much longer than the preceding, several organs had already undergone

considerable changes, so that these specimens now exhibited great similarity with full-grown specimens. The legs, with respect to form, were perfectly developed: indeed the six front ones had already attained such a size that they exceeded the cephalothorax in length. Also that portion of the cephalothorax to which the legs were attached, had acquired, in respect to length, the ascendancy over that with which the foot-jaws and cibarian apparatus are connected. The foot-jaws were very much compressed, and possessed but a slight magnitude in comparison to the legs; they were, however, with respect to form, already similar to those of the full-grown specimens. Those of the front pair, which previously were the largest, appeared at present the smallest; and indeed they had lost in circumference, their two branches had shortened perceptibly, and on the inner ramification even the articulation was missing, while the stem was further developed. The outer branch (the palpus) on the central and posterior foot-jaws was the longest, consisting of three articulations, and had therefore acquired a joint more (the newly added joint, which was now the terminal one, subsequently separates into several.). The inner branch had become shorter on the central foot-jaws, longer on the contrary on the posterior ones, so that it now appeared altogether greater on the latter. Branchiæ were already present on the legs and posterior foot-jaws. The antennæ were of the same form as in full-grown specimens, yet the long flagellum of the posterior or outer antennæ only consisted of fifteen articulations. The eyes also were already formed as in mature specimens, and directed anteriorly. The snout had entirely disappeared. The tail, it is true, had become broader, but not thicker in the same degree, and appeared therefore rather flattened; its joints were still more sharply separated from each other; no lateral curvature was yet perceptible on it. The central lamina of the fan appeared like an oval cut from off the thinner extremity, and held together with the sixth joint of the tail by this truncated end; it had therefore quite a different form from that in the less developed young. The lateral plates of the fan had likewise, it is true, a resemblance to those of full-grown individuals, but were still quite flat and thin; moreover, those of the right and left half were still equal to each other in size.

3. *Galathæa rugosa*.—Mature embryos of this crab have a structure and form similar to those of *Pagurus*. They likewise, therefore, have only three pair of locomotive organs, and in all probability these are subsequently developed into foot-jaws. They only differ from those of *Pagurus*, in the two

branches at the two front pairs being somewhat longer in proportion to the stem. On the fan of the tail likewise, consisting of only one plate, the incisure is very deep, so that this part is more distinctly divided into two flaps than in the mature embryo of *Pagurus*.

4. *Hyas Araneus*.—I obtained from Professor and Councillor of State Reinhardt of Copenhagen, to whom I am likewise indebted for the above-described young of *Pagurus*, several specimens of a crab-like animal, which had been caught by one of its possessors who had found a great swarm of them in the North Sea: they were probably the young of *Hyas Araneus* in two different periods of development.

The smallest were, without their snout, $1\frac{1}{2}$ lin. in length, and were very similar to those Crustacea which Thompson has already described as the young of a short-tailed crab. The dorsal shield was moderately compressed from the sides, and had in its hinder half a considerable height in comparison to the breadth, so that it might in some measure be compared to the shield of *Daphnia*. From the upper side of it proceeded a thin appendage directed upwards and backwards, which was about the same length as the dorsal shield; but forwards and downwards proceeded a simple and thin snout of about the same length. Of members which might serve for swimming three pairs occurred; and of these, as in the above-described smallest larva or young of *Pagurus*, the front pair was the largest, the hinder, entirely covered by the dorsal shield, the smallest. Each of these organs again consisted of a stem and two ramifications of which the inner was almost cylindrical and composed of five articulations, the outer one very compressed, and consisting only of two articulations. Behind them were likewise five pairs of legs, of which the front or largest was already provided with pretty far developed pincers. Yet all the legs were, in comparison to the two front pairs of joints for swimming, exhibiting themselves as foot-jaws in a lower stage of development, very small, and lay still completely hidden under the dorsal shield. Not a trace of branchiæ seemed as yet to exist. The small maxillæ and mandibulæ were similar in form to grown specimens of *Hyas*: the mandibulæ, for instance, had already a very long palpus. On the other hand, the antennæ had a form entirely different from those of full-grown specimens; however, it would lead me too far were I to describe these more minutely. The eyes were, in proportion to the whole body, enormously great, and directed sideways. The tail was much longer than the cephalothorax, the snout being left out of consideration, but was very narrow, and

nearly as thick as broad. At its extremity there was a large irregular triangular plate, which had at its posterior broad margin, or base, a moderately deep but long incisure, and at whose two posteriorly directed corners two long, thick spines directed backwards were inserted (articulated). False legs were already present, not yet divided into two branches, but nearly cylindrical. Two simple appendages, like the false feet, but of smaller size, were inserted on both sides of the lamina, representing the fan, at (into) the hinder extremity of the sixth joint of the tail.

Together with the above-described larvæ were likewise captured some others which had swum deeper. Now these were very much further developed, and already possessed a considerable resemblance to full-grown specimens of *Hyas Araneus*: for instance, the antennæ, foot-jaws and legs were of similar form and relative dimensions as in these; this was likewise the case with respect to the dorsal shield, only that this shield terminated in front in three rather long, thick spines, lying nearly in one and the same horizontal plane, of which the central one was larger than the two others. The tail, on the contrary, was proportionately much longer than in full-grown specimens, and was likewise of a moderate breadth and pretty thick. The false feet were very long in comparison to the tail, and were already provided with two branches unequal in size, and furnished with very long bristles. The fan consisted of a broad, moderately long, and posteriorly rounded plate, and of two minute and simple longish-oval laminae, likewise inserted on both its sides at the sixth joint of the tail; these laminae were only about half as long as the false feet of the fifth joint of the tail.

From the notices which I have here briefly communicated respecting the development of some Decapods, it therefore results that several of these animals, as first discovered and described by Thompson, undergo a very considerable and highly remarkable metamorphosis, after having thrown off their egg-shells. I therefore confess that I have done Thompson injustice in not putting faith in that discovery, relying on the history of the development of the Cray-fish, and trusting too much to analogies in the structure of full-grown Decapods; perhaps likewise led into error by the examination of very small embryos of *Eriphia spinifrons* and of *Palæmon Squilla*. It results, however, from the above communication, and from the history which I have given of the Cray-fish (and which I intend next spring partially to subject to a revision), that different Decapods quit their eggs in a different stage of

development. *Pagurus*, *Galathæa*, and *Hyas* come out in a less developed state, since at the time of quitting the egg they do not even possess a trace of legs or branchiæ. *Astacus marinus*, on the contrary, and *Astacus fluviatilis* are at that time already provided with all the legs and branchiæ belonging to their organization. Other parts with which all Decapods appear to be then already furnished are in some at that time only slightly, in others, on the contrary, exceedingly far developed with respect to size. This relates especially to the antennæ. On the other hand, some possess in the commencement parts which are subsequently entirely lost; as, for instance, in *Astacus marinus* appendages on the legs for swimming, and in *Hyas Araneus* a considerably long spine on the upper side of its dorsal shield, while in other Decapods such parts never occur. Or, in some, parts vanish, which in others are permanent, as the snout in the *Paguri*, and the lateral laminæ of the fan in *Hyas*; and other parts again undergo such considerable changes in their form, that it becomes quite different, as, for instance, central lamina of the fan, the foot-jaws, and the antennæ of several species. One of the most remarkable phænomena is, however, this;—that in Decapods which inhabit the sea the members they employ for locomotion are in the commencement so organized that they can solely or principally be used for swimming (as appears to be the case with the Lobster); in the freshwater Crab, on the other hand, when it leaves the egg those apparatus have such a structure that they can only be employed for walking.

In conclusion, I would still direct attention to the circumstance, that although several Decapods, perhaps even the greater number of them, have in the commencement with respect to the form of their members great similarity with the Schizopoda, and especially with species of *Mysis*, yet the development of the two tribes of animals is very different in several other respects.

XXXI.—*Report of the Results of Researches in Physiological Botany made in the year 1839.* By F. J. MEYEN, M.D., Professor of Botany in the University of Berlin.

[Continued from p. 144.]

FROM C. Sprengel, the writer on Rural Economy, we have received a work on Manures*, which is not only of high *prac-*

* Die Lehre vom Dünger, oder Beschreibung aller bei der Landwirthschaft gebräuchlicher vegetabilischer, animalischer und mineralischer Düngermaterialien, nebst Erklärung ihrer Wirkungsart, Leipzig, 1839, 8. 456 Seiten.

tical value, but also contains additions to our science. In the introduction we first obtain a view of the theory which was followed by the author in the compilation of his work. Under *manure*, he understands everything which belongs either to the means of nourishment of plants or to their chemical composition. Besides carbon, oxygen, and hydrogen, the author mentions eleven others, viz. lime, magnesia, soda, potash, alumina, silicic acid, iron, manganese, chlorine, phosphoric acid, and sulphuric acid, which are also to be considered as manures, because they are found more or less in all plants; and indeed, says the author, "they are really manures; for if we strew a boggy or marshy soil with quartz sand, we soon see that plants, particularly grasses, grow better there! The manures are divided into such as merely nourish and strengthen the plants, as gypsum, salt, copperas ($\text{Fe S}^{\ddot{}}$), &c., and such as not only nourish but also act as solvents on several of the constituents of the soil, which are thereby converted into substances suitable for the nourishment of the plants; and to this group are reckoned dung, ashes, marl, &c. The generally received opinion, that minerals, as gypsum, nitre, copperas, &c. act as stimulants on the growth of plants, is considered by the author to be perfectly incorrect; as proof, he mentions that the completely putrified urine of horned cattle consists solely of mineral substances, dissolved in from 90 to 92 per cent. water, and that this is nevertheless one of the most excellent manures. Moreover, the manuring with saltpetre is adduced by the author, as a proof that mineral substances are to be considered as true manures, of which often only minute quantities are necessary in order to promote to an extraordinary degree the growth of plants. The author has here adduced two examples, which certainly appear very striking; but he has forgotten to add that the carbonate of ammonia in the urine is a substance which is completely decomposed in the interior of plants, and that its constituent elements belong to the principal components, or rather to the most excellent kinds of food of plants, and by this the principal argument which he brings forward in support of his theory is done away with. As far as concerns the manuring with nitre, it appears to me as if we were still in perfect darkness as to the explanation of the phænomenon, and that this cannot, at any rate, be used as a *proof* in favour of the author's theory. We know indeed that nitre may be contained in plants, but we do not know either how much of the nitre taken up from the soil is decomposed into its elements, or how much remains undecomposed; the acid of the nitre is probably again resolved into its elements, as in the

case of ammonia, and hence it is quite comprehensible why nitre mixed with the soil in proper quantities is so highly advantageous. The idea of the most celebrated chemists, that most vegetable substances require only carbon, hydrogen, and oxygen to their formation, and that beside these nitrogen is only necessary for some certain classes of bodies, is held by the author to be erroneous; for he assumes that gluten, legumin, &c. contain lime, phosphoric acid, sulphur, &c., besides their usual ultimate constituents, and that these substances (gluten, &c.) cannot make their appearance in the plants unless the above-mentioned inorganic bodies are combined with them. Sprengel assumes also, that the woody fibres are the skeleton of the plant, and consist of $\ddot{S}i$, $\dot{C}a$, $\ddot{A}l$, Fe, Mn, C, H, O, &c.; the chemists' idea that the fibres consist of the three last-mentioned bodies alone, is in his opinion quite false; for, says he, if one burns the purest possible fibres, there always remains a small residue of ashes consisting of the above-mentioned substances. It is a pity that the author has not stated more plainly what he means by "fibres;" vegetable anatomy teaches us the infinitely great variety in the physical properties of the membranes which form the cells, and he who has attentively followed with the microscope the formation of the deposits of new membranes, will plainly see that all those inorganic matters, or a great part of them, which are contained in solution in the sap, out of which the formation of the membranes proceeds, must exist either in the substance of the hardened membrane or in fine layers between the strata. Here, probably, are all the inorganic substances which accidentally enter into the sap, in larger or smaller quantity. The small quantity of ashes found in starch can only be explained in this manner. Perhaps, therefore, the author is in error when he compares the appearance of the above-mentioned matters in the cellular membrane of plants, with the deposition of phosphate of lime in the bones of animals, and I have already (in the former Reports) drawn attention to the insurmountable difficulties in the way of the experiment, or of a perfect purification of the cells.

The author considers dung, it is true, as the universal manure, but says, that sometimes even this is not sufficient, because it contains too little mineral matter. According to his ideas, therefore, the plants in such cases were in want of the true mineral manures, while, as is well known, this phenomenon is explained by others in a totally different manner.

The author also states very positively that the soil can then only produce good crops, when it is provided with the neces-

sary substances; it will always be the better if all that which it produced is left to it, for it is then manured not only by the vegetable matter produced, but also by the substances contained in the atmosphere, which mix with it in the form of dust dissolved as it were in the rain. After the introduction, the author treats largely of the external and internal structure of plants, or of the organs by which they exert their functions and procure nourishment, but this section must be designated as altogether unsatisfactory, which, however, has no further influence on the practical value of the work; it would, however, have been better if this part had also agreed with the present state of the science, for Vegetable Physiology has advanced so much in the last ten years, that it might have been presented in such a form as to have appeared both interesting and instructive, even to the practical agriculturist. The author has formed this section principally from the old (1827—1830) writings of DeCandolle, and now teaches some points which certainly DeCandolle himself has long since acknowledged to be erroneous; for instance, the root-spongioles, the ascent of sap in the intercellular passages, the excretions of the extremities of roots, by which plants are said to prepare their food, to kill others, &c. &c. The new experiments (former Report, p. 2) which have been instituted to ascertain the origin of nitrogen in plants, are looked upon by Sprengel as quite conclusive, and he correctly remarks, that we can never hope to obtain a clear idea of the nutrition of plants, unless we call in the assistance of chemistry. The author observed, that plants growing on a soil containing much chloride of sodium, evolved, beside oxygen, also much chlorine, which seems to me to prove that the nitrates also are decomposed when in the plants, and that the manuring properties of such substances may be explained in this manner, as has been already stated. To the functions of the leaves Sprengel reckons the following:—that they draw off from the other parts of the plants, particularly the young shoots, branches, and stem, the excess of fixed matters, on which account they often contain ten times as much of these bodies as other parts; however, this phænomenon has been explained by later physiologists in quite a different manner; moreover, there are a great number of plants in which the bark of the stem contains most mineral matters.

In another section Sprengel attempts to prove that a certain quantity of mineral matter is necessary for the growth of plants; the physiologists do not doubt this, but they explain it differently. The reason why bulbs which are grown in water do not last two years, is, according to the author, because the first time they are deprived of so much mineral

matter, that the quantity necessary for their second budding is wanting. The physiologists have until now explained this well-known phænomenon quite differently, and had the author examined accurately with the microscope such bulbs as have once flowered, he would have noticed in them a great loss of starch and gum, and in their stead a large quantity of crystals. Indeed the growth of many plants which hang in the free air, e. g. the *Ærಿದೆæ*, *Sedum Telephium*, &c., is said according to the author's view to be caused by mineral substances, which are deposited on the leaves as dust, partly dissolved by means of carbonic acid in the moisture of the room, and are then absorbed by the leaves. But here it is not difficult to see that he applies everything to defend his hypothesis, which goes through the whole of this, in other respects, valuable work; indeed, in some cases, where it is not at all necessary, e. g. in the last-mentioned; for we know already for certain, that such plants as grow in the air or in distilled water, consume their own reserves of nourishment, which are often very considerable.

We consider also not only as a perfectly improved hypothesis, that which the author says concerning the formation of organic bodies in plants, but we believe that in the present state of Vegetable Chemistry we dare not propose such views. Plants, namely, are said to form their organic bodies out of the inorganic matters which they receive from the soil or the atmosphere by the assistance of light, heat, electricity and water, in a manner which remains to us for ever incomprehensible. Such general doctrines as, "Plants organize inorganic matters, and animals vitalize the already organized vegetable matters," are indeed very attractive, but, as I believe, perfectly undemonstrated. Physiology teaches us that plants absorb all substances which are offered to them in a sufficiently fluid state, and if these substances act as poisons the plants die; but the author inculcates in this respect the following, quite improved, doctrine. Minerals, as lead, arsenic, copper, selenium, &c., are without exception hurtful to plants, they injure however one more and the other less; which is explicable by the fact, that the one plant more than the other, has the power of rejecting matters not belonging to its chemical composition, or if it has already taken them up, of ejecting them again, and this excretion takes place not only by means of the roots but also by means of the leaves, and these latter die partly thereby generally at the extremities. As an example to prove the latter statement very clearly, Sprengel states, that when a plant of barley a foot high is watered with a small quantity of a solution of a lead or copper salt, the

whole plant lives but several leaves die. This fact is certainly quite true, but we must explain it otherwise. If only a small quantity of a poison in a dissolved state is offered to a plant, and this poison is not one of the very strongest, like hydrocyanic acid, it is carried up (like all other dissolved substances) with the water through the stem into the leaves; where the process of digestion takes place; here, therefore, the poison collects and kills, but the whole plant does not die from its effects, because the quantity was too small to poison the large number of cells with their contained sap.

The practical part of the work begins, properly speaking, at page 80, and this section treats most circumstantially of all the different substances which have been recommended for manuring the soil, and, indeed, as fully as any agriculturist can wish; hundreds of analyses of the manures accompany the doctrines which the author brings forward concerning their application. This is clearly not the place to give a special account of what service has been done in this purely practical part of the work; we will only mention here observations and theories with which the author makes us acquainted in order to explain the action of this or that kind of manure, because this is in close connection with the study of the nutrition of plants.

It appears, from all observations, that food in the bodies of animals is not enriched with, but rather exhausted of matters fit for manuring, because the nourishing parts are extracted and retained by the animals; if however we see sometimes that animal excrements produced from a certain quantity of food, manure more powerfully than the food itself, it is only to be explained either by the quantity of mineral substances which are mixed with excrement, or we deceive ourselves in as much as the dung acts powerfully at first but does not exert this action for a long time, while the food manures at first feebly but afterwards lastingly. The dung of animals will, however, always be the worse, the poorer their food is, and in proportion as it is better digested and extracted by the animal. In speaking of the animal manures, the author always draws attention to the development of carbonate of ammonia, which is a substance so exceedingly nutritive for plants, and states that in the treatment of the dung the principal object to be held in view is to retain that ammonia, which may be done by solution in water, or still better by combining it with humic acid, which is contained in sufficient quantity in mould. With regard to the celebrated manuring with bones which has been tried with such great success in England, the author says he has convinced himself that nothing but

the bone earth (phosphate of lime $\text{Ca}^{\text{s}} \overset{\cdot\cdot\cdot}{\text{F}}^{\text{s}}$) is the manure, and that this substance only does good in such a soil as is poor in it, which is said not to be the case in Mecklenburg and northern Germany, on which account no such astonishing success has been seen to result from manuring with bones. On the contrary, the English soil is said to have been exhausted of its phosphate of lime by the repeated cultivation of wheat, so that in it this manure is very successful. We have shown in the commencement the views which the author takes of the action of mineral substances as manures, and, according to it, the action of several, as lime, marl, gypsum, &c., are explained; if these substances are not present, or are in only small quantities in the soil, then they must be added, and in order to ascertain this it is absolutely necessary to examine the soil chemically. If one wishes to manure with marl, both the marl and the soil must be first examined, for marls are very variable in their composition, and it is not every one of them which will suit one particular soil.

From M. Pabst we have received another very important work on Agricultural Economy*, which treats of the cultivation of plants agriculturally, but it is quite practical. He who wishes for any information concerning the cultivation of those domestic plants which can be produced in our country, will find in this work sufficient instruction.

[To be continued.]

XXXII.—*A Synopsis of the Genera and Species of the Class Hypostoma (Asterias, Linnæus).* By JOHN EDWARD GRAY, Esq., F.R.S., Keeper of the Zoological Collection in the British Museum.

[Continued from p. 184.]

Fam. 3. PENTACEROTIDÆ, Gray, *Syn. Brit. Mus.*

The body supported by roundish or elongated pieces, covered with a smooth or granular skin, pierced with minute pores between the tubercles.

A. Pentacerotina. *Body pentagonal or suborbicular, rays short, dorsal wart single, the ambulacra edged with a series of small spines divided into rounded groups.*

a. *The ambulacra with a single series of large spines near the edge.*

* *Body suborbicular, convex above and below; covered above and below with granules, and scattered conical tubercles.*

* Lehrbuch der Landwirthschaft. Zweiten Bandes. 1^a Abtheilung Specielle Productionslehre. Darmstadt, 1839.

I. CULCITA, Agassiz.

Culcita Schmideliana. *Asterias Schmideliana*, *Retz. Naturforscher*, xvi. t. 1. Ast. placenta. Ast. discoidea, *Lam.*

Inhab. Lord Hood's Island, on reefs. *H. Cuming, Esq.*

Bright orange when alive, when in the water very convex.

** *Body pentagonal, formed of variously shaped, regularly arranged, externally granular ossicula.*

2. PENTACEROS.

Body convex above, margin with 2 rows of large spine-bearing tesseræ.

a. *Back formed of irregular elongated ossicula, apparently reticulated; the spines with enlarged bases, interspaces closely punctured.*

1. *Pentaceros grandis*, *Seba*, t. 8. f. 1. Arms very broad, as wide as long at the base, only half as long as the width of the body.

Diam. 17".

Inhab. ———.

2. *Pentaceros reticulatus*. *Asterias reticulata*, *Linn.* Arms rather broad, nearly as long as the width of the body; back convex. *Monstrosity* 4-lobed, *Rumph. Mus.* t. 15. f. D.

Inhab. West Indies, Barbadoes. *Ralph Green, Esq.*

3. *Pentaceros gibbus*, *Linck*, t. 23. f. 36. *Seba*, iii. t. 7. f. 1. Arms rather shorter than the width of the body, back depressed.

Inhab. West Indies and St. Vincent's. *Rev. L. Guilding.*

See also *Pentaceros lentiginosus*, *Linck*, 25. t. 41, 42. f. 72. Ast. pentacyphus, *Retz.*, with smaller spines and a nearly spineless margin; and 2. *Pentaceros horridus*, *Linck*, t. 25. f. 40.

4. *Pentaceros Cumingii*, *Gray*. The arms rather narrow, nearly as long as the diameter of the body; marginal spines few, small; back rather depressed, with conical protuberances, bearing small spines.

Diam. 12".

Inhab. Punta Santa Elena. Rocky ground 12 or 18 fathoms. *H. Cuming, Esq.*

Perhaps the young of a much larger species.

5. *Pentaceros hiuculus*, *Linck*, t. 26. f. 41. Ast. nodosa, a. *Lamk.* Arms rather narrow, nearly as long as the width of the body, with a single series of blunt tubercles; back rather depressed, with a central large tubercle, on each angle of the centre.

Inhab. Isle of France. *Dr. W. E. Leach.*

In *Linck's* figure the spines are rather larger than in our specimens of nearly the same size.

6. *Pentaceros Chinensis*. Rays elongated, nearly as long as the width of the body, with small blunt marginal tubercles; back high, with 4 or 5 small central tubercles, and a very large blunt tubercle at each angle.

Inhab. China. *J. Reeves, Esq.*

The central dorsal series of tesseræ are not armed with spines; are they so in larger specimens?

7. *Pentaceros Franklinii*. Rays elongate, as long as the width of the body, with a dorsal series of broad blunt tubercles; back high, with very large spines at each angle, margin not armed.

Var. 1. With one or two conical tubercles on each side of the tubercles, near the one at the angle of the central dorsal disk.

Inhab. Coast of New Holland. *G. Bennett, Esq.*

See also *Pentaceros turritus*, Linck, t. 22. 23. f. 3. Like the former, but the back is more spinose, and the spines are not so large.

8. *Pentaceros muricatus*, Linck, t. 7. f. 8. *Ast. Linckii, Blainv. A. nodosa, Lam. Seba, iii. t. 7. f. 3.* Arms elongated, nearly as long as the width of the body, with a dorsal series of large, and with 2 or 3 large conical spines near the tips; back rather high, spinose.

Inhab. —. *Brit. Mus.*

b. *Back formed of irregular flat-topped ossicula, placed in rows so as to appear nearly tessellated; arms elongated, rather narrow.*

9. *Pentaceros nodosa. Asterias nodosa, Gmelin (part), Seba, iii. t. 8. f. 11, 12. (t. 5. f. 11, 12. without spines on the margin?)* Arms with a double series of hemispherical tubercles; back rather depressed; marginal ossicula unequal, lower one with small blunt conical spines.

Inhab. Isle of France. *W. E. Leach, M.D.*

c. *Back formed of regular rounded ossicula, placed in rows; back rather low.*

10. *Pentaceros aculeatus, Seba, iii. t. 5. f. 5. 6.* With 3 ridges of small spine-bearing tubercles; back rather depressed, with three small spines at the angles; marginal ossiculae rounded, with conical tubercles.

Var. ? or younger? Spine-bearing ossicula further apart, with the skin and granulations worn off and bleached, *Seba, iii. t. 7. f. 1.*

Inhab. West Indies, St. Vincent's. *Rev. L. Guilding.*

See also *Pentaceros spinosa. Ast. nodosa (part), Gmel. Seba, iii. t. 5. f. 7, 8., and var. Seba, iii. t. 7. f. 1, 2.* Ossicula oblong, with 2 or 3 small conical tubercles.

d. *Back regularly convex, formed of flat granular ossicula with a blunt mobile spine on the centre of each ossicula below; arms short, broad. Nidorellia.*

11. *Pentaceros armatus, Gray.* Arms short, broad, the lower marginal and the 3 last upper marginal plates at the top with short blunt spines; back convex, with central and lateral groups and a series of spines down each arm. Young more convex; spines shorter, blunter and fewer. Younger not so convex, without any marginal spines, and only indications of them on the back.

Inhab. Punta Santa Elena. Rock ground, 12 to 15 fathoms. *H. Cuming, Esq.*

3. STELLASTER. Gray.

Body depressed, covered with large flat regular six-sided plates, margin with 2 rows of large tesserae; the lower rows with a series of compressed mobile spines.

1. *Stellaster Childreni*. Back convex, with 1 or 2 blunt tubercles on the angles of the centre, arms three quarters the length of the width of the body, narrow, attenuated to a blunt recurved tip. Young, back without any tubercles.

Inhab. China or Japan?

4. COMPTONIA, Gray.

Body depressed, spinose? dorsal and oral disk covered with very small flat plates, marginal ossicula large, without any mobile spines.

1. *Comptonia elegans*, Gray. Fossil. Black Down.

The fossil genus CŒLASTER, Agassiz, from Maestricht, appears to be most nearly allied to this genus, but the plates of the oral disk (which alone are known) appear to be linear longitudinal.

*** *Body pentagonal, formed of variously shaped rather rough ossicula sunk into a naked skin, with a single series of spine-bearing tubercles.*

5. GYMNASTERIA, Gray.

1. *Gymnasteria spinosa*. Rays triangular, tapering, about one quarter longer than the width of the body, with a dorsal series of conical cylindrical tubercles. Young with a few spines on the margin and back of the arms. Allied to PORANIA.

Inhab. Panama, fine sand, 16 fathoms. *H. Cuming, Esq.*

2. *Gymnasteria inermis*. Rays rapidly tapering, convex above without any spines.

Inhab. Panama, fine sand, 10 fathoms. Half the size of the young, spined specimens of the former species.

b. *The ambulacra with 2 series of larger spines near the edge; body depressed; back flat.*

* *The ossicula granulated, sunk in the skin, often spine-bearing.*

6. PAULIA, Gray.

Body 5-rayed, formed of flat granulated spine-bearing irregular ossicula on the disk and margin without any 2-lipped pores.

Paulia horrida. Chestnut brown; spines acute.

Var. Smaller, arms as long as the width of the body, rather tapering, spines smaller, blunt, rounded at the tip; back more closely granulated.

Inhab. Punta Santa Elena. Rocky ground, 12 to 18 fathoms. *H. Cuming, Esq.*

7. RANDASIA, Gray.

Body pentagonal, with a tubercular skin above, and large granular plates beneath and on the margin, without any 2-lipped slits, but with one or two small pores near the oral angle beneath, where the tubercles are rubbed off. Allied to CULCITA.

1. *Randasia Luzonica*. Thick, brown, the tubercles of the under side unequal, the larger ones flat-topped: sides straight.

Inhab. Island of Luçon, in the Port of Sual. *H. Cuming, Esq.*

8. ANTHENEA, Gray.

Body 5-rayed, chaffy, with immersed elongated tubercle-bearing ossicula; margin with regular rows of large tesserae; both surfaces (especially the under) scattered with large 2-lipped pores.

1. *Anthenea chinensis*, Gray. *Asterias chinensis*, Gray, *Brit. Mus.* Back obscurely netted, rather chaffy, with scattered truncated tubercles in rather diverging lines; marginal plates not tubercled; rays broad, half the length of the width of the body.

Inhab. China, Japan. *J. Reeves, Esq.*

See also Seba, iii. t. 6. f. 5, 6. (*Ast. tessellata*, var. A. Lam.). Similar, but the dorsal tubercles are larger and angular.

9. HOSIA, Gray.

Body 5-rayed, formed of distinct, hexangular, nearly equal, slightly tubercular ossicula; back with small and beneath with larger 2-lipped slits.

Hosia flavescens. Arms two-thirds the length of the width of the body.

Inhab. ——. Perhaps young.

See also *Asterias granularis*, *Retz. in Muller Zool. Dan.* t. 92. f. 1. 4. From the North Sea. Gmelin referred to Linck, t. 13. f. 22. t. 23. f. 37?—t. 24. f. 39. and t. 27. f. 45. all *Goniaster tessellatus*, for this species? as he also has done to *Ast. equestris*.

** *The ossicula of the upper and lower surface and the margin smooth, with a single continued series of uniform granules round each of their edges.*

10. HIPPASTERIA, Gray, *Syn. Brit. Mus.*

Body 4 or 5-sided, formed of roundish ossicula, with a large truncated central tubercle; upper and lower surface with 2-lipped pores.

1. *Hippasteria Europaea*. *Asterias equestris*, *Penn. B. Z.* iv. 130. *Sow. Brit. Mus.* f. 3. not Muller nor Lamk. Rays 5, broad, nearly half as long as the width of the body, marginal ossicula with three blunt tubercles placed in a central cross series.

European Ocean.

2. *Hippasteria Johnstoni*. *Asterias Johnstoni*, Gray, *Johnst. Mag. Nat. Hist.* 1836. vi. f. 21. *not Chiaje*. Rays 4, elongated, slightly tapering, back spinulose with short truncated spines, margin with 3 or 4 series of elongated tapering spines.

North of England.

See also *Hip. plana*. *Pentaceros planus*, Linck, 21. t. 12. f. 21. (*Ast. equestris*, *Gmelin and Lam.*), which chiefly differs in the arms appearing longer. 2. *H. cornuta*, *Pent. longiorum cornuum*, Linck, 43. t. 33. f. 53, with the arms still longer and more slender at the end. All four are perhaps varieties of one; Gmelin refers for this species to Linck, t. 5. f. 13; an *Astropecten*, t. 13. f. 22. t. 23. f. 37. t. 24. f. 39. and t. 27. f. 45. all *Goniaster tessellatus*.

11. CALLIASTER, Gray.

Body 5-rayed, with flat immersed ossicula armed with flat-based deciduous conical spines, and without any 2-lipped slits on either surface.

1. *Calliaster Childreni*, Gray. Gray, back slightly convex, with a centre, a ring and 5 radiating lines of small spines; rays slender, tapering, as long as the width of the body; each of the marginal pieces with a central series of 3 distant spines.

Inhab. —.

c. *Ambulacra* with 3 or 4 series of equal close larger spines near the edge; body depressed, flat; marginal ossicula large, smooth, 2-rowed, with only a single series of granules on each of their edges.

12. GONIASTER.

Ossicula flat, the dorsal ossicula granulated and armed with deciduous flat-based spines; both surfaces destitute of any 2-lipped slits.

In the younger specimens only the middle of the back and the central dorsal lines of the rays are spine-bearing, but as the animal enlarges the other tesseræ on the sides become covered, and at length they are separated into groups by the groove extending from the centre to the angle of the margin between the rays. The tubercles easily fall off in the dry specimens, leaving a smooth distinct flat scar.

1. *Goniaster cuspidatus*. *Pentagonaster semilunatus cuspidatus*, Linck, 21. t. 23. f. 37. perfect; t. 22. f. 39. imperfect; and *Seba*, iii. t. 6. f. 9. perfect. *Ast. tessellatus*, *D* and *C. Lam.* Body 5-angular, sides curved, arms broad, triangular, rather more than half as long as the width of the body.

Inhab. —.

2. *Goniaster Sebæ*, *Seba*, iii. t. 8. f. 2. differs in the sides of the rays being angularly inflexed.

3. *Goniaster regularis*, *Seba*, iii. t. 8. f. 4, copied for *Pentagonaster regularis*, Linck, 20. t. 13. f. 22. Body with five nearly straight sides.

13. PENTAGONASTER, Gray.

Body formed of convex, smooth, and spineless ossicula; the ossicula of the under side with a central sunk line with a central perforation and a small pit at each end. The marginal ossicula near the tips of the rays very large and swollen.

1. *Pentagonaster pulchellus*. *Asterias pulchella*, Gray, *Encycl. Metrop.* t. . f. . Body with 5 deeply concave sides, with 4 oval convex tubercles on each side, and a small one interposed between the angles of each of them.

Inhab. China.

When the large apical tubercles have been injured it becomes divided into small unequal ones.

14. *TOSIA*, Gray.

The body formed of smooth and spineless ossicula, rather convex; the dorsal and ventral ossicula entire, without any impressed line, subequal; the marginal ossicula 2-rowed, with a small intermediate one near each tip; dorsal wart triangular.

1. *Tosia australis*. Body flat, with 5 slightly inflexed sides, the central interradiial dorsal ossicule largest, marginal 6 above and below, with a small intermediate ossicule at the top of each side, the lower gradually diminishing in size towards the top.

Inhab. Swan River, Port Lincoln, and Van Diemen's Land.

The granules between the ossicula are deficient in the dead and washed specimens. There are 3 or 4 fossil species in the chalk.

B. *Echinasterina*. *The body discoidal, many-rayed, skeleton netted with numerous elongated doubly mobile articulated spines on mammillary tubercles; dorsal warts numerous.*

15. *ECHINASTER*, Gray, *Syn. Brit. Mus.* 62.

Body star-like, granulated, depressed; back rather convex, with a circle of 10—15 conical dorsal warts! Ambulacral spines small, placed in groups with a single continuous row of large slender spines near them. The spines are very long and covered with a granular skin, and have generally a second articulation about one-third the length from the base.

1. *Echinaster Ellisii*, Gray. *Asterias Echinus*, *Solander and Ellis*, t. 60, 61, 62. *Asterias Echinites*, *Lam.* Dorsal warts 15; rays 11, or 12; spines large, thick.

Inhab. South America. *H. Cuming, Esq.*

2. *Echinaster solaris*. *Asterias solaris*, *Naturforscher*, xxviii. t. 1, 2. Rays 21; spines small; dorsal warts 10.

Inhab. —.

C. *Cribellina*. *The body divided into cylindrical, elongated rays; dorsal wart single.*

a. *Ambulacra with a single series of crowded filiform spines, sometimes united by a membrane at their base.*

†. *Smooth, the rays netted, with mobile spines, with impressed dots between the net work; dorsal wart convex, flat-topped, with a few radiating grooves.*

* *Spine single, large, on the junction of the ossicula, placed in equidistant series.*

16. *OTHILIA*, Gray.

Skin smooth, polished; ambulacra with two very close series of filiform spines.

1. *Othilia spinosa*. *Asterias spinosa*, *Retz*. *Pentadactylosaster spinosus*, *Linck*, t. 4. f. 17. *Asterias Echinophora*, *Lam.* n. 25. not *Chiaje*. Rays rather more than twice the length of the width of the body.

Inhab. North America, Virginia.

2. *Othilia aculeata*. Rays cylindrical, more than 3 or 4 times as long as the breadth of the body, with 7 rows of acute spines. Young (or *Var.*) arms with only five series of similar spines.

Inhab. Guacomayo, Central America, fine sand, 13 fathoms. *H. Cuming, Esq.*

3. *Othilia multispina*. Rays short, depressed, broad, rather more than twice as long as the width of the body, blunt at the end, with 11 rows of acute distant spines.

Inhab. —.

4. *Othilia purpurea*. Purplish, rays cylindrical, nearly three times as long as the width of the body, with numerous short, rather blunt spines; under side with cross wrinkles, and 2 or 3 series of pores parallel to the ambulacra. *Monstrosity* 4-rayed.

Inhab. "Isle of France." *W. E. Leach, M.D.*

5. *Othilia Luzonica*. Reddish brown, rays 5 or 6, elongates 4 times as long as the width of the body, with many blunt spines.

Inhab. Isle of Luzon. *H. Cuming, Esq.*

17. METRODIRA, Gray.

Slightly granular; rays slender, with large single pores and small scattered spines on the back; smooth, and formed of regular flat ossicula on the sides.

1. *Metrodira subulata*. Yellow brown; rays elongated, slender, tapering.

Inhab. Migupou. *H. Cuming, Esq.*

** *Spines small, crowded, scattered on the sides and at the junctions of the slender ossicula.*

18. RHOPIA, Gray. *Stellonia* part, *Agassiz*.

Ambulacral spines long, with several series of larger spines near them.

1. *Rhopia seposita*. *Asterias seposita*, *Retz. Nov. Ac.* 1783. 229; *Gmel.* 3182; *Lam.* n. 30; *Seba*, iii. t. 7. f. 5. *Pentadactylosaster reticulatus*, *Linck*, t. 4. f. 5. *Stellonia seposita*, *Agassiz*.

2. *Rhopia Mediterranea*. Yellow, rays 6, tapering, nearly three times as long as the width of the body; spines short, cylindrical. *Var.?* Rays 7, unequal; spines shorter.

Inhab. Marseilles.

†† *Granulated, the rays above largely tubercular, not spinose, with minute dots between the tubercles, beneath uniform; dorsal wart triangular, irregularly punctate and contorted.*

19. FERDINA, Gray.

Body flat; rays broad, convex and warty above, flat and uniform beneath; ambulacral spines short, united at the base.

1. *Ferdina flavescens*. Yellow, brown varied; rays near half as long again as the width of the body, uniformly tubercular, blunt.

Inhab. Isle of France. *W. E. Leach, M.D.*

2. *Ferdina Cumingii*. Yellow or brown; rays rather longer than the width of the body, with a central and a marginal row of larger rounded tubercles and some scattered smaller ones; the larger tubercles on the sides are red when the granules are rubbed off, which they often are.

Inhab. West Coast of Columbia. *H. Cuming, Esq.*

b. *The ambulacra with a series of very small short filiform spires (placed in pairs) with a parallel series of spines near them; the rays formed of longitudinal series of tubercles united by transverse ossicula; dorsal wart intricate.*

* *Spines near the ambulacra larger than the ambulacral ones.*

20. DACTYLOSASTER, Gray.

Rays cylindrical, nearly smooth, formed of regular oblong ossicula, each furnished with a central group of unequal short mobile tubercles; dorsal wart 1.

1. *Dactylosaster cylindricus*. *Asterias cylindrica, Lam.* Gray, Ency. Metrop. t. . f. . Reddish, brown marbled, rays elongated, cylindrical, blunt, with 8 rows of groups of spinose tubercles, 3 times as long as the width of the body.

Inhab. "Isle of France." *W. E. Leach, M.D.*

2. *Dactylosaster gracilis*. Reddish, brown marbled, rays slender, four times as long as the width of the body, with 7 rows of groups of small spines.

Inhab. West Coast of Columbia. *H. Cuming, Esq.*

21. TAMARIA, Gray.

Rays cylindrical, formed of 7 series of granular convex roundish ossicula, each of the upper ones with 3 or 4 unequal and the lower ones with a central short blunt spine.

1. *Tamaria fusca*. Brown; rays rather tapering.

Inhab. Migupou. *H. Cuming, Esq.*

22. CISTINA, Gray.

Rays cylindrical, nearly smooth, formed of rows of 3-lobed flat ossicula, each furnished with a central mobile spine; dorsal warts (1 or 2) oblong.

1. *Cistina Columbiae*. Yellow, arms rather more than 4 times as long as the width of the body, with 7 rows of spines.

Inhab. West Coast of Columbia. *H. Cuming, Esq.*

The larger specimen has two very distinct dorsal warts, but I can only see one very obscure one in the smaller specimen. It may be a monstrosity in the large specimen.

23. OPHIDIASTER, Agassiz.

Rays cylindrical, elongate, uniformly granular all over, without any spines; back with a small central group of larger tubercles; dorsal wart concave with radiating or twisting grooves.

† *Rays cylindrical, blunt.*

1 *Ophidiaster aurantius*. Orange, rays with 7 rows of rounded tubercles, about 4 times as long as the width of the body; spines near the ambulacra short, ovate, club-shaped.

Inhab. Madeira, rocks on Porto Santo Laurenço. *Rev. R. T. Lowe*.

2. *Ophidiaster Leachii*. Rays elongate (smooth?) with 8 or 9 irregular rows of unequal tubercles. The spines near the ambulacra club-shaped, rather dilated and more compressed at the tip.

Inhab. "Isle of France." *Dr. W. E. Leach*.

3. *Ophidiaster Guildingii*, Gray. Pale brown (dry), rays cylindrical, 4 times as long as the width of the body, with 7 series of moderate tubercles; the spines near the ambulacra compressed, thin ovate. *Var.* 1. female? Rays thick, spaces between the tubercles large, with numerous dots. *Var.* 2. male? Rays thin, spaces between the tubercles small, with 4 or 6 dots.

†† *Rays round, tapering, acute.* Hæcelia.

4. *Ophidiaster attenuatus*. Rays rounded, elongate, nearly 4 times as long as the width of the depressed body, broad at the base and tapering, with 9 rows of triangular tubercles; spines near the ambulacra large, ovate, blunt.

Inhab. —. *Brit. Mus.*

††† *Rays triangular, tapering, with 3 interrupted bands of pores on each side.* Pharia.

5. *Ophidiaster pyramidatus*. Rays subangular, elongate, nearly 4 times as long as the width of the pyramidal body, with 7 rows of tubercles; the central dorsal series much the largest; spines near the ambulacra ovate, subacute.

Inhab. Bay of Caraccas, West Colombia, on the rocks. *H. Cuming, Esq.*

** *Series of spines near the ambulacra nearly of the same size as the ambulacral ones.*

24. LINCKIA (not Micheli), *Linkia*, Nardo and Agassiz, not Persoon nor Cav.

† *Rays 5, cylindrical, with the groups of pores scattered on the whole surface.*

1. *Linckia Typus*, Nardo. *Pentadactylosaster miliaris*, *Linck*, t. 28. f. 47. *Ast. lævigata*, *Linn.*, *Lam.* 39. Pale yellow (dry), rays cylindrical, elongate, rather tapering at the end, nearly 7 times as long as the width of the body; back and sides with equal-sized tubercles, and moderate sized dotted interspaces on the sides; apical tubercles moderate. *Distorted*; *Asterias cometa*, *Blainville*.

Inhab. Mediterranean, *Linn.* Egypt, *Sir J. G. Wilkinson*.

See also *Linckia franciscus*, *Nardo*, and *Asterias multiforas*, *Lam.* n. 37.

2. *Linckia crassa*. Rays elongate, thick, cylindrical, blunt at the

ends, nearly 3 times as long as the width of the body; apical tubercle indistinct.

Inhab. — ?

3. *Linckia Brownii*, Rumph. Amb. t. 13. f. E? Seba, Mus. iii. t. 6. f. 13, 14. Grew, Mus. t. 8. f. 1, 2? Rays elongate, cylindrical, rather tapering at the end, 4 times as long as the width of the body; back of the arms with 3 or 4 rows of small tubercles; sides with 4 rows of large pierced spots; apical tubercle moderate.

Inhab. New Holland. *Rob. Brown, Esq.*

4. *Linckia Leachii*. Rays elongate, slender, cylindrical, rather tapering; sides with 3 or 4 rows of rather convex tubercles; apical tubercle indistinct?

Inhab. "Isle of France." *Dr. W. E. Leach.*

Very like *L. Typus*. Our specimens, which are almost all young of the *Comet variety*, are only to be distinguished from that species by the arms being slenderer. The adult may differ more.

5. *Linckia Guildingii*. Brown, olive varied; rays slender, elongate, cylindrical, nearly equal, largely granular; back and sides with groups of 3 or 4 holes between the interspaces of the tubercles, apical tubercles large and convex. *Monstrosity* 6-rayed.

Inhab. St. Vincent's. *Rev. L. Guilding.*

Differs from *L. Typus* principally in being much smaller and slenderer.

6. *Linckia pacifica*. Rays elongate, cylindrical, rather tapering at the end, 6 times as long as the width of the body, with close oblong convex ossicula, apical tubercle indistinct; the series of spines near the ambulacra crowded together with them.

Inhab. Tahiti on the reefs. *H. Cuming, Esq.*

7. *Linckia Columbiae*. Rays elongate, cylindrical, rather tapering at the end, covered with large coarse granulations; series of spines very close to the ambulacral spines, oblong and truncated. *Monstrosity*, with 1 of the rays long, rest small, reproduced.

Inhab. West coast of Columbia. *H. Cuming, Esq.*

†† Rays 5, rather trigonal, with 1 or 2 continued bands of pores without any intervening tubercles on each side. *Phataria*.

8. *Linckia unifascialis*. Rays trigonal, tapering; back with 3 rows of flat ossicula; sides with a single broad band of pores; rather more than 3 times as long as broad.

Inhab. Bay of Caraccas, West Columbia, on the rocks at low water. *H. Cuming, Esq.*

9. *Linckia bifascialis*. Rays trigonal; back with 4 or 5 rows of irregular convex ossicula at the base, and many at the end of the ray, sides of the ray with 2 broad bands of pores at the base and 1 at the end.

††† Rays depressed, with a single pore between each dorsal ossicula, and a narrow band of a few pores along each side of the arm. *Acalia*.

10. *Linckia pulchella*. Brown, rays flat, nearly 3 times as long

as the width of the body; the spines near the ambulacra oblong, compressed, truncated.

Inhab. —.

11. *Linckia intermedia*. Rays elongate, cylindrical, rather tapering at the end, formed of oblong convex ossicula; pore on the back single, on the sides in 2 rows of groups of 3 or 4, the series of spines on the side of the ambulacra separate from it and from one another.

Inhab. —.

12. *Linckia Erythræa*. Rays elongate, cylindrical; the row of small spines near the ambulacra double in some part of its length.

Inhab. Red Sea. *James Burton, Esq.*

c. *Ambulacra with a series of short filamentous spines, placed in groups of 4 or 5 (1 group on each ossicula); rays formed of series of tubercles with (1 or 2) small holes between them, and covered with granules.*

* *Rays with only 1 (or 2) series of small blunt spines on the side of the ambulacral spines.*

25. FROMIA, Gray.

Rays 5—8, flat, triangular, formed of flat-topped granular tubercles.

1. *Fromia milleporella*. *Asterias* Sebæ, *Blainv.*, *Seba*, *Thesaur.*, t. 8. f. a. b. *Asterias* Millepora, *Lam.* Rays flat, pale yellow (dry.).

Var. 1. Rays 6, rather slender; *Var.* 2. rays 7, slenderer; *Var.* 3. larger, 5 or 6-rayed.

Inhab. Isle of France, *Dr. W. E. Leach*. Indian Ocean, *Gen. Hardwicke*. Red Sea. *James Burton, Esq.*

26. GOMOPHIA, Gray.

Rays elongate, cylindrical, tapering, with a terminal tubercle; back with large rounded tubercles; back of the rays with series of large conical convex tubercular spines; the spines near the ambulacra small, crowded.

1. *Gomophia Egyptiaca*. Rays tapering, acute, 4 times as long as the width of the body, with 5 irregular rows of conical acute tubercles.

Inhab. Egypt. *Sir J. G. Wilkinson*.

** *Rays with the series of spines on the side of the ambulacra gradually passing into the granulations which crowd on them.*

27. NARDOA, Gray.

Rays cylindrical, spineless, formed of large granular convex ossicula.

1. *Nardoa variolata*. *Asterias* variolatus, *Lam.* 36; *Oudart*, t. . f. . *Pentadactylosaster* variolatus, *Linck*, t. 8. f. 10. *Linckia* variolosa, *Nardo*.

Inhab. Mediterranean Sea.

2. *Nardoa Agassizii*, Gray. Rays cylindrical, tubercles subequal.

Var. 1. 4-rayed, *Linck*, t. 1. f. 1; *Var.* 2. 6-rayed. *Monstrosity* 1, 7-rayed. *Monstrosity* 2, 3-rayed, with 2 short rays on the opposite side. *Monstrosity* 3, with 1 ray bifid, *Linck*, t. 14. f. 2. 4.

Inhab. Isle of France. *Dr. W. E. Leach.*

3. *Nardoa tuberculata*, Gray. Rays cylindrical, with scattered hemispherical larger tubercles.

Inhab. Island of Luzan, Port of Sual. *H. Cuming, Esq.*

28. NARCISSIA, Gray.

Body pyramidal, thin, coriaceous, uniformly granular; rays tapering, elongate, triangular on the base, formed of thin flattened ossicula.

1. *Narcissia Teneriffæ*. Rays tapering, elongate, acute, more than 4 times as long as the width of the body.

Inhab. Teneriffe. *Brit. Mus.*

29. NECTRIA, Gray.

Body rather pyramidal, coriaceous, scattered with truncated warts, granular at the top; rays roundish, produced, edged with 2 series of flat granular warts on each side, beneath largely granular.

1. *Nectria oculifera*. *Asterias oculifera*, *Lam.* n. 5; *Oudart*, t. . f. .

Inhab. ——. *Brit. Mus.* .

30. NEPANTHIA, Gray.

Body small, flat; rays very long, cylindrical, tapering, not margined, formed, above and below, of many regular longitudinal and transverse series of flat-topped tubercles, furnished at the top with a series of elongate spine-like granulations.

Intermediate between *Astropectinidæ* and *Cribellinæ*, but the rays are not margined, and the spines at the top of the tubercles are not regularly radiately disposed.

1. *Nepantia tessellata*. Brown; rays elongate, slender, tapering, with series of square warts.

Inhab. ——. *Brit. Mus.*

2. *Nepantia maculata*. Gray with black spots; rays rather depressed, blunt, middle of the back with oblong transverse, and the sides with squarish, warts.

Inhab. Migupou. *H. Cuming, Esq.*

d. *Ambulacra with very fine long hair-like spines placed in rounded groups, with a series of large spines near them.*

31. MITHRODIA, Gray.

The rays cylindrical, elongate, spinulose; the skeleton netted with scattered small rugose spines, and series of large clavate spinulose spines regularly articulated to a broad expanded base on the sides of the arms.

1. *Mithrodia spinulosa*. *Asterias clavigera*, Lam. n. 29? *Pentadactylosaster reticulatus*, Linck, t. 6. and 10. f. 16? *Asterias reticulata*, Blainv. Man. ? not Linn. nor Lam. Arms 5 times as long as the width of the body, with a series of large spines on each side.

The series of spines next to those on the edge of the ambulacra are sometimes hatchet-shaped.

e. *The ambulacra with 2 or 3 series of equal equidistant filiform blunt spines on each side.*

32. UNIOPHORA, Gray.

Body rather depressed; rays broad, blunt; skeleton formed of series of transverse oblong ossicula, each bearing a large unequal sized subglobular articulated spine placed in longitudinal series; dorsal wart convex, complicated.

1. *Uniophora globifera*. Rays short, broad, rounded with globular tubercles.

Inhab. Van Diemen's Land. *Ronald Gunn, Esq.*

See also *Asterias granifera*, Lam. n. 24.

Fam. 4. ASTERINIDÆ, Gray, *Syn. Mus.* 62.

Body discoidal or pyramidal, sharp-edged; skeleton formed of flattish imbricate plates; dorsal wart single, rarely double.

1. PALMIPES, Linck.

Body flat, thin, nearly membranaceous; margin radiately striated; the dorsal ossicula with a radiating tuft, and the oral ones with a transverse line of many thin mobile spines; ambulacral spines in oblique rounded groups.

1. *Palmipes membranaceus*, Linck, t. 1. f. 2. 2. *Ast. membranacea*, Retz. and Lam. *Ast. placenta*, Pennant. *Ast. cartilaginea*, Fleming. *Ast. rosacea*, Lam. *a broken specimen*?—Rays 5 broad.

Inhab. British Ocean, Plymouth Sound. Mediterranean?

2. *Palmipes Stokesii*. Rays 15, acute. *Mus. Mr. Stokes.*

See also *Asterias pulvillus*, Muller, *Zool. Dan.* t. 19. f. 1, 2; *Ast. equestris* and *Ast. militaris*, Muller, of the North Sea; and *Ast. Luna*, Linnæus, from India. All species I have not been able to see.

2. PORANIA, Gray.

Body pyramidal, thick, five-rayed, skin above and below varnished, spineless; dorsal ossicula irregular; the margin with 2 series of large ossicula, the lower ones produced sharp-edged, and each furnished on the edge with a series of mobile spines; the ambulacra with 2 series of mobile spines, each pair on a separate ossicule; the upper marginal ossicula trigonal, imbricate; the dorsal ones unequal, irregular, the central of the lower marginal ossicula with 4 and the apical ones with a pair of spines.—Allied to *Gymnasteria*.

Porania gibbosa. *Asterias gibbosus*, Leach, *Brit. Mus.* 1817.

Ast. Equestris? *Thompson, Mag. Nat. Hist.* ix. 237. *Goniaster Templetoni*, *Forbes, Wern. Trans.* 1839. 6.

Inhab. Isle of Arran and Plymouth Sound, *Dr. W. E. Leach*, 1817. Isle of Man, Douglas Bay, *J. R. Wallace, Esq.*

2. *ASTERINA*, Nardo.

Body rather pyramidal, 5-rayed; the back convex; the oral surface flat; the ossicula of each surface furnished with 1 or more mobile tapering spines; the margin sharp-edged, each of the ossicula with a marginal series of spines; ambulacral spines placed in groups of 4 or 5.

1. *Asterina gibbosa*, *Forbes. Asterias gibbosa, Pennant, B. Z.* iv. 121. n. 6; *Flem. B. A.* 486. *Pentaceros plicatus et concavus, Linck*, 25. t. 3. f. 20. *Asteriscus exigua, Pet. Gaz.* t. 16. f. 8. *Ast. minuta, Linn.?* *Ast. stellata obtusa ciliata, Linn. F. Suec.* 2112. *Asterina minuta, Agassiz?* *Asterias pulchella, Blainv.?* *Faun. Franc. t.* : *Man. Malac. t.* 22. f. 8.

Each of the ossicula of the oral surface with a central pair of mobile tapering spines. Each of the marginal ossicula of the dorsal surface with a pair of spines, of the discal one with many crowded pairs; back with series of distinct pores.

Inhab. Plymouth Sound, *Dr. W. E. Leach*. Ireland, *Linck*. Marseilles, *Dr. W. E. Leach*. Sicily, *W. Swainson, Esq.* Madeira, *Rev. — Bulwer*.

2. *Asterina Burtonii*. Rays elongate, convex, blunt at the end; each of the ossicula of the oral surface with a central group of 3 crowded mobile tapering spines, of the dorsal surface with a crowded group of short tubercles.

Inhab. Red Sea. *James Burton, Esq.*

3. *Asterina minuta*. *Asterias minuta, Linn., Gmelin?* *Asterias exigua, Lam.* n. 43; *Seba*, iii. t. 5. f. 15. 15.

Each of the ossicula of the oral surface with a single spine or a central group of 3 crowded mobile spines; of the dorsal surface granular, with a few very small spicula on the upper edge, and of the margin with a spreading tuft of spines.

Var. 1. Larger, each of the ossicula of the oral surface with 3 spines; *Var.* 2. smaller, each of the ossicula with one and rarely 2 spines. *Monstrosity* 1, rays 4; and 2, rays 6.

Inhab. America, *Linn.* West Indies, St. Vincent's, *Rev. L. Guilding*.

The specimens of the two varieties exactly resemble each other, except in the characters mentioned, and they appear to have been taken at the same time.

4. *Asterina Krausii*, *Gray*. Olive-green; the centre ossicula of the oral surface spineless, those near the margin with a single central triangular spine; the dorsal ossicula with a series of minute, very short blunt spines.

Inhab. Cape of Good Hope. *Dr. Kraus*.

5. *Asterina Gunnii*, *Gray*. The central ossicula of the oral surface

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with 1 and the marginal ones with a pair of cylindrical blunt spines; the dorsal ossicula with radiating groups of short cylindrical spinulose spines; body with 6 slightly concave sides.

Var. Body 5-sided. *Var.* or *Monstrosity* with 2 dorsal warts.

Inhab. Van Diemen's Land. *Ronald Gunn, Esq.*

6. *Asterina Calcar*. *Asterias Calcar*, *Lam.* 17; *Oudart*, t. . f. . All the ossicula of the lower surface with a single central cylindrical blunt spine; the dorsal ones with numerous short tapering spinulose spines; body convex, with 8 rather elongate blunt rays.

Inhab. Van Diemen's Land. *Dr. Lhotsky*, and *Mr. G. B. Sowerby*.

3. PATIRIA.

The body pyramidal, coriaceous, with five rays; the ossicula of the oral surface with uniform radiating groups of small spines; of the dorsal surface of two kinds, the one crescent-shaped with series of small bundles of spines, the others bearing irregular round bundles of spines between them.

Patiria coccinea. Scarlet, the body 5-rayed, sides concave, the end of the rays rather slender, blunt.

Inhab. Cape of Good Hope.

4. SOCOMIA, Gray.

The body depressed; rays elongate, formed of imbricate plates; the margins broad, the upper and lower series of ossicules being separated by a groove.

Socomia paradoxa. Yellow.

Inhab. ——— ?

XXXIII.—Some Remarks on the British Species of the Genus Martes. By T. C. EYTON, Esq., F.L.S.

It has been long, and is now, I believe, a disputed point between the writers on British Mammalia, whether or not two species of Marten exist in the British Isles; thus, Mr. Bell in his excellent 'History of British Quadrupeds' gives them distinct; while, on the other hand, Mr. MacGillivray in the 'Naturalists' Library' is of the opposite opinion. With a view of doing something towards setting this question at rest, I requested several persons living in neighbourhoods where Martens are found to obtain some for me; within a short period I have received four specimens, one of which externally presented all the characteristics of the true Pine Marten, having the bright yellow breast of that species; another agreed with the descriptions of the Common Marten, was larger than the last, and had a white breast. Both of these I had made into skeletons. The other two specimens presented an intermediate character, having the breast slightly tinged with yellowish: I have merely kept the cranium of one of these. I have no hesitation in

saying, from an examination of the above specimens, that the yellow-breasted specimen is merely the young of the other ; and that the Common Marten retains a yellow tinge on that part until after the first, or perhaps until after the second winter. My yellow-breasted specimen had been obtained in September, and was not, I should think, from the state of ossification, an animal born during the foregoing summer ; the other specimens were all procured during winter, are all larger, and have the colouring on the breast not nearly so deep as in the one just mentioned. Had I not, however, seen a cranium in an intermediate state, I should certainly have supposed that the skeletons were those of two distinct species.

I do not, however, by any means intend to affirm that no second species exists in the British Isles, as my specimens were all obtained from a limited district in North Wales, but nevertheless presenting all the characteristics of the supposed British species.

The numbering of the vertebræ and ribs in both skeletons are the same ; but I give them here for the sake of offering other persons the opportunity of comparing them with any skeletons that they may have belonging to the genus.

Cer. 7, dor. 14, lum. 6, lac. 7, caud. 15, ribs 14 pair.

The form of the different bones, with the exception of some of those composing the crania, do not present any remarkable differences ; those, however, of the smaller skeleton present many marks of immaturity. The following admeasurements will show the disparity in size.

	Larger skeleton, or adult.	Smaller skeleton, or young.
	Inches.	Inches.
Length of tibia	$3\frac{4}{10}$	3
— of femur	$3\frac{1}{10}$	$2\frac{9}{10}$
— humerus	$2\frac{9}{10}$	$2\frac{1}{2}$
— ulna	$2\frac{6}{10}$	$2\frac{4}{10}$
— scapula	$1\frac{9}{10}$	$1\frac{6}{10}$
Breadth of ditto	$1\frac{6}{10}$	$1\frac{4}{10}$
Length of cranium	$3\frac{5}{10}$	3
Breadth of ditto	2	$1\frac{9}{10}$
Length of pelvis	$2\frac{5}{10}$	$2\frac{1}{10}$
Breadth of ditto, at acetabular cavity	$1\frac{1}{10}$	$1\frac{1}{10}$

In the cranium of the younger specimen, the tuberos process to which the ligamentum nuchæ is attached appears the most prominent, and the crest over the vertex, on which the temporal muscles arise, is narrower than in the adult. The greater degree of prominence in the tuberos process in the young, may be explained by the crest running from it over the vertex as it becomes broader, filling up the indentation on each side ; thus this apparently greater degree of prominence merely proceeds from an incomplete state of ossification in the surrounding parts.

The next most striking point of difference in the cranium, is that

the bones composing the zygomatic arch are broader in the young than in the adult: how to account for this I do not otherwise know, than that it is a contrivance of nature to give greater strength to the jaw in the young, before the remainder of the cranium is sufficiently ossified to bear the strain of the large temporal muscles without such support; but on referring to the skeletons of the young and old otter, I find the same difference to exist as regards the posterior portion of the arch. This, therefore, does not appear to be a character of any value.

The dentition in all the specimens is the same, and agrees with that assigned to the genus; the canines in the adult are, however, slightly larger than in the younger one. No other points, throughout the whole skeleton, of sufficient importance to call for observation, present themselves. I think, however, that my readers, from what I have said, will agree with me in saying, that it is at least most probable that the young of the Common Marten has been mistaken for a distinct species, and that no such animal as the Pine Marten exists in the British Isles.

It may, perhaps, while on the subject of British animals, not be out of place here to advert to a short account of the Irish Hare, published by me in vol. ii. p. 283, of the Magazine of Zoology and Botany, (1837) since which period another paper on the same subject has been published in one of the Irish Transactions, by Mr. Thompson of Belfast, to whom I take this opportunity of returning my thanks for it. He adverts in it to some disparity between his measurements and mine.

On the receipt of his paper I immediately referred again to my skeletons, and found the measurements to agree perfectly with those I had already published; but having obtained another Irish Hare and another English one, I found that I could compare them either so as nearly to agree with his measurements or my own: thus a comparison between the second specimens obtained, agreed very nearly with Mr. Thompson's, and the original specimens with my own; but a comparison between one of the last with one of the first differed from either.

This, I think, proves the necessity of being very careful in the admission of measurements as distinctive marks of species, unless the limit of variation in each species is to a certain extent ascertained.

XXXIV.—*On the Occurrence of two Species of Shells of the Genus Conus in the Lias, or Inferior Oolite, near Caen in Normandy.* By C. LYELL, Esq., F.R.S., F.G.S., &c.

THE discovery by MM. Deslongchamps and Tesson of fossil shells of the genus *Conus*, in the lias of Normandy, in 1837, has by no means attracted the attention it deserves, either in

France or in this country. The fact, indeed, has remained almost unknown, a brief notice of the fossils, unaccompanied by figures or a specific description, having alone appeared in a report of a meeting held in 1837, by the Linnæan Society of Normandy.

Although fossil shells belonging to Lamarck's family of the *Enroulés* are sufficiently abundant in the tertiary strata, a very few examples have yet been recorded of the occurrence of any of these shells in any of the more ancient fossiliferous rocks. The *Enroulés* of Lamarck comprise the genera *Ovula*, *Cypræa*, *Terebellum*, *Ancillaria*, *Oliva*, and *Conus*. Of these, the only examples known to me in secondary formations, are a species of *Cypræa*, which I have mentioned and figured in the Geol. Trans. (2nd Series, vol. v. p. 243.) as occurring in the upper chalk of Faxoe in Denmark, and a Cone called *C. tuberculatus*, of which a single specimen was found by M. Dujardin in the chalk near Tours, of which he has given a figure in les Mém. de la Soc. Géol. de France, tom. ii. deuxième partie, 1837. Plate 17. p. 232.

I was greatly surprised, therefore, during my late visit to Caen (June, 1840) to see in the cabinets both of Prof. Deslongchamps and M. Tesson, several specimens of Cones which they told me had been discovered in the lias of La Fontaine-Etoupe-four, about six miles south of Caen. We find it stated in the report before alluded to, that M. Deslongchamps had found in the Commune of Bretteville sur Laize, three species of Cones in the lias, and that M. Tesson had afterwards found a fourth and more perfect individual of the same genus in the quarries of Fontaine-Etoupe-four not far from the locality before-mentioned. In both these places the lias is described as resting on the quartzose sandstone of the transition formation (terrain intermédiaire). Two of these specimens only retained the shell itself, the others were casts. (See Figures.)

In order to satisfy myself of the correctness of the alleged geological position of these Cones, I visited in June, 1840, Fontaine-Etoupe-four in company with M. Deslongchamps, and ascertained to my full satisfaction that the rock from which the Cones had been extracted was full of *Ammonites*, *Pleurotomaria*, and other fossils, which must belong either to some member of the inferior oolite or upper lias.

The fundamental rock consists of highly inclined vertical, and in some places curved, beds of reddish and white quartzite, alternating with greenish talcose schists. Upon these ancient rocks the brown fossiliferous limestone rests unconformably and in horizontal stratification. At many points are seen at the contact deep rents traversing the inferior quartzose

rock, which have been filled from above with rubbish, consisting of angular fragments of quartzite, pieces of limestone, and numerous fossil shells, the whole imbedded in a calcareous matrix resembling that of the incumbent strata. The most perfect fossils, together with the greater part of the Cones, have been all found in this breccia filling the rents, and the upper parts of the breccia unite with the lowest strata of fossiliferous limestone in such a manner as to make it clear that the fissures were filled before or at the time of the deposition of the lowest strata of the limestone. The quarries in which these sections are exposed have been opened, not for the sake of the limestone but for the subjacent quartzite which is used for making roads, and which at some points comes up nearly to the surface. This quartzite, however, and the accompanying transition schist, are only found at a moderate depth along a certain line from N.N.W. to S.S.E., in which direction they form an underground ridge stretching for many leagues beneath the platform of limestone. At the distance of a few yards either east or west of this narrow ridge the incumbent oolite or lias is of such thickness that the quartzose stone cannot be worked with profit.

Among the Ammonites which I collected myself in the rent or in the bed immediately covering it, or which were given me from this locality by M. Deslongchamps, were the following, which have been examined by my friend Mr. Lonsdale, of the Geological Society:—

1. *Ammonites Walcottii*, Alum shale. Phillips, Geol. Yorkshire, p. 164; Hunton, Geol. Trans., vol. v. part 1, p. 220; Williamson, *ibid.*, p. 242; Cheltenham, Murchison, Geol. Cheltenham, p. 17.
2. *A. corrugatus*, Inferior oolite. Dundry, M. C. tab. 451; Gloucester, Lonsdale, M.S.
3. *A. Stokesii*, Inferior oolite? Bridport, M. C. tab. 191. *Marlstone*, coast of Yorkshire, Williamson, Geol. Trans., vol. v. part 1, p. 242.

Among many others which were shown me at Caen and named by M. Deslongchamps, were *Ammonites planicosta* and *A. Bucklandii*, which occur in the lias in England, *A. falcifer*, found in the alum shale near Cheltenham, and *A. Strangwaysii* and *A. Murchisonæ*, both from the inferior oolite of England. Associated with these I saw a Belemnite, several species of *Pleurotomaria*, fragments of a *Pentacrinite* and other fossils, which in the opinion of M. Deslongchamps indicates that the formation constitutes either the upper member of the lias, or is intermediate between the lias and the inferior oolite.

Since my return from Caen I have seen M. Alcide D'Orbigny, who has also visited lately the quarries of Fontaine-Etoupe-four. A consideration of the numerous fossils obtained by him from the rock in which the Cones occur leads him to the opinion that the breccia filling the rents is of the age of the upper lias. Among other liassic species he pointed out to me the *Pentacrinus cingulatus*. These and other well-known species were accompanied by many others new to the oolite, of the genera *Nucula*, *Arca*, *Delphinula*, *Trochus*, *Cirrus*, and several more, for which new genera must be established.

It may be objected that the mineral character and colour both of the breccia filling the rent and of the overlying beds differ totally from those of ordinary lias, for the rock is a pale brown ferruginous limestone. But Mr. Lonsdale informs me that near Radstock the great deposit of blue lias is represented by only a few feet of a pale brown granular rock, so like inferior oolite that the quarry men apply the same name to it. But this gritty lias is clearly not inferior oolite, being separated from that rock by blue clay from 100 to 200 feet thick. (See Lonsdale, Geol. Trans., vol. iii. 2nd series, p. 245.) The "corn-grit" above-mentioned is a granular light brown limestone, but of a closer and finer grain than the gritty lias. Yet Radstock is only seven miles S.W. from Bath, where the lias is well-developed, with its usual characters.

In proceeding from Caen to Fontaine-Etoupe-four the geologist obtains no sections which display the superposition of the different members of the oolitic series, but he finds the white oolite of Caen give place to the ferruginous oolite of Eterville, which resembles in appearance the oolite of Dundry. Travelling still further south he meets with the beds of Fontaine-Etoupe-four already described. As all these formations appear to be everywhere horizontal, and the surface of the country, following the direction above-described, is constantly attaining a higher level, we might naturally have expected to reach newer instead of older beds. But it must be remembered, that a slight dip, and one quite inappreciable in the space of a quarry, as for example, an angle of five degrees, might in a distance of six miles cause a difference of level of more than 800 feet, so as to allow beds which may be concealed beneath the oolite building-stone at Caen to crop out in a high platform at Fontaine-Etoupe-four.

Having offered these remarks on the position and age of the containing rock, I shall now describe the Cones themselves, in which task I have had the assistance of Mr. George Sowerby, who examined the original specimens at my request during a late visit to Normandy.

I am indebted to the liberality of M. Deslongchamps for the principal drawings.

Conus cadonensis. Shell smooth, slender, with six or seven volutions and an acuminate spire, posterior edge of each volution carinated, and slightly crenulated. Posterior part of each volution rather concave, and very finely longitudinally striated.

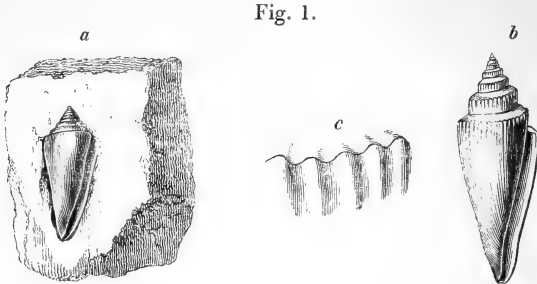


Fig. 1.

Fig. 1. *a*. represents an internal cast of a variety with a shorter spire. This cast is still imbedded in the limestone in which it was found. It is regarded as a mere variety of *b*, because it is well known that in this genus the height of the spire differs greatly in the same species, as for example, in *Conus antediluvianus*, to which *C. cadonensis* approaches most nearly.

Fig. 1. *b*. A perfect specimen of *Conus cadonensis*, in the possession of M. Tesson, in which the entire shell is extant.

Fig. 1. *c*. A magnified representation of a part of the crenulated posterior edge of one volution of *C. cadonensis*.

Conus concavus. Shell smooth, conical, contracted near the middle, with a concave depressed spire, consisting of nine volutions, each volution carinated at the external edge, and very slightly longitudinally striated.

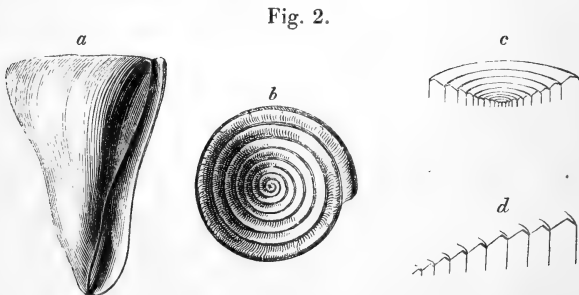


Fig. 2.

Fig. 2. *a*. A perfect specimen of *Conus concavus* in the possession of M. Tesson, from a drawing by M. Deslongchamps. In this specimen the shell itself is extant.

Fig. 2. *b*. represents the concave spire of the same.

Fig. 2. *c*. is a section of the spire, showing the depth of the concavity.

Fig. 2. *d*. A magnified section of a portion of the same, showing the form of the volutions.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

June 16.—The Lord Bishop of Norwich, President, in the Chair.

Read, "Description of a new species of the Coleopterous genus *Cerapterus*, from South America." By J. O. Westwood, Esq., F.L.S.

In the present paper the author enumerates eight species of this interesting genus of the family of *Paussidæ*, which he distributes into six subgenera. The following are the characters of the new species:—

1. *C. Horsfieldii*, piceus; thorace anticè emarginato, elytris maculâ apicali flavescente haud rotundatâ literam y quodammodò simulante, palporum labialium articulo ultimo securiformi.
2. *C. quadrinotatus*, piceo-niger, nitidissimus; thorace (anticè viso) subemarginato, maculis duabus magnis ovalibus prope scutellum, alterisque duabus apicem versus majoribus anticè et posticè lobatis rufo-fulvis.
Long. corp. lin. lat. lin.
3. *C. piceus*, nitidus; antennis pedibusque rufo-piceis, punctis irregularibus minutissimis.
4. *C. brasiliensis*, fulvo-rufescens; oculis albidis tenuissimè punctatis, vertice depresso, thorace intra angulos posticos utrinque foveolato.
Long. corp. lin. lat. lin.

This remarkable species was discovered by Mr. Miers in the vicinity of Rio de Janeiro, and a drawing of the insect accompanies the present paper. Mr. Westwood regards it as the type of a new subgenus, which he names *Homopterus*.

5. *C. Westermanni*, rufo-piceus, haud nitidus; elytris nigris posticè cruce rufescente notatis basi bicostatis discoque longitudinalitèr subimpressis, apice rufescente.
Long. corp. lin. lat. lin.

Read also the conclusion of a paper, entitled "Arrangement and Definition of the Genera of Ferns, founded upon their venation, with examples of the species, and observations on the affinities of each genus." By Mr. John Smith, A.L.S.

The principles of the author's arrangement are similar to those proposed by Presl in his *Tentamen Pteridographiæ*, published at Prague in 1836, in which the venation of the frond (a character the importance of which was first pointed out by Mr. Brown) is adopted as the basis of generic division. It is but justice, however, to Mr. Smith, to state that his arrangement was completed before the work of Professor Presl had reached this country, and the coincidence of their views affords presumptive evidence in favour of the accuracy of the principles upon which their distribution of the species is founded. This extensive family, or rather class, was divided by Mr. Brown into four very natural subfamilies. It is only with the first of these (*Polypodiaceæ*) that Mr. Smith has more particularly occupied himself in the present paper. The following are the names and characters of the tribes into which he has distributed the *Polypodiaceæ*.

Subfam. I. POLYPODIACEÆ, *R. Br.*

Sporangia globose, or oval, transparent, unilocular, pedicellate, or rarely sessile, opening transversely by the elastic property of a vertical, rarely oblique, articulated ring.

Tribe I. POLYPODIEÆ. Sori punctiform or elongated, destitute of a special indusium.

Examples.—Polypodium, *Sw.* Grammitis, *Sw.* Hemionitis, *L.*

Tribe II. ACROSTICHIEÆ. Sori amorphous, destitute of a special indusium.

Example.—Acrostichum, *L.*

Tribe III. PTERIDEÆ. Sori punctiform, or elongated transversely. Indusium lateral, attached exteriorly.

Examples.—Pteris, *L.* Adiantum, *L.*

Tribe IV. ASPLENIEÆ. Sori elongated, oblique. Indusium lateral, linear.

Examples.—Asplenium, *L.* Diplazium, *Sw.*

Tribe V. ASPIDIEÆ. Sori punctiform, intramarginal. Indusium orbicular and central, or reniform and lateral, and attached interiorly.

Examples.—Aspidium, *Sw.* Nephrodium, *Mich. R. Br.*

Tribe VI. DICKSONIEÆ. Sori marginal. Indusium lateral, attached interiorly, its free margin conniving with the indusiform margin of the frond, forming a calyciform bilabiate cyst.

Examples.—Lindsæa, *Dry.* Davallia, *Sm.* Dicksonia, *L'Herit.* Trichomanes, *L.* Hymenophyllum, *Sm.*

Tribe VII. CYATHEÆ. Sori punctiform, intramarginal. Indusium calyciform, or wanting. Receptacle elevated.

Examples.—Cyathea, *Sm.* Hemitelia, *R. Br.* Alsophila, *R. Br.*

These tribes are again subdivided into minor groups, founded upon characters derived from the venation of the frond, the position of the sori, and the form of the indusium. *Notholæna* and *Ceratopteris* are referred to the first, *Ceterach* to the fourth, and *Onoclea* to the fifth tribes.

Nov. 3.—Mr. Forster, V.P., in the Chair.

Mr. William Taylor, F.L.S., exhibited a sample of the oil obtained from the fruit of *Madia sativa*, grown at Aspull Stoneham, near Ipswich.

Read, "A Note on the Bokhara Clover." By William Taylor, Esq., F.L.S.

Mr. Taylor obtained from Mr. Loudon a small parcel of seeds of the Bokhara Clover (*Melilotus arborea*), which was sown early in April, 1839. The plant proved to be biennial, and stood the winter well. On the 28th of April following, a part of the crop was cut down, the stems measuring 15 inches in height; and on the 28th of May, from the same piece of ground, a second crop was obtained, which had reached the height of 16 inches; a third on the 28th of June, 17 inches; a fourth in July, 16 inches; a fifth in August, 15 inches; and a sixth in September, measuring 14 inches. According to Mr. Taylor's calculation, the Bokhara Clover would yield from 20 to 30 tons of green herbage per acre, and from 2 to 3 tons of strong fibre, which appears capable of being manufactured into cordage.

The flowers are white and very fragrant, and the plant does not appear to differ specifically from the *Melilotus leucantha*, although regarded by DeCandolle as a distinct species.

There was also read, "Descriptions of some new Insects collected in Assam, by William Griffith, Esq., Assistant Surgeon in the Madras Medical Establishment." By the Rev. F. W. Hope, M.A., F.R.S., and L.S.

This paper contains a further selection of new insects from Mr. Griffith's Assam collection in the possession of Mr. Solly, an account of part of which has been already noticed at p. 42, and has since appeared in the Society's Transactions. The descriptions are accompanied by coloured figures. The species described belong chiefly to the group of *Lucanidæ*, and are as follows:—

LUCANUS.

1. *L. Forsteri*.

Long. unc. 2, lin. 11; lat. elytr. lin. 10.

Nigro-piceus; mandibulis valdè exsertis internè multidentatis ad basin dente valido suprâ et infrâ armatis, apicibus furcatis.

This splendid species has been named in compliment to Edward Forster, Esq., Treas. and V.P.L.S.

2. *L. Rafflesii*.

Long. unc. 2, lin. 6; lat. lin. 8.

Niger, nitidus; mandibulis valdè exsertis ante apicem unidentatis, apicibus obtusis et obliquè truncatis.

This species is nearly related to *L. nepalensis*, but is of larger dimensions, and is extensively diffused over the eastern part of the Indian continent, occurring in Nepal, Bengal, and Assam.

3. *L. Spencei*.

Long. unc. 1, lin. 9; lat. lin. 6.

Ater; mandibulis exsertis basi robustis et unidentatis, apicibus furcatis.

4. *L. curvidens*.

Long. unc. 1, lin. 9; lat. lin. 6½.

Niger; mandibulis exsertis intùs dente curvato valido ferè ad basin posito.

5. *L. bulbosus*.

Long. unc. 1, lin. 6; lat. lin. 6.

Nigro-castaneus; mandibulis exsertis dentibus bulbosis armatis, apicibus acutis.

6. *L. astacoides*.

Long. unc. 1, lin. 3; lat. lin. 4.

Castaneus; mandibulis exsertis intùs ad basin denticulatis denticulis nigricantibus, apicibus acutis.

7. *L. foveatus*.

Long. unc. 2; lat. lin. 6.

Castaneus; mandibulis valdè exsertis, apicibus acutis, dente ferè medio fortiori, aliisque 4 æqualibus ante apicem positis.

8. *L. omissus*.

Long. unc. 1, lin. 9; lat. lin. 6.

Castaneus; mandibulis valdè exsertis, apicibus acutis, dentibus 2 nigris subbasalibus, aliisque 4 subapicalibus.

9. *L. serricollis*.

Long. unc. 1, lin. 3; lat. lin. 6.

Ater, politus; mandibulis parùm exsertis sinuatis et punctatis.

10. *L. punctiger*.

Long. lin. $9\frac{1}{2}$; lat. lin. 4.

Ater, corpore punctato nitido, thoracis marginibus externis serratis, elytris suturâ parùm elevatâ glabrâ insignitis, tibiis 4 posticis unidentatis.

CHEIROTONUS.

Corpus oblongo-ovatum, crassum. *Antennæ* 10-articulatæ. *Thorax* elytris anticè angustior, lateribus subrotundis, valdè serrulatis. *Elytra* thorace latiora. *Pedes* robusti, armati, anticè longiores; *tibiis* externè irregularitèr dentatis: *tarsis* elongatis, articulis apice spinâ brevi armatis, unguibus bidentatis. *Tibiæ* 4 *posticæ* seriebus spinarum irregularibus armatæ.

1. *C. MacLeayii*.

Long. lin. 23; lat. lin. 13.

Æneo-viridis; thorace lateribus externè serrulatis et varioloso-punctatis, sulco longitudinali in medio dorso fortitèr impresso, elytris nigro-æneis maculisque croceis insignitis.

This splendid insect, which forms the type of the above new genus, has been named in compliment to that learned and philosophic entomologist, Mr. W. S. MacLeay. It forms, along with *Eucheirus* of Kirby, and *Propomacrus* of Newman, a small natural family, which has been termed by the author *Eucheiridæ*, and regarded by him as related to the *Dynastidæ*, and constituting a link of connexion with the *Goliathidæ*.

LAMIA.

1. *L. Swainsoni*.

Long. unc. 1, lin. 4; lat. lin. 6.

Brunnea; thorace utrinque spinoso, dorso convexo in medio bulboso, elytris concoloribus albo-variegatis et ad basin nigro-tuberculatis.

This species, which has been named after Mr. Swainson, appears to constitute a subgenus related to *Euoplia*, described in the first part of the account of Assam Insects at p. 42.

MONACHAMUS.

1. *M. beryllinus*.

Long. lin. 8; lat. lin. 3.

Cœruleo-beryllinus; antennis griseis, thorace utrinque spinoso elytrisque nigro-maculatis.

STIBARA.

Corpus saperdæforme, crassum, robustum. *Caput* latum, antice ferè quadratum, posticè convexum. *Antennæ* corpore breviores, 11-articulatæ. *Thorax* robustus, nodosus, inermis. *Elytra* lata, thorace vix triplò longiora, apicibus abruptè truncatis, lateribus elevatis. *Pedes* femoribus incrassatis, tibiis robustis.

1. *S. tetrapilota*.

Long. lin. 10; lat. lin. $3\frac{1}{2}$.

Aurantio-rubra; antennis oculisque nigris, thorace nodoso, elytris concoloribus, maculâ magnâ ovali nigrâ ad humeros positâ, apicibus nigris.

2. *S. trilineata*.

Long. lin. 9; lat. lin. 3.

Pallidè castanea; antennis albo-cinctis, thorace nodoso utrinque denticu-

lato, elytris lineis 3 nigris insignitis, suturâ latiori, lateribus punctatis, punctis duplici serie ad disci medium fortissimè insculptis.

A new genus belonging to the *Saperdiidæ*, to which family the *Lamia nigricornis* is also referrible, besides several other types of undescribed genera.

ZOOLOGICAL SOCIETY.

February 11, 1840.—The Rev. J. Barlow in the Chair.

A letter addressed to the Secretary by Sir John McNeill, and dated January 31, 1840, was read. It related to the two Persian Deer presented by that gentleman to the Society's menagerie, and contained an answer to some inquiries from the Secretary respecting them.

The letter states that this species of Deer is called by the Persians, Marâl, or Gevezu, or Goo Koohee, and is frequently noticed in their literature. It is found in all the wooded mountainous districts of Persia, but apparently does not occur in the central parts of the country.

The Persian Deer "rarely descend into the plains. During the summer they are found in the highest wooded parts of the mountains, and during the winter in the lower ravines near their bases, where they are frequently tracked in the snow.

"The horns of the adult male closely resemble those of the Red Deer of this country, insomuch that I doubt whether an unscientific observer could distinguish them, unless by the superior size of those of the Marâl."

Mr. Yarrell communicated to the meeting, on the part of R. H. Sweeting, Esq., some facts relating to a female Rorqual Whale (*Balænoptera boops* of authors), which was stranded near high-water-mark at Charmouth, Dorsetshire, early in the morning of Wednesday, February 5th, 1840.

The whole length was	44 feet.
Girth	21 —
Breadth of tail	9 —

Probable weight from twenty to twenty-five tons.

The jaws long and slender, but not sharp, the tip obtuse and convex; the upper jaw the shortest, and received, when the mouth is closed, within the lower jaw, which projected nine inches beyond it. The plates of whalebone amount to upwards of 250 on each side of the jaw; the palate and tongue of a pale pink colour; no warts about the lips. The back black; the under surface of the body white; the throat plicated. The nostrils or blow-holes are two longitudinal fissures, the anterior points nearly touching, but diverging posteriorly to a distance of three inches, and separated by a furrow. The opening of the eye six inches in length, from canthus to angle; the bony socket from anterior to posterior margin is eight inches; eyeball seven inches; the pupil oval; the irides hazel. There was not the slightest appearance of eyelashes, which some authors state whales possess.

The distance from the end of the under jaw to the origin of the pectoral fin ten feet nine inches; the length of the fin five feet six inches; the breadth eighteen inches. The dorsal fin small, of cartilage only, conical, the basal length eighteen inches, the elevation twelve inches; placed eleven feet in advance of the tail.

The subcutaneous layer of fat varied in thickness from three to five inches.

The figure at the bottom of page 521 in Mr. Bell's History of British Mammalia and Cetacea, was referred to as a very good representation.

The dimensions of the skeleton are as follows:—

Whole length 40 feet.
Head 10 —

The vertebræ are sixty in number; viz. seven cervical, fifteen dorsal, sixteen lumbar, fifteen caudal, and seven caudal bones. Of ribs there are fourteen, the first of which is double-headed, and is attached to the two first dorsal vertebræ; each of the other ribs is attached to a single vertebra, and has a single head; the dorsal vertebræ, therefore, exceed the ribs in number by one.

The rest of the details of the bony fabric, as regards the pectoral fins, &c., correspond precisely with Dewhurst's plate and description of the Ostend specimen, allowing of course for the inferior size of the present animal.

Mr. Yarrell exhibited, at the request of G. T. Fox, Esq., of Durham, a specimen of a beautiful spiny Lizard, from Texas,—the *Agama cornuta* of Harlan, *Phrynosoma Bufonium* and *Phrynocephalus Bufonius* of other modern authors. The specimen on which Dr. Harlan drew up his description was from the west of the Rocky Mountain Range.

A paper was then read, by Mr. Blyth, entitled "A Summary Monograph of the species of the genus *Ovis*," in which the author recognized nine species, besides indicating others as more or less doubtful.

The Argalis of Asia and America were provisionally considered as the same, under the appellation of *Ovis ammon*, as also the Kamtschatka sheep of M. Eschscholtz, which Mr. Blyth suspected to be only an individual slight variety; and accordingly, he traced the geographic range of this animal from Asia through Kamtschatka and the Aleutian Isles to the Rocky Mountains of North America, and southward upon that continent to California, where there was reason to believe it occurred, together with the true Californian species described by Mr. Douglas. In Asia he followed it southward to the Himalayas, but suspected that the *Ovis ammon* mentioned by different authors as inhabiting the Caucasus and Taurus, referred to a distinct species which he had to describe. The *Ovis Californiana* was next noticed; and then a superb new species, believed to be from Mount Taurus, the horns of which were suggested to bear every appearance of having supplied the model which ancient sculptors followed in their representations of Jupiter Ammon, and which therefore it

was proposed to designate *O. sculptorum*. Mr. Blyth then proceeded to distinguish two Himalayan species, which presented a somewhat different form of horn from the rest of the genus; one, the *Ovis Nahoar*, Hodgson, of superior size, and general pale colour, which he believed did not inhabit so high; the other he termed *O. Burrhel*, which was of a very dark colour, and presented numerous other specific distinctions, being an inhabitant also of more elevated regions. The *Ovis aries* he considered a species *per se*, and not descended from the Moufflon; and the *O. musimon* was treated of in detail under its two alleged varieties, specimens of which, however, had never been compared together. The *Ixalus probaton*, Ogilby, was deemed to belong strictly to the genus *Ovis*, and Mr. Blyth suggested, that as the abnormal growth of its hoof indicated that it had long lived in captivity, it was not unlikely that castration at an early age may have obstructed the development of its horns, the rudiments of which exactly resembled those found upon many breeds of true sheep, and upon the lambs of all horned breeds of a certain age. The last animal included was the *Ovis tragelaphus*, Auctorum, of which the *O. ornata*, Geoffroy, appeared to be merely a dwarfish individual: the characters of this species were treated of at considerable length, and it was proposed to elevate it to the rank of a sub-genus of *Ovis*, for which the name *Ammotragus* was suggested. The paper was illustrated by numerous elaborate drawings of the horns, &c., and by a pictorial group, containing the principal species, the relative sizes of which were thus rendered obvious to the eye.

February 25, 1840.—Prof. Rymer Jones, in the Chair.

Mr. Ogilby drew attention to a prepared specimen and skull of a Gibbon, which had recently died at the Society's menagerie. The precise locality from which this animal was procured had not been ascertained; it was presented by John Abel Smith, Esq., and after living some months in the menagerie, fell a victim to the same complaint which carried off so many of the *Quadrumana* during the past winter.

The whole body is of an uniform deep black colour, except the throat and cheeks, which are covered with long white hair, forming a broad band which extends from ear to ear. This circumstance induced Mr. Ogilby to propose the name of *Hylobates leucogenys* for this species. There is no white mark over the eyes, as in the *Hoolock*, and the chin and under jaw are black, like the rest of the body. The head is remarkable for its pyramidal elevation, as contrasted with the flattened form of the same part in the *Hoolock*. Mr. Ogilby stated, that the only doubt he had with respect to the specific distinction of this animal, is the probability of its being the male of that described by Dr. Harlan under the name of *H. niger*. The hair of the forehead and head in general is directed backwards, towards the neck: that on the crown of the head is very long, and gives to the head that pyramidal or conical form before mentioned.

The skeleton and dentition show it to have been a young animal; the permanent teeth had not yet protruded from the alveoli. The

total length of the skull (from the intermaxillaries to the occiput) is 4 inches; its greatest width is 2 inches $7\frac{2}{3}$ lines; width between the outer boundaries of the orbits, 2 inches; from base of nasal bones to apex of intermaxillaries, 1 inch $1\frac{2}{3}$ line. The length of the humerus is 7 inches 2 lines; of the ulna, 8 inches; radius, 7 inches 7 lines; femur, 6 inches; tibia, 5 inches 3 lines; fibula, 5 inches 1 line.

The principal external characters of this animal may be thus expressed:—

HYLOBATES LEUCOGENYS. *Hyl. niger*; *pilis ad latera faciei et ad gulam albis*; *pilis verticis longis et semi-erectis.*

Mr. Waterhouse exhibited a new species of Squirrel from the Society's collection, and pointed out its distinguishing characters, which are as follows:—

SCIURUS DIMIDIATUS. *Sci. suprâ griseus fulvo lavatus, subtùs flavus*; *capite, corpore ad latera pedibusque rufescentibus*; *caudâ ferè corporis longitudinem æquante, indutâ pilis nigris, flavis atque fulvis commixtis.*

	unc. lin.
Longitudo ab apice rostri ad caudæ basin	10 0
———— caudæ, ferè	7 6
———— ab apice rostri ad basin auris	1 11
———— tarsi digitorumque	2 3
———— auris	0 8

Hab. South America?

This curiously-coloured species of Squirrel was purchased at a sale, and in the same lot were specimens of *Sciurus astuans* and *Sc. Langsdorffii*, well-known South American species; it is probable, therefore, it may be an inhabitant of the same country. Its fur is very short for a Squirrel, rather harsh, and less loose than in the generality of Squirrels: the back is gray, or what might be termed an iron-gray, having a rusty hue; on the upper part of the head the rust-like tint prevails, and the muzzle is almost entirely of a rich rust colour; the sides of the head and neck are of a golden-yellow tint, and the under parts of the body are yellow: a bright rust-coloured line runs along each side of the body, and separates the yellow colouring of the under parts from the iron-gray of the upper: on the outer sides of the limbs, and on the feet, a rich deep golden-yellow hue prevails. The tail is apparently cylindrical, and not bushy; the prevailing hue of the hairs is deep rust colour, but they are for the most part more or less broadly annulated with black in the middle. The ears are slightly pointed, and well clothed with golden-yellow hairs; those on the outer side are of a bright rust colour; they have no pencil of hairs at the tip. The hairs of the moustaches are numerous, long, and of a black colour. The incisors of both upper and under jaws are deep orange.

Mr. Fraser read his descriptions of, and observations upon, some new species of Insectorial Birds, belonging to the genus *Agriolorhinus*.

"In the northern parts of South America and in Mexico," Mr. Fraser observed, "are certain small birds, resembling the Warblers

in size, and in having a slender beak; they differ, however, in having the beak stronger and compressed; the upper mandible straight, or even slightly recurved; its apical portion strongly hooked, and distinctly notched; its cutting edges are curved inwards, so as to inclose the corresponding edges of the under mandible. But the most remarkable character consists in the existence of three or four small notches in the edge of the upper mandible, on either side, and behind the ordinary notch which characterizes the *Dentirostres*.

“The Prince of Musignano first noticed these peculiarities in a bird from Mexico, and described them in the ‘Nuovi Annali delle Scienze Naturali,’ where he used the name *Agrilorhinus* to distinguish generically the bird in question.

“I have now the honour of laying before the meeting four new species of this interesting genus; three from a collection belonging to the Earl of Derby, which I am informed was made at S^{ta} Fé de Bogota, and one from the Society’s museum, the precise habitat of which is not known; there are reasons, however, for believing it to be a Mexican bird.

“The Prince of Musignano is of opinion that the genus *Agrilorhinus* has affinities both with the *Sittina* and *Sylvicolina*. The strong notch in the upper mandible, its distinctly curved point, and the compressed form of the beak, combined with the well-developed *vibrissæ*, lead me to believe that this genus ought rather to be regarded as a somewhat aberrant form of *Laniada*.

AGRILORHINUS BONAPARTEI. *Agr. in toto niger, humeris exceptis, his cærulescenti-cinereis.*

Long. tot. $6\frac{5}{8}$ unc.; *rostri*, $\frac{3}{4}$; *alæ*, 3; *caudæ*, 3; *tarsi*, $\frac{7}{8}$.

Hab. S^{ta} Fé de Bogota.

AGRILORHINUS HUMERALIS. *Agr. in toto niger, humeris exceptis, his cærulescenti-cinereis.*

Long. tot. 5 unc.; *rostri*, 7 lin.; *alæ*, $2\frac{3}{4}$; *caudæ*, $2\frac{1}{4}$; *tarsi*, $\frac{7}{8}$.

Hab. S^{ta} Fé de Bogota.

This bird only differs from the preceding species in its smaller size.

AGRILORHINUS OLIVACEUS. *Agr. olivaceus, corpore subtùs pallidiorè, et flavido tincto.*

Long. tot. 4 unc.; *rostri*, $\frac{1}{2}$; *alæ*, 2; *caudæ*, 2; *tarsi*, $\frac{5}{8}$.

Hab. Mexico?

This specimen is probably a female.

AGRILORHINUS PERSONATUS. *Agr. cæruleus; fronte, spatio circa oculos, rostro pedibusque nigris; remigibus rectricibusque internè nigrescentibus.*

Fœm. plumbea.

♂ Long. tot. $6\frac{1}{2}$ unc.; *rostri*, $\frac{3}{4}$; *alæ*, 3; *caudæ*, $2\frac{3}{4}$; *tarsi*, $\frac{3}{4}$.

♀ ——— $5\frac{3}{4}$ —; ———, $\frac{3}{8}$; —, $2\frac{5}{8}$; ———, $2\frac{3}{8}$; ———, $\frac{3}{4}$.

Hab. S^{ta} Fé de Bogota.

“This bird is about the size of the Blue Bird (*Sialia Wilsoni*) of North America; its blue colouring is much darker, and less brilliant. The bill is strong, long, and compressed, and suddenly bent down-

wards at the apex; the lower edge of the upper mandible is curved inwards and encloses the cutting edges of the lower one, but it is not notched as in the more typical species of *Agrilorhinus*. The forehead, a broad space around the eye, and the ear-coverts, are black: the chin is blackish. The feathers of the wing are blackish, but externally edged with blue; and so are the tail-feathers."

March 10, 1840.—Professor Owen in the Chair.

A paper by Dr. Richardson, on a collection of Fishes, was read:

The proceedings of the Society for June 25, 1839, contain the first part of the description of this collection, which was made at Port Arthur in Van Diemen's Land, by Deputy-Assistant-Commissary-General Lemprière, pursuant to the directions of His Excellency Sir John Franklin, K.C.B. &c., Lieutenant-Governor of the colony. The subject is resumed in this paper, and the author describes a Dajao, which differs from the three known mullets of Australia in many particulars, and from all the *Mugiloideæ* described in the *Histoire des Poissons*, in the greater number of rays of the anal fin, as well as in the combinations of other characters. The only Dajao mentioned in the work referred to, is an inhabitant of the mountain streams of the Caribbee Islands; while the Van Diemen's Land one has been found only in the sea; but perhaps both are anadromous. The rough plates on the palate and vomer of some acknowledged typical mullets assimilate their dentition greatly to that of the Dajaos; and the present species approaches the ordinary mullets in the form of the orifice of the mouth, while its palatine and vomerine teeth are nearly as large as those on the jaws. It is prized as an article of food.

DAJAUS DIEMENSIS (Richardson). *Tasmanian Dajao*.

Dajaus, rostro ferè truncato, vix prominente.

Radii:—Br. 6—6; P. 15; D. 4—1 | 9; A. 3 | 12; V. 1 | 5; C. 14 $\frac{5}{4}$.

The author next remarks that of four *Labri* in the collection, two species, comparatively little ornamented, are furnished with six gill rays, while the other two, more gaily coloured, and one of them indeed brilliantly striped, have only five rays in the branchiostegous membrane. They are all true labri, but the scales which protect their opercula, though in fact much larger than those of *Labrus bergylta*, are so deeply imbedded in mucous skin, that in a recent state these fish might pass for examples of the genus *Tautoga*, which they further resemble in possessing a tolerably regular inner row of minute teeth. They are without scales on the interoperculum, and the small scales on their cheeks being variously distributed, furnish specific characters. All four have canine teeth at the corners of the mouth, and, contrary to the prevailing character of the *Labri*, the soft rays of the dorsal exceed the spinous ones in number, resembling in this respect the *Labrus pacilopleura* of New Zealand.

LABRUS TETRICUS. *Lab.*, squamis minutis in ordinibus duobus ad marginem anteriorem superiorem preoperculi instructis; operculo squamis majoribus in seriebus ternis quaternisve dispositis tecto.

Radii:—B. 6—6; P. 13; D. 9 | 11; V. 1 | 5; A. 3 | 10; C. 14.

LABRUS FUCICOLA. *Lab.*, squamis parvis inter oculum et præoperculum in seriebus quatuor instructis; squamis opercularibus majusculis.

Radii:—B. 6—6; P. 13; D. 9 | 11; V. 1 | 5; A. 3 | 10. C. 14.

LABRUS PSITTACULUS. *Lab.*, squamis genæ in ordinibus quatuor præoperculo approximatis, oculoque remotiusculis; corpore ovali; pinna caudæ supernè apiculatâ.

Radii:—B. 5—5; P. 13; D. 9 | 11; V. 1 | 5; A. 3 | 10; C. 14.

LABRUS LATICLAVIUS. *Lab.*, smaragdinus, fasciis puniceis purpureo marginatis, binis lateralibus posticè in unam coalescentibus inque pinna caudæ productis; pinna dorsi basi viridi: in mediâ latè purpured: supernè aurantiacâ, purpureo guttatâ, inque margine extremo cæruleâ; pinna ani basi aurantiacâ, dein primulaceo-flavâ cæruleo cinctâ, exinde purpureâ cæruleis guttis, denique in margine extremo cæruleâ*.

Radii:—Br. 5—5; P. 12; V. 1 | 5; D. 9 | 11; A. 3 | 10; C. 14.

Then follows the description of a small *Odax*, known at Port Arthur by the name of "Kelp fish." It agrees with *Odax semifasciatus* of the *Histoire des Poissons* in many of its details, but on a minute comparison with the description of that species it appears to be distinct.

ODAX ALGENSIS. *Od. capite longiusculo; præoperculo denticulato; facie utrinque sex-striatâ.*

Radii:—Br. 5—5; P. 14; D. 17 | 12; A. 2 | 12; V. 1 | 4. C. 12 $\frac{2}{3}$.

Another species of kelp-fish common at Port Arthur, and of which a specimen was sent by Mr. Lemprière, but too much decayed for identification, is described by that gentleman as being marked with a dark stripe. It is probably the *Odax balteatus* of the *Histoire des Poissons* which was discovered by Peron.

The author then describes a new scaroid fish which did not form part of Mr. Lemprière's collection, but which there is reason to believe was taken either at Hobart Town or Sydney. It was presented to the Museum of Haslar by Mr. Conway, formerly medical superintendent of a convict ship, and since deceased. The specimen being a mounted one, no details of internal structure can be given, and in so far the characters of the genus or sub-genus are incomplete; but it differs from the ordinary *Labri* in the scaliness of the vertical fins, and from *Scarus* in external aspect, the form of the fins, the smallness of the scales, especially at the base of the caudal fin, and in the manner in which the lips cover and move with the jaws. It differs from *Odax* in the teeth and ventral fins.

OPLEGNATHUS, genus novum.

Corpus ellipticum, crassum, squamis parvis oblongis tectum. Mandibulæ modo Scarorum dentes incorporatos gerentes. Labium

* The character of this species being rendered obscure in the abstract of the former paper by the omission of a word in printing, is here repeated.

superius basi profundè sulcatum, intermaxillas ferè tegens, et cum illis movens. *Operculum* osseum altè sinuatum, hinc bilobatum, cum genâ squamis parvis tectum. *Dorsum* monopterygium. Costæ branchiostegæ quinque. *Pinnæ* ventrales ponè pectorales sitæ, radiis quinque ramosis et uno aculeato sustentatæ. *Radii* aculeati pinnarum dorsi anique fortes. *Fasciæ* squamosæ inter radios articulatos pinnarum verticalium decurrentes.

OP. CONWALL, *species unica cognita*.

Radii:—Br. 5—5; P. 18; V. 1 | 5; D. 12 | 12; A. 3 | 12; C. 15 $\frac{1}{4}$.

In Mr. Lemprière's collection there are three specimens of *Ostracion* which the author considers as examples of the *Auritus* of Shaw, of different ages, and one which he characterizes as a new species, also belonging to Mr. Gray's sub-genus *Aracana*. They are known at Port Arthur by the name of "Pig-fish."

OSTRACION SPILOGASTER. *Ostr. (Aracana), ventre maculato; lateribus dorsoque fasciis interruptis ornatis, quarum quatuor sub oculo numerandis, tribus in basibus pinnarum dorsi anique et tribus propè finem pinnæ caudæ anastomosantibus.*

Radii:—P. 11; D. 11; A. 11; C. 11.

The three following species are also from Van Diemen's Land, though not now characterized for the first time.

OSTRACION AURITUS (Shaw). *Ostr. (Aracana), ventre pallenti unicolore; lateribus dorsoque lineis saturatis rectis curvisque ornatis, quarum quinque sub oculo numerandis, et tribus in propriis basibus pinnarum dorsi, ani, caudæque.*

Radii:—P. 11; D. 11; A. 11; C. 11.

OSTRACION FLAVIGASTER (Gray). *Ostr. (Aracana), ventre pallido unicolore, lateribus dorsoque lineis saturatis percursis, quarum octo sub oculo numerandis, totidemque lineis pallidis interjacentibus; in basi pinnæ caudæ lineis quinque pallidis et tribus in basibus pinnarum dorsi caudæque.*

OSTRACION ORNATUS (Gray). *Ostr. (Aracana), lateribus dorsoque albo tessellatis; facie ventreque lineis purpureis, fuscis, et albidis numerosis, percursis; fasciis sex obscuris in pinnâ caudæ, sub finem anastomosantibus.*

MONACANTHUS RUDIS. (Nob.) *Grey Monacanthus. Mon. (nec pleari extensivo, nec caudâ setosâ, nec corpore papilloso vel penicelligero præditus;) retro-scaber; colore (murino?) immaculato; rostro mediocri; dentibus latis in serie duplici dispositis, decem superioribus sex inferioribus; aculeo dorsali subulato, spinifero; pinnâ caudæ rotundatâ.*

Radii:—P. 14. D. 2 | 35; A. 34; C. 12.

This *Monacanthus* known at Port Arthur (as well as the *Aleuterus* described below,) by the name of "Leather Jacket," attains the length of a foot or more, and is considered to be a good fish for the table, the skin being removed before it is cooked. After long maceration in spirits it has a dull greyish-brown hue, without any traces of spots or other configurations of colour, and the species also

wants the extensible dewlap, the bristly tail, pedunculated warts or branching cirri, which characterize other groups of *Monacanthi*.

ALEUTERES MACULOSUS (Nob.). *Speckled Leather Jacket*. *Al. retro-scaber, sub-ovalis, ventre prominulo; angulis quatuor aculei dorsalis spiniferis; pinnâ caudæ rotundatâ, sub finem nigro fasciatâ; corpore colore murino? nebuloso-guttato.*

Radii:—P. 11, aut 12; D. 2—34; A. 32; C. 12.

This is a small *Aleuter*, seldom exceeding five inches in length, and having a sub-oval form, the back being less arched than the belly. The dorsal and anal fins are arched, the curvature being more abrupt anteriorly. The dorsal spine is four-sided, with rows of prickles pointing downwards on each of the angles. The minute second spine is very slender. As has been remarked by Salvian, this small spine aids like a trigger in fixing the large one in any required position. The colour of the fish after being kept in spirits is dull olive-brown or mouse-colour, with scattered clusters of small dark spots. The subterminal black band on the caudal fin is very faint.

ALEUTERES PARAGAUDATUS (Nob.). *Trim Leather Jacket*. *Al., retro-scaber; dorso depresso ex ore usque ad pinnam secundam ferè recto; ventre regulariter arcuato; pinnâ caudæ rotundatâ, sub finem nigro-fasciatâ; colore corporis murino; fasciâ pallidâ (flavâ) è mento per pinnam pectoralem medio in latere tractâ, sub quâ lined cæruleâ; lined alterâ cæruleâ è mento per oculum et ultra extensâ; corpore subtùs et posticè cæruleis guttis pulchrè interstincto.*

Radii:—P. 12; D. 2—34; A. 32; C. 12.

This handsome *Aleuter* is named in allusion to the striped upper vestments of the Roman ladies. Like the preceding, it is a small-sized fish. One of our specimens had the gut and the whole abdomen distended by a large *Idotea*, full of roe, not at all crushed, and apparently little digested: a portion of its tail fin protruded at the anus of the *Aleuter*.

The *Aleuter* *Ayraud* of Shark Bay (Quoy et Gaimard) differs from this and the preceding species in the dorsal spine having only two rows of prickles, and in the dorsal fin having a concave outline, and reaching to the caudal fin. It is also differently striped, and no spots are mentioned. The *Aleuter* *spilomelanurus* taken by the same naturalists at Port Jackson resembles the Port Arthur fish in the form of the dorsal spine and shape of the three vertical fins, but the numbers of the rays in the dorsal and anal are different; there are no spots on the body, and merely a single dark line extending from the angle of the mouth along the higher part of the sides. In both the Port Arthur *Aleuter* the minute prickles of the skin, when examined by a good microscope, appear to be solitary, and to spring from a globular base.

CALLORHYNCHUS TASMANIUS (Nob.). *Tasmanian Callorhynchus*. *Call., pinnis pectoralibus ad ventrales haud attingentibus; pinnâ dorsi secundâ pone ventrales incipienti, ante lobum anteriorem inferiorem pinnæ caudæ desinenti.*

This species agrees with the *Callorhynchus Smythi* of Benne

figured in Beechey's Zoological Appendix, in the distance between the pectorals and ventrals, but is so unlike that figure in other respects that it is impossible to assign it to that species. *Call. Antarcticus* has large pectorals whose tips overlie the base of the ventrals.

NARCINE TASMANIENSIS, (Nob.). *Tasmanian Narcine*.

This species has not yet been compared with *Narcine capensis*, but it is most probably distinct. A full description is given in the paper, to enable authors who have the opportunity of seeing figures or recent specimens of *Narcine capensis*, to point out the differences. It is named "Ground Shark" at Port Arthur and Hobart Town.

SYNGNATHUS ARGUS (Nob.). *Ocellated Pipe-Fish*. *Syng.*, *depressus*, *latus*, *pinnis pectoralibus dorsique præditus*; *ventralibus caudæque orbatis*; *dorso maculis aculeis ornato*; *maculis albis und serie in margine ventris dispositis*.

This very handsome pipe-fish differs from all the groups of species indicated in the Règne Animal, in having pectoral fins, while the caudal and ventrals are wanting. It did not form part of Mr. Lemprière's collection, but is said to have been presented to the Haslar Museum by the surgeon of a convict ship; its exact habitat being unknown.

It was mentioned in the former paper that labels of many of the specimens were detached, so that correct references could not be made to Mr. Lemprière's list. In this predicament is the 'Saw-fish' or 'Bugler,' which attains the weight of sixteen pounds, but the example sent was below the usual size. Also one of the 'Parrot Fish,' known locally as the 'Blue-head.' The *Thyrsites altivelis* is named the 'Baracoota,' and Mr. Lemprière says that there is a second species taken at Port Arthur, which has much lower dorsal spines, but is more esteemed as an article of diet. This is probably the *Thyrsites atun* of the *Histoire des Poissons*. The most choice fish in the colony is called the 'Trumpeter,' and weighs, when full-sized, eight or nine pounds. A single specimen of this was sent, and is doubtless described in this or the former part of the paper.

There are also in the collection several specimens of a *Hemiramphus*, which is known locally by the name of 'Guard Fish.' They are only half the full size, which is said to be fifteen inches. Several specimens of a *Diodon* have all the characters ascribed to *D. nycthemerus* in Cuvier's monograph (*Mem. du Mus.*, iv.). Two species of *Hippocampi* are probably those described by White and Shaw as inhabitants of Port Jackson. A 'Rock Cod' taken in the sea was too much decayed for examination, the skull being all that could be preserved; and several examples of a small freshwater fish were also very much injured. The species bears the local name of 'Trout,' is said to have an olive colour, with small red spots, and to weigh when full-grown about nine ounces. It is perhaps the *Galaxias truttaceus* of Cuvier, or an allied species. A 'Sea Cow' mentioned in the list may be the *Callorhynchus Tasmanius*. A *Solea* of a sub-orbicular form, and having a small square spot on each scale, and a freshwater *Anguilla*, remain undescribed.

MICROSCOPICAL SOCIETY OF LONDON.

Oct. 21, 1840.—Richard Owen, Esq., President, in the Chair.

A communication from the Rev. C. G. Vernon Harcourt to Mr. Owen was read, in which the author relates his observations made upon some microscopic animalcules found in a pond at Nuneham.

The author's attention was attracted to the subject by observing the brilliant masses of red which appeared in the pond in the morning, and seemed to disappear in the evening. Portions of this were collected and submitted to the microscope. It was found to consist of a number of small particles adhering together so as to form a continuous film, which floated upon the surface of the water in the glass in which it was kept, but after a few hours resolved itself into its component particles, which sunk to the bottom.

When the films were observed in the pond they were found to be of a green colour until six o'clock in the morning, at which hour they begin to change from green to red. The red colour continues until four o'clock in the afternoon, at which hour the films, after passing through shades of brownish purple, again return to the green state, and so continue until the following morning, when the same phenomena are repeated.

It was found very difficult to keep the animals in their green state, and the only good opportunity of examining them in that condition was found to be by the side of the pond. When carried home in a wine-glass they quickly became red. Some, however, were collected, with great care not to disturb them, in a wash-hand basin, which was left in the open air. The films remained united and went through their regular changes for three days, after which the creatures fell to the bottom, remained red, and appeared dead.

The change of colour from green to red, and *vice versa*, appears to depend on certain alterations taking place in the interior of the animal. Although the mass of united animals looks green, yet there may always be discovered with the microscope, in each individual, a red spot, which when the mass becomes red dilates, the animal being stretched out at full length, with the mouth and vent open. The green colour is reproduced by the red interior contracting towards a vent near the tail. The process by which these changes are effected was repeatedly observed.

The animals were never observed to feed, nor was anything ejected from the vent. They are very sluggish, and when separated were never seen to reunite. In a cloudy morning they are of a purplish brown colour, the dilatation of the red interior not being completed, and when it rains they sink to the bottom.

The author refers to the figure in Shaw's Miscellany of *Cercaria mutabilis* (*mutabilis*, from change of shape, not of colour) as furnishing a correct representation of most of the appearances which the animalcule assumes in its red state, and offers some conjectures as to the possibility of Shaw having mistaken the different appearance of the animal at different times as indicative of a difference in species.

The colour, he observes, does not depend altogether upon light and heat, as in that case it would probably change earlier than six o'clock in the morning in the middle of summer, and at all events would not return to the green state as soon as four o'clock; neither would it, upon being disturbed, resume the red colour in the dark. The green colour could not be preserved by sudden emersion in spirits of wine, which dissolved out the red colour and gave a brown solution.

Mr. Varley stated his own observations on similar animalcules, which he was disposed to refer to the genus *Euglena* of Ehrenberg, and endeavoured to explain the change of colour by reference to optical phenomena.

A paper was read by Mr. Bowerbank, "On a new variety of Vascular Tissue found in a Fossil Wood from the London Clay."

The singular variety of vessel, which is the subject of this paper, occurs in a fossil dicotyledonous wood from the London clay of Herne Bay, in Kent. The texture of the mass is very similar to Bovey coal, but more carbonaceous. It is in the possession of Mr. Samuel the lapidary.

With a low power the wood bears a close resemblance to the structure of beech. A thin section, when viewed as a transparent object with a power of 100 linear, exhibits numerous large vessels, the greater part of which are of that variety of annular vessel which has the annulations very much interrupted, and divided into numerous portions of various sizes.

Occasionally large vessels are seen thickly covered with minute dots having a dark line passing through the centre of each at right angles to the axis of the vessel. The true nature of this singular appendage is best seen by a power of 800 or 1000 linear, which exhibits the transverse line as consisting of two lines, separated from each other at their centres, but united together at either extremity. In most cases these lines do not extend over the surface of more than one dot, and their united ends project slightly beyond its margin; but a few instances may be seen of their extending over two, three, and even four dots, and then the lines are observed to expand to the greatest degree over the centre of each of the dots, and to approach each other slightly in the spaces between them. An almost precisely similar structure had been pointed to the author by Mr. Edwin Quekett in the recent wood of *Piper nigrum*.

Another remarkable appearance observed in the same fossil wood, consists in certain of the vessels being occupied by numerous vesicular globules, which appeared to have been freely floating within their parietes. When not in contact with each other they are perfectly spherical and uncompressed, and in some cases are so numerous as to fill nearly the whole diameter of the vessel. These globules are very variable in size, and the author considers that the whole of them may be attributed to a more than ordinary development of globules of circulation analogous to that observed in *Valisneria* and other plants. No analogous structure to this is observable in the recent wood of *Piper*.

There was a large attendance of Members and visitors.

BIBLIOGRAPHICAL NOTICES.

Flora comitatus Pesthinensis in uno volumine compressa. Auctore Jos. Sadler, ed. secunda. Pesth, 1840.

We have now again the pleasure of introducing to the notice of our readers one of the valuable local floras of the continent, most of which are so full of valuable notes upon the distinction of species, and without which it is quite in vain for us to endeavour to identify our native plants with those of the other European countries. The work before us, containing 1429 species of flowering plants, is occupied with the description of the plants growing wild in the county of Pesth in Hungary, and presents a flora, as might be expected, in many points differing materially from that of our own country, although singularly resembling it in others. Containing as it does so large a portion of the Hungarian Flora, this book cannot but be interesting to such of our botanists as extend their researches upon European plants to so distant a country, and to all such we can strongly recommend it.

Supplement to English Botany. No. 51, October, 1840.

We have just received this new Number of Mr. Sowerby's excellent and beautiful Supplement to English Botany, which contains plates and descriptions of *Achnanthes brevipes*, *Odontella aurita*, *Erucastrum incanum*, *Arthrolobium ebracteatum*, *Laminaria Fascia*, and *Asperococcus compressus*. We trust that Mr. Sowerby is now about to continue this work at more regular intervals, for the long interval which has elapsed since the appearance of No. 50, appears to us to be quite unaccountable, since we are well aware that deficiency of matter is not the cause.

In the Press.

A History of British Algæ (Sea-weed), by the Hon. W. H. Harvey, in 8vo.

A Journal of a Winter at the Azores and a Summer at the Baths of the Furnas, by Henry Bullar, Esq., and Dr. Joseph Bullar, in 2 vols. 8vo.

A Grammar of Entomology, by Edward Newman, a new edition, almost entirely re-written, 8vo.

MISCELLANEOUS.

DIANTHUS PLUMARIUS, LINN.

In the 'Flora Hibernica' (p. 40.), Mr. Mackay introduces this plant as a native of Ireland, from two stations near to Cork, on the authority of Mr. J. Drummond, and refers to a specimen in the herbarium of the late James Brodie, Esq., now in the possession of David Steuart, Esq., of Edinburgh. Through the kindness of that gen-

tleman I have recently had an opportunity of examining that specimen, and find that it is not *D. plumarius* but *D. superbis*, which is so frequent an inhabitant of gardens that I think it certainly cannot be considered as an indigenous plant without further proof than we as yet possess. Mr. Mackay's description appears to have been drawn from the true *D. plumarius*.

In Mr. Leighton's 'Flora of Shropshire' (p. 188.), *D. plumarius* is introduced upon the authority of specimens gathered upon the walls of Ludlow Castle and Haughmond Abbey, in both which places it is very plentiful, as I know from personal observation, and has quite as good a claim to be included in our lists as *D. Caryophyllus*, the only certain stations for which are the walls of the Kentish Castles.
—CHARLES C. BABINGTON.

SINAPIS CHEIRANTHUS, Koch.—Specimens of a plant from near Penard Castle, Swansea, have been distributed by myself and others under this name, which turn out, upon more careful examination, to be only *S. Monensis*.—See *Prim. Fl. Sarn.*, p. xiii. The Jersey plant is the true *S. Cheiranthus*, which has not yet, I believe, been found in England.—CHARLES C. BABINGTON.

SAXIFRAGA UMBROSA.

Brislington, near Bristol, Nov. 24, 1840.

SIR.—It is stated in the Review of Mr. Baines's Flora of Yorkshire (*Ann. Nat. Hist. for Nov. p. 216.*), that *Saxifraga umbrosa* is "not a northern plant," but that it is found "in the west and south-west of Ireland, in as mild a climate as any part of the British islands affords." It may be worth mentioning that it was brought to me some years since from Clovelly, when I doubted its being truly wild. I this year have had an opportunity of verifying the locality myself, and from the circumstances of its being a mile distant from any garden, and that no other cultivated plants are to be found in the course of the road near which it grows, I am much inclined to admit the station as a true one. I found it on the left-hand side of the Hobby approaching Clovelly near a little bridge.

I am, Sir, obediently yours,

Richard Taylor, Esq.

F. RUSSELL,

BUCK BEAN OR BOG BEAN, MENYANTHES TRIFOLIATA.

This beautiful flower has always been referred to *Pentandria Monogynia*, but on examining several plants I was struck with observing that the terminal flower of four out of eight specimens had six equal perfectly formed stamens. This fact does not appear to have been observed, as I do not find any reference in the Synoptic Tables to plants under *Hexandria Monogynia*. It is also remarkable that the terminal flowers should have the anomalous number; as in general the student is directed, if he is under any difficulty on account of the difference in the number of stamens in the flowers of the same plant, to be guided by the number of the terminal flowers.

The corolla is six-lobed, or rather formed of six petals soldered together, as they separate very easily one from the other, and the calyx is six-leaved, with a small scale at the centre of the base of the

alternate leaflets, which are only found on the apical flower; but in their place in the other there are sometimes three bractææ, placed far from each other on the peduncle, the larger one (which alone is constantly found) being placed at the base, where it springs from the scape. The flower opens regularly from the bottom upwards till within a few of the top; then the top one opens, and after that the remaining ones which surround its base.

RIVER-SPONGE INSECT.

Correction of a mistake relating to the *River-Sponge Insect*, and to the *Freshwater Sponge*. By John Hogg, Esq., M.A., F.R.S., F.L.S., &c.

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

GENTLEMEN,—Having forgotten to correct an error into which the able Entomologist, who contributed the description of the anomalous Insect discovered by myself inhabiting the *Spongilla fluviatilis*, to the ‘Magazine of Natural History,’ had inadvertently fallen, in making me conclude that the *motions* of that *Insect* were mistaken by some French naturalists for the *movements* of the *Freshwater Sponge* itself, and having lately read the same error inserted in the ‘*Annales des Sciences Naturelles*,’ I think it incumbent on me no longer to delay sending you the following correction, which I hope you will favour me with publishing in an early Number of your ‘*Annals and Magazine of Natural History*.’

The mistake, which I here point out, is contained in this paragraph, taken from p. 200 of the ‘Magazine of Natural History,’ vol. iii. New Series;—“Mr. Hogg, F.L.S., by whom these insects were discovered, during a series of minute investigations upon the *Spongilla*, has arrived at the conclusion that the motions of these insects, and the undulations which they produce in the water, have been mistaken by Laurenti and others for movements of the Sponge itself, and which they have accordingly regarded as affording proofs of the animality of that substance.”

Again, I find the same translated into p. 380 of the ‘*Annales des Sciences Naturelles*,’ *Séconde Série*, tom. xi. *Zoologie*, in the following words:—“M. Hogg, qui a découvert ces insectes pendant une série d’observations délicates, qu’il avait entreprises sur la *Spongille*, est arrivé à conclure que ce sont les mouvemens de ces insectes et les ondulations qu’ils produisent dans les eaux, qui ont été pris par Laurenti et autres pour les mouvemens de la *Spongille* elle-même, et regardées comme des preuves de l’animalité de cette substance.”

Now, as well from this paragraph, as from its translation, it must not only be inferred, that the same remarkable insects were actually present in those specimens of the *Spongilla*, whilst M. Laurent and others were witnessing the movements described by them, and that they had not noticed the insects themselves; but also, that the undulations in the water or currents were produced by the respiratory motions of these identical insects alone, and of no other parasitical

animals; or, in a word, that there is a necessary connexion between the *River-Sponge Insect* and every species of the *Freshwater Sponge* wherein such movements and currents are perceptible. This, however, is incorrect; and for the erroneous paragraph before given, I beg to substitute the following correction:—

Mr. J. Hogg, F.L.S., by whom these insects were discovered, during a series of minute investigations, by which he has become convinced of the *vegetable* nature of the *Spongilla fluviatilis*, has arrived at the conclusion, that the *currents* observable entering into and returning out of the *Spongilla*, and which have been erroneously accounted by some naturalists as proofs decisive of the *animality* of that substance, are caused by the *function* of *respiration* being effected by this insect by means of its rapidly vibrating its abdominal filaments, or gill-like organs, within the pores or canals of the Sponge, and thereby producing streams in the water; for he has never witnessed the like currents to occur in any part of that Sponge which has been entirely free from that parasite. Mr. J. Hogg, therefore, considers, that the *process of respiration* being carried on by that or some other aquatic or marine insect, or molluscous, or crustaceous, animal, &c. parasitically inhabiting and almost constantly discoverable lurking within every specimen of all kinds of Sponge, is the principal—if not the sole—*cause* of the *currents* of water taking place in those most singular productions.

I will here only remark, that this subject is fully investigated in my 'Observations on the Sponges,' published in part 3. vol. xviii. of the Linnæan Transactions; and that circumstances have as yet prevented me from procuring more of these anomalous insects, so as to determine whether they be only *Larvæ*, or insects having assumed their *perfect* form; but, I may add, that I am still most inclined to the latter opinion.

I remain, Gentlemen, yours very truly,

JOHN HOGG.

London, Nov. 16, 1840.

THE ANIMAL OF HYRIA.

The mantle lobes of the species of this genus, brought from British Guiana by Mr. Schomburgk, are united together behind, and furnished with two short separate contractile siphons, like the animals of *Iridina* and *Leila*, though the submarginal impression of the shell does not show indications of any inflection behind.—J. E. GRAY.

LOTTIA PULCHELLA.

I this summer examined many living specimens of my *Patella pulchella*, and found the animal a true *Lottia*, thereby confirming its distinctness from *Patella tessulata*, from small specimens of which the shell can scarcely be distinguished. On examining microscopically the *Lottia testudinalis*, I found the mantle as well as the gill to be covered with vibratile cilia.—EDWARD FORBES.

ON THE GENUS *EUPLOCAMUS** OF PHILIPPI.

Euplocamus of Philippi (*Triopa* of Johnston) is not, as has been hitherto supposed, a genus of Nudibranchia, uniting the characters of *Doris* and *Tritonia*, the dorsal branchiæ of the one with the lateral branchiæ of the other. The lateral appendages of *Euplocamus* I find to be processes of the mantle, unfitted for the respiratory office, not being provided with vibratile cilia, which are seen only on the plumose dorsal branchiæ and on the laminated dorsal tentacula. The lateral appendages of *Tritonia* are, however, true ciliated branchiæ, as are also those of *Eolida* and its allies. The gill-lids or branchial appendages of *Polycera* are not ciliated.—EDWARD FORBES.

NEW LAND SHELLS FROM NEW ZEALAND.

Helix Busbyi, Gray. Shell depressed, subdiscoidal, largely umbilicated, opaque white, covered with a very thick dark green smooth periostraca, which is inflexed over the lips. The spire flattened, rather rugose; outer whorl smooth, depressed, rounded; the mouth large, bent down towards the axis. Inhab. New Zealand.

This curious species was discovered by Mr. Busby, to whose exertions in natural history we are indebted for many specimens belonging to the natural productions of these interesting islands, after whom I have great pleasure in naming it. It is much like *H. Cunninghamii* of New Holland in form and size, but is very peculiar on account of the thickness and colour of the periostraca, which is unlike any other *Helix* we are at present acquainted with.

Helix Dunnia. Shell depressed, large, umbilicated, pale brown; outer whorl rather angular, smooth. Inhab. New Zealand. Mr. Busby.

Specimens of both these species have been presented to the British Museum by Mrs. Dunn, who received them from Mr. Busby.—J. E. GRAY.

BLOOD OF NUDIBRANCHIA.

The beautiful colours of the Nudibranchous Mollusca are in many species, though not in all, owing to the colour of their blood. Thus in certain species of *Montagua* the blood is green, in several of the *Eolida* red, in others brown. The analogy between the Nudibranchia and the Annelides is thus curiously supported by the variations of colour of the blood. The globules of the blood in most species are very large. The blood of *Polycera quadrilineata* is white, and its heart beats one hundred and thirteen in a minute.—EDWARD FORBES.

RED COLOUR OF THE SALT MARSHES OF THE MEDITERRANEAN.

The red colour of these marshes, often of a very deep tint, has been for a long period attributed to the presence of a minute crustaceous animal, *Artemia Salina*, Leach. Mons. Joly has last year attended to this subject, and has come to the conclusion that the

* See Ann. Nat. Hist. vol. iv. p. 88, v. p. 91.

colour is produced not by the *Artemia*, but by a minute animalcule occurring in incalculable numbers, and to which he has given the name of *Monas Dunalii*. This is fed upon by the *Artemia*, to which it communicates its brilliant red colour, and whence has arisen the error which M. Joly now considers he has corrected.—See an interesting paper on *Artemia Salina*; *Annales des Sc. Nat.* xiii. p. 225. 1839, 1840.—See *Ann. Nat. Hist.* vol. iv. p. 357.

FOSSIL FAUNA OF BRAZIL.

Mons. Lund, in a late communication to the Editor of the *Annales des Sciences Naturelles*, dated Lagoa Santa, 1st April, 1840, enumerates an increased list of fossil mammalia amounting to 101 species. Among what he considers as the more interesting of his discoveries is the metatarsal bone of a Horse, larger and of a more flattened form than the corresponding bones in the living species. This he has named *Equus neogæus*. Numerous remains of birds have also been met with, among which are those of two species of *Rhea*, one of them of a size much exceeding that of the existing *R. Americana*.—*Annales des Sc. Nat.* for May, 1840.

MR. SCHOMBURGK.

This enterprising traveller is again about to leave Europe to survey and make further researches in Guiana, for which purpose his services have been secured by Government. The information which that gentleman has added to our knowledge of the physical geography and productions of Guiana have been already great, and we have little doubt that the experience of former years and a liberal support will enable him now to fill up what is wanting. To those unacquainted with his researches; we would recommend a perusal of the journals of his various expeditions to the interior of the country, printed in the *Journal of the Royal Geographical Society*, by which body he was originally patronized; and an idea of its magnificent scenery will be obtained from the series of beautiful views, lithographed from original drawings, which are just ready for publication by Messrs. Ackerman and Co. It is gratifying also to be able to add that Mr. Schomburgk's exertions in the cause of science have been appreciated by other governments as well as our own; the King of Prussia has granted to him the order of the Red Eagle, while the Queen of Prussia and King of Saxony have each presented him with handsome presents.

ANOUPLEURA BRITANNIÆ.

It gives us pleasure to be able to state that the British Association, at its last meeting at Glasgow, granted the sum of fifty pounds sterling to assist in the publication of Mr. Denny's valuable Monograph on the *Anopleura*, and appointed Sir W. Jardine, Mr. Selby, Mr. Yarrell, and Dr. Lankester to be a committee to superintend the application of the sum above mentioned. Notwithstanding, however, this liberal grant, we know that the great expense attending the carefully and minutely engraving and colouring of the

plates will be scarcely covered; and we would request our zoological and ornithological, as well as entomological readers, to come forward with their subscriptions; the ornithologist in particular does not look at the work with sufficient interest. The parasites appear to run *generically*, and in many instances *specifically*, and may be taken as a mean to assist in distinguishing closely allied species from each other. The price of the work complete is 1*l.* 1*s.*, and the number of the plates coloured will be from twenty to thirty.

ADDITION TO THE BRITISH MUSEUM.

The zoological collection of the British Museum has lately received some very interesting Mammalia from Siberia, viz. *Antelope siaga*, *Ant. subgutturosa*, and some small quadrupeds described by Pallas, which have not before been seen in Western Europe. Capt. George Gray has presented to it some very interesting specimens which he collected during his travels in New Holland, and Mrs. Dunn has sent a series of shell and radiated animals from New Zealand, which she had received from Mr. Busby. These, with the shells which the Museum received some time ago from the Rev. Mr. Yates, show the great riches we are to expect from these islands when they are properly explored.

ORNITHOLOGICAL GALLERY OF THE BRITISH MUSEUM.

The eastern gallery of the British Museum, which was formerly occupied by the collections of minerals, having undergone a complete repair, has been lately re-opened to the public, with the collections of birds and shells. The passerines, gallinaceous, and wading birds are as yet only arranged, but the remainder will be exhibited in the course of the spring, when this room, which is 300 feet long and 50 wide, will contain one of the richest ornithological collections in Europe. The cases are all glazed with large panes of plate-glass, with very narrow brass bars; and the smaller birds are arranged on a new plan, on box shelves, each bird having a back ground close behind it, so as to show its outline distinctly and relieve its colours, and the shells, which will occupy forty table cases, are exhibited on black velvet, which gives them admirable relief.

METEOROLOGICAL OBSERVATIONS FOR OCT. 1840.

Chiswick.—October 1. Overcast. 2, 3. Very fine. 4. Rain. 5. Fine: rain. 6. Fine. 7. Frosty and foggy. 8. Very fine. 9. Hazy. 10. Dense fog: very fine. 11. Hazy. 12—15. Foggy in the mornings: fine. 16. Overcast. 18. Cloudy: rain. 19. Cloudy. 20. Clear. 21. Fine. 22. Hazy: rain. 23. Overcast: rain. 24. Overcast. 25. Very fine. 26. Overcast. 27. Heavy rain: clear. 28. Fine. 29. Foggy: rain: dense fog at night. 30. Cloudy and fine: clear. 31. Foggy: clear at night.

Boston.—Oct. 1, 2. Cloudy. 3. Fine. 4. Cloudy. 5. Cloudy: rain early A.M. 6, 7. Fine. 8. Fine: rime frost this morning. 9. Cloudy. 10, 11. Fine. 12—14. Foggy. 15. Fine. 16. Cloudy. 17. Rain: rain early A.M. 18. Cloudy: rain P.M. 19. Stormy. 20. Fine. 21. Cloudy. 22. Cloudy: rain early A.M. 23. Fine: rain P.M. 24. Fine. 25. Fine: rain early A.M. 26. Fine. 27. Cloudy: rain early A.M. 28. Foggy. 29. Cloudy: rain A.M. and P.M. 30, 31. Foggy.

Days of Month, 1840, Oct.	Barometer.				Thermometer.						Wind.				Rain.			Dew point.	
	London: Roy. Soc. 9 a.m.	Chiswick.		Boston, 8½ a.m.	Dumfries-shire.		London: Roy. Soc. 9 a.m.		Self-register.		Chiswick.		London: Roy. Soc. 9 a.m.	Dumfries-shire.	Boston.	Chiswick.	London: Roy. Soc. 9 a.m.	Dumfries-shire.	Mean.
		Max.	Min.		9 a.m.	8½ p.m.	Fahr. 9 a.m.	Max.	Min.	Max.	Min.	Max.								Min.	Max.	Min.
1.	30.022	30.039	29.996	29.34			55.3	57.7	51.7	58	46	53.5							50
2.	30.172	30.124	30.039	29.56			53.7	58.7	51.3	61	36	51							52
3.	30.194	30.153	30.061	29.66			47.7	59.0	44.3	56	46	44							46
4.	30.084	30.056	30.033	29.60			51.2	54.6	46.3	57	45	53							49
5.	30.100	30.073	29.997	29.54			49.5	57.2	46.4	57	33	50							48
6.	30.126	30.094	30.082	29.60			45.4	55.3	42.6	53	30	44							45
7.	30.114	30.121	30.071	29.53			43.7	53.6	39.0	58	30	47							42
8.	30.266	30.241	30.190	29.70			40.7	53.9	36.8	60	30	43							41
9.	30.326	30.293	30.260	29.75			40.3	51.6	40.0	59	30	48							39
10.	30.318	30.280	30.254	29.79			45.7	55.4	39.8	60	35	45.5							41
11.	30.400	30.401	30.323	29.92			52.5	56.7	44.4	58	35	40							46
12.	30.604	30.549	30.543	30.11			50.3	59.3	44.7	60	31	39							46
13.	30.590	30.548	30.328	30.05			43.2	57.3	42.2	63	31	40							43
14.	30.404	30.359	30.271	29.83			43.2	56.6	39.7	66	32	45							42
15.	30.258	30.225	30.071	29.69			43.7	60.7	41.9	57	36	41.5							42
16.	29.936	29.915	29.755	29.34			48.3	54.8	42.0	56	51	49							46
17.	29.812	29.965	29.757	29.36			54.8	56.7	48.0	56	46	48.5							49
18.	30.026	29.977	29.755	29.20			50.8	56.8	49.0	56	49	49							47
19.	29.704	29.803	29.664	29.04			53.5	55.7	49.0	57	42	50.5							48
20.	30.100	30.075	30.052	29.58			47.7	56.6	45.8	57	29	46							45
21.	30.156	30.124	30.046	29.65			48.7	54.8	42.2	54	39	42							41
22.	29.904	29.897	29.861	29.40			48.8	52.8	44.8	53	38	45							45
23.	29.960	29.933	29.662	29.43			45.2	52.7	43.7	53	40	41.5							42
24.	29.556	29.586	29.523	29.06			45.2	53.2	42.5	53	35	42							43
25.	29.784	29.877	29.746	29.33			42.2	50.6	39.3	51	28	40							38
26.	29.886	29.875	29.126	29.30			39.2	49.3	35.4	52	43	38							37
27.	29.178	29.204	29.160	28.75			51.3	52.8	38.6	50	30	49							45
28.	29.136	29.266	29.114	28.76			42.7	52.3	41.3	52	36	37.5							42
29.	29.340	29.369	29.292	29.00			45.6	49.4	41.4	50	32	45							43
30.	29.522	29.520	29.477	29.15			47.3	49.6	40.3	56	36	42							44
31.	29.564	29.566	29.515	29.19			47.3	52.8	43.2	57	36	47							45
Mean.	29.985	29.984	29.871	29.46			47.2	54.8	43.2	56.32	36.64								Mean.
																			44

The Meteorological Observations from Applegarth Manse, Dumfries-shire, for October, have not yet been received.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.

No. 38. JANUARY 1841.

XXXV.—*Horæ Zoologicæ.* By SIR W. JARDINE, Bart.,
F.R.S.E. & F.L.S., &c.

No. III. *On the History and Habits of the Birds composing the Genus Prionites of Illiger.*

THE genus *Prionites*, or the Motmots of British writers, is a small group of beautiful birds peculiar to the New World. They are all very closely allied by their habits, and have the colours of the plumage and the distribution of its markings assimilating so remarkably with each other, that some confusion still exists in the distinction of the species; and there is also much difficulty in always recognising with certainty that to which the observations of travellers relate. In our latest ornithological system by Mr. Swainson, two species have been separated from *Prionites*, under the subgeneric title of *Crypticus**, characterized by the great dilatation of the bill; while in the old form, as now restricted, we appear at present to know six distinct birds†.

The *P. Brasiliensis* is the species from which the genus was originally established, and it is the only one regarding the habits of which we have hitherto had any authentic record. The notes of both Azara and Waterton refer to it‡,

* *C. platyrhynchus* and *superciliaris*.—Orn. Illust. pl. 106. and pl. 18. N. S.

† *P. Brasiliensis*; *ruficapillus*; *Bahamensis*, Sw.; *Mexicanus*; *Martii*; and *cæruleocephalus*.—Orn. Illust. pl. 42. N. S.

‡ Of this species, described by Azara, two specimens were procured alive, and were kept in confinement for five months. "It is a rare, strong, bold, mistrusting and observing bird; it ate small pieces of bread, or more readily of raw meat, which before swallowing it struck several times against the ground, as if, believing them alive, it wished to kill them. Sometimes I saw them eat water-melons and oranges; but they never drank or took any notice of maize, either whole or pounded, nor did they use their feet to hold with. If the piece was large they left it; but what they liked best were small birds, which I let loose into the room, and they followed them obsti-

and from the other scattered information which we possess, the favourite haunts of the Motmots are known to be the depths of retired forests generally near the vicinity of water; they are solitary, or live in pairs only, utter a monotonous often repeated note, breed in holes in the banks of ravines or in hollow trees, and live upon insects, reptiles, small or young birds, and fruits or berries; and as we learn from the notes of our correspondent, they occasionally also search for their food upon the ground.

The Motmots seem to be confined chiefly to the northern half of the southern continent of America, one at least, as its name implies, extending into the Mexican provinces; it is probable also that the different species are local or restricted

nately for a long time, till they tired them, caught them and killed them with strokes as they treated the meat. They continued this even after the birds were dead, till they had completely swallowed them, beginning at the head, and not hesitating at the feathers; they did the same with mice, but did not care for rather larger birds, which they could not swallow; whence it may be inferred that they would do as much damage to nests as the Toucans, which they resemble in other points."—*Apuntamientos de Azara*, tom. i. 243. Num. LII. Del Iutu.

"The *Houtou* shuns the society of man. The plantations and cultivated parts are too much disturbed to engage it to settle there; the thick and gloomy forests are the places preferred by the solitary *Houtou*. In those far-extending wilds, about day-break, you hear him articulate in a distinct and mournful tone, 'Houtou, Houtou.' Move cautiously to where the sound proceeds from, and you will see him sitting in the underwood, about a couple of yards from the ground, his tail moving up and down every time he articulates 'Houtou.' He lives on insects and the berries amongst the underwood, and very rarely is seen in the lofty trees, except the bastard Liloabali tree; the fruit of which is grateful to him. He makes no nest, but rears his young in a hole in the sand, generally on the side of a hill."—*Waterton's Wanderings*, p. 127.

"The Motmots, so named from their monotonous note, live only in the tropical forests of the New World, preferring those deep recesses of perpetual shade, where a high canopy of matted foliage nearly excludes the rays of a vertical sun. They appear even more solitary in their disposition than the *Trogons*; their note may be heard morning and evening, from the depths of the forests, but the bird is never seen, unless the hunter comes unexpectedly upon its retreat. This we have generally found to be a low withered branch, completely shaded, and just at the edge of such paths as are made by the Cavies or the Indians. The *Jacamas* and the *Trogons* both love these shady nooks, where they sit motionless, watching for passing insects, on which they dart. Such is no doubt the manner in which the Motmot feeds, but his strong conformation enables him to capture larger game."—*Swains. Zool. Illust.* 2nd Series, descrip. of *P. Martii*.

"The Motmot is solitary, hiding in the deep shades of the forest, and, like other air-feeding birds, is always found sitting nearly motionless."—"While its fissirostral habit of catching its food upon the wing, and the discovery of the broad-billed species (*P. platyrhynchus*), seem to us a conclusive argument for placing this genus in the Fissirostral order."—*Swains. Nat. Hist. and Classification of Birds*, ii. p. 141.

in their distribution; that which we have now under consideration, we do not know as inhabiting the continent at all. Mr. Swainson gives the Bahama isles generally as its native country; and in the locality of the specimens before us we have it stretching to the very south-eastern extremity of the West Indian islands, but we do not know if the species occurs also in Cuba, St. Domingo, &c., or continuously along the group; on the continent the first species which occurs in Guiana* and the Brazils is the old *P. Brasiliensis*.

Our active correspondent in Tobago has procured and forwarded to us skins and specimens in spirits of what we consider to be the *P. Bahamensis* of Swainson†, which have enabled us partially to examine its internal structure; but before noticing this or making any remarks upon the place the group should occupy in our system, we shall transcribe Mr. Kirk's observations upon their habits, which may be usefully compared with the notes from various authors which we have given beneath.

“This beautiful species, with his hair-like plumage and spatulated tail-feathers, is a very common and obtrusive bird in this island; and it may be fairly said that if they are passed unobserved it will be no fault of their own, for they will sit and look stupidly down upon any intruder until he comes within a few yards, when they generally accost him with their usual low hollow-sounded note, *Who, Who*, which with very little ingenuity may be converted into *Who are you?* and, indeed, reports are current of instances of their having been answered, in the belief that the question was put by a human being; and when the Prionites demanded over and over again ‘Who are you?’ in a dark and solitary grove, it is not a matter of surprise that a poor ignorant African (as the story goes) should, after giving an explanation which proved unsatisfactory, take to his heels and leave the ‘king’ in the undisputed possession of his forest.

“The *Prionites* of Tobago builds a nest, or rather occupies the cavity of some deserted yellow ant's nest, or other hole, generally in the bank of a road or gully, or *scaur* by the side of some rivulet, though it does not follow that it should always be near water. The entrance is generally very small, from two to two inches and a half in diameter, and the hole is pierced from three to nine feet into the bank, sometimes directly in, at other times along the bank, parallel, and at no

* The specimens brought home by Mr. Schomburgk from Guiana were all *P. Brasiliensis*.

† Two centenaries and a quarter.—Lard. Cyclop., Animals in Menageries, p. 332.

great depth; but the aperture widens as it proceeds, especially where there is a turning or angle, otherwise it would be impossible to save the two centre feathers of the tail; at the extremity it is widened to about two feet in diameter, where about the month of May, without the slightest preparation, they deposit three or four dusky cream-coloured eggs, about the size of those of a pigeon.

“When the young have been hatched they remain in the nest until able to fly; they are supported by the parents, and are fed upon snakes, beetles, berries, &c., and in every nest which I have found there was below the young thousands of large maggots, bred and fed there I suppose by the nauseous fragments of insects left by the young birds. The young are easily tamed, and will eat mutton cut into small pieces, lizards, cock-roaches, &c. The sun appears oppressive to them, and when driven out of doors they strove always to regain the house, where with unerring aim they would dart upon the smallest insect moving upon the ceiling. They are exceedingly acute in sight, nothing that moved passing their observation. They do not assist with the feet in destroying life, but will hold a snake of two or three feet long in their saw-like bill, and continue to strike him against the ground until life is extinct, when they begin at one end and swallow him whole. I have also seen one with a very large lizard swallowed to the head and arms, which apparently could not be then got further.”

In reply to some additional queries, our correspondent again writes on the 22nd of March: “The *Prionites* never catch their prey upon the wing like the Flycatchers; they frequent dark solitary groves, and are fond of being in the vicinity of marshy gullies or rivulets; in such places I have often surprised them, sometimes singly and sometimes in pairs, with the bill and breast dirty as if they had been searching the earth for insects, the moist spots around bearing evident symptoms of having been so examined. When they seize a snake they never let go their hold, as if to renew it more securely, but turning the head to the right and to the left keep striking the snake sharply against the branch on which they are perched, for they, in a wild state, never remained on the ground a moment after I saw them catch their food. In speaking of the seizing of cock-roaches on the roof, I must be understood to refer to the young which I had domesticated; and in such cases the cock-roaches were not flying, but were running along the ceiling; when seized, the *Prionites* invariably alighted upon the floor, against which it would repeatedly strike the insect before swallowing. The domesticated *Prionites*

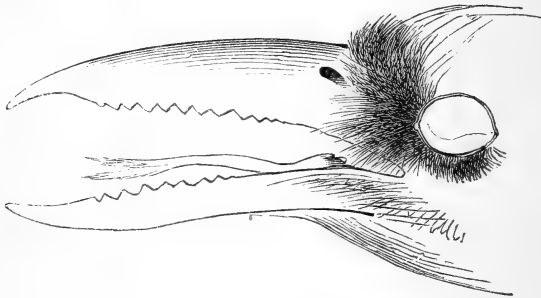
used at times to sit in our portico, from whence it would dart down into the flower-garden, seizing the lizards indiscriminately without regard to size; when hungry I have seen them kill and attempt to swallow one ten inches long; I have often extracted the lizard in such instances when the tail protruded from four to six inches out of the bird's mouth; at other times, when it had succeeded as far as the hind legs, and the bird appeared in a state of suffocation. They feed also on soft fruits; I took several large seeds from the stomach of one a few days since. The two spatulate tail-feathers are entire at the first moult, but when or how they become spatulate, I am sure no one in Tobago knows. The birds have always been reported to assist it with their bill, hence my anxiety to domesticate them for the purpose of ascertaining the fact; but in this I have always failed, for the tail had no sooner extended four or five inches than it was broken off by the cage or floor. One thing is certain, that at this season, viz. from October until May or June, we may search in vain for a specimen without the spatulate tail, while betwixt June and October they may be met with in abundance; this leads me to the conclusion that it is natural, and that they assume the spatulate appearance with the first moult and unassisted."

The specimens of the Tobago Motmot which we have received, vary in length from seventeen to fourteen and a half inches; when compared with *P. Brasiliensis*, the blue colour encircling the crown covers less space on the occiput, the feathers are not so elongated, and the tint is pale or greenish at their base, and not of the deep and uniform cobalt of the Brazilian bird; the upper part of the plumage is nearly similar in tint, but the whole of the lower parts and under wing-covers are of a deep and uniform brownish-orange, relieved only by the black elongated feathers, which appear through nearly the whole group in a similar situation.

From the specimens in spirits* being rather soft and tending to decay, the examination of the soft structures could not be made satisfactorily. The whole muscular system exhibited little strong development; indeed the outward form of the bird (confirmed by our knowledge of its habits) shows no provi-

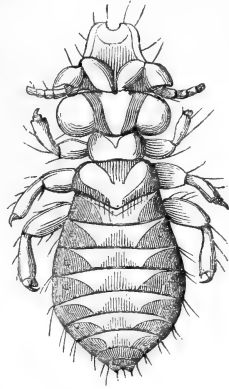
* In sending home specimens in spirits care should be taken not to place too many in the same jar or barrel; a certain quantity of spirits will only preserve a certain portion of animal matter, and the desire to fill the vessel often proves destructive to the whole. It should also be noticed, that partial putridity or decay has not commenced; and if the vessel has remained for some time in a warm climate, it will tend much to the preservation of the specimens to renew the spirits before they are despatched, taking out at the same time any which may seem to be soft or not keeping.

sions for exertion or rapid flight; the skeleton, with the exception of the bones of the head and neck, is likewise as weakly formed. The stomach is small and oval; the proventriculus gradually narrowing into the œsophagus, which is wide and dilated; when distended the stomach appears muscular without, but the walls when cut through show a moderate thickness only. The inner coating is rather coriaceous, and separates easily and cleanly from that next to it. The intestinal canal is narrow, but was too much spoiled to be distinctly made out. The cæca appeared long, and to be given off nearly at the extreme end, and the cloaca is very large. The tongue is lengthened, bifid for half an inch, and is slightly feathered on the sides; the muscles of the inferior larynx, so far as observed, resemble in number and position those of the Corvidæ.



In placing *Prionites* among the Fissirostres and near to the Rollers, we believe that Mr. Swainson will ultimately be found to be correct; their weak formation and the internal structure, the wide gape and partially bristled rictus, together with their habits, all tend to this place; at the same time their analogies towards the Crows are extremely strong. The elongated form and short wings of *Pica* and *Crypsirina* remind us of *Prionites*, and it is remarkable that in both of these there is a narrowing of the centre tail-feathers, where they are spatulate in the last. In the typical crows the bill is often ragged on the edges; they are carnivorous and insectivorous, and many feed eagerly on fruits and grain, while reptiles are often seized by the stronger species; the tongue is slightly bifid, and is fimbriated on its edges,—the commencement of that pencilled or feathered form which more particularly belongs to those species which live much on sweet or pulpy fruits. One other remarkable analogy we would notice, and one perhaps by which it has not yet struck ornithologists to trace the alliance between the various groups. The birds in spirits afforded

numerous specimens of *Nirmi*, some of which were sent to Mr. Denny, who is now engaged on a monograph of the British species of this very curious race of insects. That gentleman obligingly furnished the drawing for the annexed wood-cut, and the following remarks: "It belongs to one of the genera most numerous in species; the most striking character is the great size of the trabeculæ or moveable organs before the antennæ; I know of no species in which they are so large or thick; the nearest approach is in those species infesting the Crow family; you will see these organs thick and strong in the *Nirmi* from the Jay, Raven, Carrion Crow, Rook, and Jackdaw."



1

Docophorus Prionitis, from
P. Bahamensis.

The spatulate form of the tail-feathers is another part of the structure of this group which seems to have attracted general observation. It is the popular notion in their native country that the bare portions of the tail-feathers are cut by the bird itself*, which, for this purpose, has been provided with a serrated bill. The observations of Mr. Kirk all tend to disprove this, and we would certainly consider it as merely a state of adult plumage, and when we look around to other groups we see corresponding structures to be far from uncommon. The utility or design of it is not at first apparent, except as an indication of maturity. It is common to both sexes, and does not appear before the second moult; previously the feathers are entire, but there is a narrowing of the web where it becomes afterwards stripped off, and in one or two examples we have seen a lateral feather stripped in the same manner with those in the centre. The bill may be used to dress the feathers, but the serratures on its edges are at once explained by Mr. Kirk's notes, and must prove eminently useful in holding fast the reptiles which constitute a great

* "This bird seems to suppose that its beauty can be increased by trimming the tail, which undergoes the same operation as our hair in a barber's shop, only with this difference, that it uses its own beak, which is serrated, in lieu of a pair of scissors; as soon as his tail is full-grown, he begins about an inch from the extremity of the two longest feathers in it, and cuts away the web on both sides of the shaft, making a gap about an inch long; both male and female adonize their tails in this manner, which gives them a remarkable appearance among all other birds."—*Waterton's Wanderings*, p. 127.

portion of their food; in different species the serratures vary in their development, being in some irregularly broken, while in others they are regularly serrated. In *Crypticus* they are very minute, and with the dilated form of the bill may be adapted for seeking a peculiar kind of food.

XXXVI.—On the recent Additions to the Flora of Ireland.

By CHARLES C. BABINGTON, Esq., M.A., F.L.S., &c.

BELIEVING that a catalogue of the additions to the Flora of Ireland, made since the publication of Mr. Mackay's work, would be an interesting Supplement to the paper by Dr. Hincks, on 'The Early Contributions to the Flora of Ireland,' contained in recent Numbers of the Annals, I have, as far as lies in my power, collected together the scattered notices of newly-discovered plants, natives of that country, and now present them in a connected form.

1. *Cerastium atrovirens*. Common on the sea-coasts, *C. C. B.*
2. *Elatine Hydropiper*. Near Newry, *Mr. Thompson*, of Belfast; and at the Lagan Canal, where it enters Lough Neagh, *Mr. D. Moore*, Hook. Br. Fl. 166.
3. *Rubus carpiniifolius*. At Ma'am in Cunnamara, Galway, in Aug. 1835, *C. C. B.*, Mag. of Nat. Hist. ix. 129.
4. *R. Kähleri* β . *fusco-ater*. At the same place and time as the last, *C. C. B.*
5. *Callitriche pedunculata a. vera*. The Mullet, Mayo, July, 1836, *C. C. B.*, Mag. of Zool. and Bot. ii. 124.
6. *C. pedunculata* β . *sessilis*. Newport, Mayo, Aug. 1840, *C. C. B.*
7. *C. platycarpa*. Newport and Achil Isle, Mayo; and near Sligo, Aug. 1840, *C. C. B.*
8. *Fedia auricula*. Oughterard, Galway, Aug. 1835, *C. C. B.*, Mag. Nat. Hist. ix. 129.
9. *Anthemis maritima*. Bear Haven in S.W. of Ireland, *Hooker*, Br. Fl. 308.
10. *Leontodon (Apargia) alpinus* (Jacq.). *Mr. J. Ball* found a single specimen which appeared to agree with the description of this plant better than with that of any other species on the mountains south of Glen Cree, in Wicklow, in 1837, Annals of Nat. Hist. ii. 29.
11. *Erica vagans*. Islet on the coast of Waterford, near Tramore, *Dr. Burkett*, Hook. Br. Fl. 159.
12. *Cuscuta epilinum*. Near Newport, Mayo, Aug. 1840, *C. C. B.*

Mr. Mackay informs me that this is identical with his *C. europæa*.

13. *Myosotis repens*. Cunnamara, Galway, Westport and the Mullet, Mayo, July, 1836, *C. C. B.*, Mag. Zool. and Bot. ii. 124. Glen Cree, Wicklow, 1837, *Mr. J. Ball*, Ann. Nat. Hist. ii. 29.
14. *Orobanche barbata*. On the roots of ivy in many places, *C. C. B.* I learn from Mr. Mackay that the true *O. minor*, which is parasitical upon clover, has not been found in Ireland, and that therefore the *O. minor* of the Fl. Hibern. is this plant.
15. *Lamium intermedium*. Near to the foot of Ben Bulben, Sligo, 1837, *Mr. J. Ball*, Ann. Nat. Hist. ii. 34.
16. *Atriplex erecta*. In fields in many places, *C. C. B.*
17. *A. rosea*. On the sea-shore, not uncommon, *C. C. B.*
18. *Polygonum viviparum*. Ben Bulben, Sligo, 1837, *Mr. J. Ball*, Ann. Nat. Hist. ii. 34. I am informed that a notice of its discovery in this place by Mr. Murphy exists in the Mag. of Nat. Hist., but I have been unable to find it, and the plant is omitted in the Flora Hibernica.
19. *Euphorbia Peplis*. Garreries Cove, near Tramore, Waterford, 1836, *Miss Trench*, Mag. Zool. and Bot. ii. 124.
20. *Salix ambigua*. Tully, Cunnamara, Galway, Aug. 1835, *C. C. B.*, Mag. Nat. Hist. ix. 129.
21. *Juncus nigritellus*. Bogs between Sligo and Ballina, 1837, *Mr. J. Ball*, Ann. Nat. Hist. ii. 34.
22. *Potamogeton oblongus*. Common, *C. C. B.*
23. *P. longifolius*. In the narrow part of Lough Corrib, between Ma'am and Cong, Galway, *Mr. J. Ball*, Supp. to Eng. Botany, f. 2847.
24. *Carex canescens*. On the shores of Lough Neagh, 1836, *Mr. D. Moore*, Comp. Bot. Mag. i. 307. Under the name of *C. Buxbaumii*.
25. *Calamagrostis lapponica*. Lough Neagh, 1836, *Mr. D. Moore*, Comp. Bot. Mag. ii. 191.
26. *Kæleria valesiaca*. Ben Bulben, Sligo, 1837, *Mr. J. Ball*, Ann. Nat. Hist. ii. 34. Having myself gathered this plant on Ben Bulben during the last summer, I have come to the conclusion that it is not *K. valesiaca*, but only a remarkable alpine form of *K. cristata*. It has a much denser spike than is usual in *K. cristata*, an elongated ascending stem thickly clothed with the dead leaves of the preceding year, and glabrous leaves which are sometimes ciliated.

XXXVII.—*Report of the Results of Researches in Physiological Botany made in the year 1839.* By F. J. MEYEN, M.D., Professor of Botany in the University of Berlin*.

[Continued from p. 275.]

M. MIRBEL† has given us some very interesting researches on the "Generative sap" of the roots of the Date-palm (*Phoenix dactylifera*); this sap he calls "Cambium." The cambium deposits itself in layers in the stems and boughs of the mono- and di-cotyledons, partly in the large interstices which remain between the utriculi or cells (schläuche), and partly in the cavities of the cells and tubes. From it proceeds the organization; and the principal object of this treatise is to follow, by a series of observations, the transition of the cambium from an amorphous state into that of continuous cellular tissue and of independent utriculi. The aim of the observations is no less than the profoundest study of the formation of all the tissues of which the different vegetative organs are composed. On examination of the roots of the date-tree, there are seen in transverse sections masses of cambium with a granular surface, at least it appears so, and this is seen with all possible distinctness. It is certain the appearance of the granulations (mamelons) precedes that of the cells; often in sections from a root of determinate age (viz. very young) in the centre of each granulation a dark spot is visible, and this is an unequivocal sign of the formation of the cavity of a cell; a larger spot shows the increase of the cell. In this latter case there was nothing granular to be seen, and the undivided partitions which bounded the neighbouring cells were thinner, in proportion as the cavities of the cells had increased in size. Frequent comparisons showed that this metamorphosis takes place without increase of substance. The cells do not remain long in this state; their sides extend, and become covered with minute papillæ, which are arranged like the squares of a chess-board, and which, although of firmer consistence than at first, still contain much moisture. Shortly afterwards these cells, which until then had had no determinate form, assume the shape of more or less regular hexagons (on transverse sections), their sides extend, become thin, dry, and stronger; the papillæ vanish, and there appear in their place horizontal, parallel, fine

* Translated from the German, under the direction of the Author, and communicated by Henry Croft, Esq.

† Nouvelles notes sur le Cambium, extraites d'un travail sur la Racine du Dattier.—Compt. Rend. 29 Avril, 1839. Ann. des Sci. Nat., Part. Bot. 1839, I. 321. Pl. 11—15. With larger plates in the Archive du Muséum d'Hist. Nat. I. p. 305.

close-pressed lines, like streaks. It is now thirty years, says M. Mirbel, since I first observed these streaks. On longitudinal sections these streaks appear vertical, and never cross each other at right angles. Some years ago M. Mirbel described an analogous case, namely, in the milk-vessels of *Nerium Oleander*—[these vessels are the cells of the liber, and in the *Apocynæ* there is found in company with these another quite independent vascular system which constitutes the true milk-vessels!—Meyen], but the cause of the difference appeared to him to be evident. Very fine granules, placed like the squares on a chess-board, have the appearance of horizontal, vertical, or even diagonal lines, according to the point from which they are viewed.

In other vessels M. Mirbel could not see these points, but is inclined to believe, until a better explanation be given, that these horizontal, vertical, and diagonal lines on the cells and on the long and short utriculi, as well as in other vessels, are caused by a quantity of undistinguishable papillæ placed like chess-board squares. [This preferable explanation, I believe, was given by myself several years ago.—M.]

From the hollow granulations up to the cells with thin, dry, and striated sides, the vegetable matter forms one and the same completely continuous cellular tissue, the contents of which are modified by the advances of vegetation. The two states, one of which M. Mirbel designates as that of continuous cellular tissue, the other as a collection of distinct cells which are either separated or combined solely by juxtaposition, determine or fix two periods of utricular formation which may be exactly distinguished.

The root of the date-palm exhibits three clearly distinct organic regions, a peripheral, a medial, and a central.

In the above-mentioned early stages of vegetation there is a layer of cambium lying between the peripheral and the medial part, as also between the medial and the central; moreover, there are in each region certain parts destined for the formation of cells.

The peripheral part being exposed to external injuries would soon be destroyed if new cells were not added from the neighbouring layer of cambium; this addition is the more necessary, as the above-mentioned spots destined for utricular formation are here wanting, and when the layer of cambium is wanting this part of the root is reduced to two or three layers of torn and lifeless cells. The medial region exhibits in its centre the oldest cells; the younger they are the nearer they lie to the cambium of the outer or inner region. Even if it should at first sight appear as if

both streams, acting in opposition to each other, must necessarily pass into each other and, as it were, meet together; still closer observation shows that only one single centrifugal and irresistible force draws along with it the layers of cambium and all the utriculi or cells. Here, where the cells formed from the cambium have so much the upper hand, there are a quantity of peculiar smaller deposits of this substance, which are destined for very different purposes; some fill the cells, while others fill the intercellular passages.

The cambium in the interior of the cells is only visible when it has the form of a gummy tissue; frequently it disappears directly after its appearance, and leaves no trace of its ephemeral existence behind. At another time these cells separate into granular spheroids, which also only exist a short time; another time one of the cells alone increases, and appears destined to acquire double the size of that which contains it, but suddenly arrested in its development it sinks again, and mixing with the cambium forms an amorphous ferruginous mass, which exists some time and then vanishes.

The cambium in the intercellular passages is not less abundant; it either separates into small masses or else forms long threads. In the first case, the organizing substance passes so quickly into the utricular state, that it is often impossible to follow its changes. The new cells are easily distinguished from the old ones; they are smaller, and their walls appear as a gelatinous tender layer. Afterwards they become stronger, larger, press themselves between the others, and grow together with them. In the second case, when the cambium passes through the intercellular passages in the form of long threads, the changes can be clearly followed nearly from beginning to end. After a granular cambium appear—gelatinous cellular tissue; a cellular tissue whose sides are covered with papillæ; tissue with dry, thin, and finely striated walls; a tissue of long distinctly bounded utriculi, which are connected with each other; new cells press themselves in between these, which are thereby increased two, three, four, or five-fold; at last openings in the partitions establish an internal communication between the utriculi.

The outer layer of cambium exists only for a short time, and in roots which possess some consistency it is not to be found. Between the cells of the first and second region there appear here and there new ones, which, by increasing, combine with each other and inclose the central region as in a sheath. They are tubular, cylindrical, and their ends fit exactly on to each other. They are at first simple, but become compound by the addition of new tubes which are formed in

the interior, and between which a communication is established by means of openings.

The central region of the root derives its utriculi from the inner layer of cambium, as do also the inner parts of the medial region. Here also the oldest cells lie in the middle, but are cylindrical, they are connected only in some points, and are in full vegetation. They soon, however, pass into the compound state. The youngest exterior cells are, as it were, only cellular cambium; at this age the central region can be clearly distinguished from the medial. Afterwards there is formed between them a plate or stratum of the thickness of a single layer, the cells of which assume a determinate form, either tetrahedral or in form of a parallelogram; they are equal and closely connected together in concentric rows, while the tubes of the medial part have no fixed form. At a later period the cells of this zone become filled with cambium, which soon forms irregular tissue. They increase in size, always retaining their concentric arrangement, and each is developed in the form of a semicircle whose diameter lies on the medial region. In the centre of each of these semicircles there is a small cell analogous to the large containing cell. From its external surface proceed vertical partitions in different directions like rays, which are attached to the inner surface of the large cell. The metamorphosis proceeds rapidly, and cannot be followed by the most attentive observation.

The increase of the central region by the insinuation of new cells begins at a slight distance from the centre, and becomes continually greater till it reaches the above-mentioned zone. This phenomenon (one of the most curious in the whole formation of vegetable organs) takes place in every cell by means of successive deposits of cambium, which exists but a short time itself, but before it disappears produces a quantity of small cells which are often destined to live for centuries. Vessels of all sizes pass lengthwise through the central region; the larger lie towards the centre, the smaller near the periphery; all are polyhedral tubes, whose sides are penetrated by transverse clefts (or at least apparently so), and have more or less the appearance of small ladders, and hence the name "*Vasa scalariformia*" (*Treppengefässe*). In a note M. Mirbel adds, that he has found in the root of the date-palm that that which appears to be an opening is probably in most cases only a spot where the side of the cell is thin; but a thinning of the membrane is not very far from an opening, and every opening in a tube commences by it*.

* The opinions concerning the pores which occur so frequently on the sides of cells have been very various. Their discoverers, Moldenhawer the elder, and

Between the vessels there are compact masses of cells, which also reach as far as the zone; these separate, and a new cellular tissue, whose sides are covered with papillæ, insinuates itself between them. It extends itself in the form of an irregular layer, in the same direction as the compound vessels, viz. towards the centre.

M. Mirbel does not agree with those physiologists who hold these cellular layers to consist of laticiferous vessels, but considers them as lengthened cells destitute of coloured sap; and he thinks he has observed the gradual metamorphosis of the utriculi into variously sized scalariform vessels. Each new layer, in lengthening, separates the mass of tubes in the centre.

In the mean time a new layer of cambium is formed in each half, which is soon converted into a layer of cells and then into vessels. These formations continue so long as cambium is produced.

The metamorphosis of cells and vessels from simple ones into compound, takes place in the same manner as was stated above, by means of the development of other cells in their interior.

I have given the contents of this very excellent work without any remarks; but I must add that I by no means agree with all the results contained in it; for on an examination of the young roots of the date-palm I took quite a different view of several of the above observations. I cannot, however, here enter further into the subject.

M. Mirbel, considered them as small holes, and the latter seemed to assume the presence of such holes in the membrane of cells as a general occurrence. The Germans, in general, disputed the existence of these holes, but afterwards acknowledged their error, and held these formations as true holes. At a later period it was found that these pores were only thinner portions of the membrane, which could be clearly seen with a good instrument. M. Mohl described them as such. These differences of opinion arose solely from the imperfections of microscopes; but now we can always determine whether at any spot there are holes or only thinner parts, and we must therefore modify our opinions on this subject. The small pores appear very generally as transparent dots; but we may easily convince ourselves that actual holes do occur in the membrane of the parenchymatous cells of most herbaceous and succulent plants when they are old, for then the original or primitive membrane which closed the transparent spot is absorbed; this may easily be seen in autumn, when succulent plants are killed by the first frost. Even in the membrane of the parenchymatous cells of the *Tradescantia* I found holes at this season, although in summer not even transparent spots were to be seen. It is just the same with the large transparent spots on the sides of the parenchymatous cells in the leaves and leaf-stalks of the *Cycadææ*; in the ferns, the palms, in short, in every case, where at an earlier period there are only transparent spots, these pores may make their appearance, but one is soon convinced that in the interior of such porous cells no circulation of the sap and no new production can take place. These formations might therefore reassume their old name of pores, if, indeed, it were any improvement.

The delineations which accompany this treatise, are among the most beautiful and correct which have ever been published; especially those in the 'Annales des Sciences Naturelles.' They are not so good in the 'Archives du Muséum.'

By new observations I have confirmed the statement, that the bark of trees is not reproduced*; in a series of cases I had covered barked twigs and young stems with glass tubes which fitted air-tight, and thereby prevented the injurious influence caused by evaporation and the consequent desiccation of the wounded surface. The substance which, under certain circumstances, is formed on the decorticated wood, and which has been considered as bark, consists simply of a loose parenchymatous tissue, and is formed out of a gum-like sap exuded from the medullary rays which open upon the decorticated surface. This sap exudes in the form of transparent drops, which, when protected from evaporation, metamorphose themselves into a colourless cellular tissue, which increases more or less according to the quantity of forming sap exuded by the medullary rays; sometimes a surface of a square inch or more is covered with this bark-like tissue, which proceeds from one point; and if this formation commences at several neighbouring spots at the same time, the masses at length join together and cover the decorticated wood for a considerable space. This new tissue is, however, not bark, and produces no new wood, and therefore cannot prevent the final death of a tree when it has been barked all round; but in case of partial decortication only its rapid production is much to be desired.

On some specimens I could see that the new layer of wood, with its medullary rays, &c. was formed only on the inner surface of the bark, for the bark which had been separated from the wood before the formation of ligneous matter produced a new ring; in some places, indeed, a quantity of this bark-like tissue had been deposited between the new-formed ring and the surface of the wood.

Moreover, I remarked that in eight cases the thick glass tubes which were fastened over the decorticated surfaces were three times broken, and indeed suddenly, and into small pieces, which cannot well be explained by an evolution of vapour.

Dr. Becks† has published a treatise 'On some Phænomena in the growth of Dicotyledonous Trees,' in which he explains the formation of those raised signs and figures which one sometimes finds on the stems of trees, when in a former period they had been imprinted on the wood, as, for instance, in

* Berichte über die Setzung des Vereins zur Beförderung des Gartenbaues in der Preussischen Staaten, vom 27 October, 1839.

† Linnæa, von 1889, 544.

the case of marks made on those trees in forests which are destined to be sold.

M. C. van Hall* has laid before the Academy of Sciences of Amsterdam a series of observations on the increase of trees in thickness, by which it is clearly shown which trees thicken slower or faster, and what is the proportion of increase in different ages, different years, and even in the several months. An oak stem which in 1826 had a circumference of 140 millimetres†, during ten years increased yearly on the average 37 mill. in circumference; an oak of 555 mill. increased during ten years 307 mill., or yearly $30\frac{7}{10}$ mill.; and another of 1792 mill. in circumference increased yearly only $12\frac{1}{2}$ mill. An elm of 170 mill. increased yearly on the average $36\frac{5}{10}$ mill.; another of 190 mill. $32\frac{1}{2}$; and one of 1155 mill. only $20\frac{5}{8}$ mill. A willow (*Salix alba*) of a circumference of 191 mill. increased $47\frac{1}{2}$ mill., and one of 1130 nearly as much. The Canadian poplar (*Populus monilifera*), in circumference 620 mill., increased yearly as much as 81 mill.; and one of 1645 mill. even $91\frac{1}{7}$ mill. Birch and maple, on the contrary, increased even when young only about 10 or 12 mill. *Pinus Abies*, *Tilia europæa*, *Juglans regia*, and *Æsculus Hippocastanum* were measured in the same manner. Moreover, seven different kinds of trees were measured for five years during the summer monthly, and these measurements in particular have given good results. It appears, first of all, that the increase in the five years was not always the same, and that no determinate increase or decrease therein, according to the age, could be observed. The increase of the circumference varied very much in the different months of the several years, which is evidently to be referred to the weather. We will here give only one of the tables in order to prove the above statements. A stem of *Ulmus campestris* measured in February 1834 265 millimetres, and increased in millimetres

	May.	June.	July.	Aug.	Sept.	Oct.	Total.
1834	13	21	17	15	2	$1\frac{1}{2}$	$69\frac{1}{2}$
1835	10	12	10	16	1	1	50
1836	8	17	6	15	7	0	53
1837	5	7	17	15	2	0	46
1838	6	15	16	12	$4\frac{1}{2}$	1	$54\frac{1}{2}$

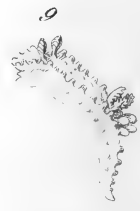
M. van Hall remarks, that by the observations, the opinion of Agardh, that trees increase in length in the first part of the summer and in breadth in the latter part, is proved to be unfounded; and that they also show that the circumference of stems is not altered during the six winter months.

[To be continued.]

* Waarnemingen over de Toeneming der Boomen in Dikte.—Tijdschrift voor Natuurl. Geschied. en Phys. 1839, vi. p. 207.

† The millimetre is $\cdot 03937$ of an English inch.





New species of Polycera.

XXXVIII.—*Observations on the Genus Polycera of Cuvier, with Descriptions of two new British Species.* By JOSHUA ALDER, Esq.

[With a Plate.]

IN consequence of the small number and rarity of the species constituting the genus *Polycera* of Cuvier, its characters and limits are at present very imperfectly understood. I shall, therefore, make no apology in bringing under the notice of naturalists two or three species belonging or allied to this pretty genus, which have lately occurred to me on the coast of Northumberland, near Tynemouth and Cullercoates, in the hope that the more detailed descriptions and figures which I shall be able to give, from having examined the animals in a living state, may furnish materials for estimating the value of those characters on which a generic distinction ought to be founded.

Cuvier describes the genus as having the branchial plumes accompanied by a pair of membranous lamellæ capable of covering and defending the branchiæ in cases of danger*. Though the number of these appendages is stated by Cuvier to be two, it seems doubtful whether the character of the genus should be thus limited. Rang, who had the opportunity of examining some exotic species, does not confine his generic character to that number, but merely says in his description of the branchiæ, that “quelques appendices membraneux les environnent.” Without giving any opinion in this matter, it will suit my convenience on the present occasion to adopt the latter and more enlarged view of the characters of the genus, for the purpose of including in it two new species about to be described, which, though they differ in some other respects from the typical form, I feel reluctant in the present imperfect state of our knowledge to raise to the rank of genera. They constitute, however, two very marked divisions, the characters of which may probably afterwards be found of sufficient value to constitute generic distinctions. Until lately the only known British species of this genus was the *Doris flava* of Montagu, to which Dr. Fleming has added, with some doubt, the anomalous *Doris pennigera* of the same author. Neither of these species appear to have been recognized by later observers. Very recently the indefatigable researches of Mr. Thompson of Belfast have brought to light two other British species of this genus, (if, indeed, one of them be not

* The use here attributed to these appendages appears to be in part, at least, imaginary. Such an use is not and cannot be made of them by some of the species; their position and small degree of motion preventing their being so applied.

identical with the *Doris flava* of Montagu,) which have been described in a preceding Number of this Journal*. Of the three species which I have met with on our coast, one is probably the same with *D. quadrilineata*, Mull., and *D. flava*, Mont.; the varieties I have met with inducing me to bring these two together. A detailed description may enable others to judge whether or not I am right in this view of the subject.

MOLLUSCA NUDIBRANCHIA, Cuvier.

Fam. DORIDÆ, Johnston.

Gen. POLYCERA, Cuv.

a. *With two branchial appendages, body without spiculæ.*

P. quadrilineata, Plate IX. fig. 1. to 6.

Doris quadrilineata, Mull. Zool. Dan. t. 17†; Prod. 2771.

Doris flava, Mont. Linn. Trans. vii. 79. t. 7. f. 6.

P. White, with 5 rows of orange tubercles, 4 to 6 tentacular filaments, 7 to 9 branchial plumes, and 2 branchial appendages.

Variety, marbled with dark brown and orange, with 4 dark lines along the sides, uniting the orange tubercles.

Body nearly half an inch long, limaciform, prismatic, tapering to a point behind, smooth, white, semi-transparent; with two moderately sized clavate and strongly lamellated tentacula, mucronated at top, tipped with orange, non-retractile; at a little distance behind which are two very small black eyes. The anterior portion of the body is produced into a kind of veil, the margin of which is adorned with four, or sometimes six, linear tentacular filaments tipped with bright orange. The sides of the mouth are produced into two angular points, but not tentacular. Seven, or rarely nine, plumose branchiæ are situated about two-thirds along the centre of the back. They are white tipped with orange; the three anterior ones largest, the others very small, surrounding the vent in an incomplete circle. At the sides of these, and slightly posterior, are two plain, linear, branchial lobes, about three times the length of the longest plumes, abruptly tapering to an obtuse point, tipped with orange. Two rows of orange or golden yellow tubercles, extending from the margin of the veil, form an elevated ridge on each side of the back to the branchial lobes, beyond which they unite and form a central carina to the tail. Another row of orange tubercles, not always regular, occupies the centre of the back, and two others adorn the sides between those first mentioned and the foot. Foot linear, very narrow, truncated in front, where it forms two sharp angles, and ending in a point behind. There is a strong groove down the centre, and the margins can be brought together like the leaves of a book. No cloak. The skin smooth and without any spiculæ. Aperture of the sexual organs on the right side, as in *Eolidia*.

* Annals, vol. v. p. 92.

† For the quotation from Muller I am indebted to my friend Mr. E. Forbes.

Variety, white, beautifully marbled with dark reddish-brown and orange. Two bands of dark chocolate-brown extend along each side of the back, connecting the orange tubercles, and interrupted by them. Branchial plumes speckled with brown and yellow.

On first discovering this elegant variety I took it to be a distinct species, especially as the tentacular filaments amounted to six, while in the ordinary forms before examined they never exceeded four. Further investigation, however, brought intermediate stages to my notice, and also taught me that the number of tentacular filaments was extremely variable. The veil, in fact, is surrounded by six prominent points, any number of which may be elongated into filaments, the rest remaining merely tubercles. Thus I have found individuals with only one, two, or three of these elongated. Usually, however, the four anterior ones become tentacular, the two lateral ones very rarely so. The other appendages of these animals are equally liable to variation. Specimens have occurred with only one branchial lobe, and others without any, though no appearance could be found indicating that they had been deprived of them by accident.

The excellent description of Muller agrees perfectly with this, excepting in the number of branchial plumes. These have already been seen to be irregular, but I am inclined to think the discrepancy to have arisen from his observing the larger ones only and overlooking the smaller. No individual coming under my observation has had fewer than seven plumes.

Several specimens of this pretty little mollusk have occurred to me on small sea-weeds at low-water mark between Tynemouth and Cullercoates, and also on the roots of *Laminaria digitata* thrown up by the tide. When kept in a glass of sea water they are very active, but usually prefer swimming at the top in an inverted position. I have never observed them suspend themselves by threads, but they are very fond of making a cup or sucker with the hinder part of the foot, and suspending themselves by that means either from the surface of the water, or by adhering to any foreign substance. The spawn I have found associated with them is in the form of a short, broad riband, with a slight curvature, and glued by one of its edges to sea-weeds.

The pulsations of the heart observed at various times and in different individuals, were from ninety to one hundred in a minute*.

* The question of the connexion between quick pulsation and rapidity of movement in animals, is worthy of more careful investigation. I have found some of the molluscous animals, whose motions are proverbially slow,

b. *With 4 branchial appendages, body with spiculæ.*

P. citrina, n. s. Plate IX. fig. 7—9.

P. minute, lemon-yellow, with 5 rows of tubercles down the back. Veil surrounded with numerous small tubercles, 5 branchial plumes, and 2 pair of short branchial lobes.

Body limaciform, prismatic, about 2 lines long, rounded in front, tapering to a point behind, pale lemon yellow, studded with five rows of tubercles of a deeper shade of the same colour. Tentacula two, short, broad, and strongly imbricated, behind which are two very minute eyes. Veil strongly sinuated in front, and rounded at the sides, the margin divided into 12 or 14 short tubercular expansions; from the sides of the veil an elevated ridge, studded with tubercles and capable of a slight expansion, runs along each side of the back, uniting behind the branchial lobes and extending in a strongly tuberculated keel to the tail. Branchial plumes about five, transparent, forming a semicircle in front of the vent, a little behind which are four short, opaque, rounded branchial lobes, two on each side. Mouth without tentacula. Foot linear, a little expanded and angulated in front. Body containing imbedded spiculæ.

A single specimen was found on a coralline from deep water in a fishing boat at Cullercoates.

When put into a watch-glass of sea water, so fond was this little creature of swimming inverted on the surface (a treat which one would think it could scarcely have in its natural place of abode), that it could with difficulty be made to remain at the bottom a sufficient time to allow of a drawing being made of it.

The *Triopa Nothus* of Johnston is probably a *Polycera* of this division.

c. *With 10 branchial appendages, without veil or spiculæ.*

P. cristata, n. s. Plate IX. fig. 10, 11.

P. smooth, white, without veil, with 2 pair of tentacular filaments, 3 plumose branchiæ, and 10 branchial appendages.

Body nearly half an inch long, limaciform, of a transparent watery white, smooth. Tentacula two, large, club-shaped, pale yellow, not retractile, strongly imbricated on the upper part and terminated by a mucro; from the bases of these spring two pair of simple, linear, tentacular filaments tipped with bright orange, and also non-retractile; two inferior tentacular processes are situated at the sides of the mouth, capable of considerable extension and contraction. No eyes? The vent is in the centre of the back rather nearer the posterior end, and is surrounded by three beautifully plumose, transparent white

to have a quickness of pulsation quite unexpected. In *Vitrina pellucida*, for instance, I have found the heart to beat so many as 120 times in a minute, while in other states of the same animal the pulsations have been very slow, and sometimes suspended for several seconds.

branchiæ of about five pectinated branches each, the points of which are tipped with pale yellow. The anterior plume is longest, the two side ones shorter, and all having a graceful curve inwards. Surrounding these are ten linear, subclaviform, branchial appendages; generally arranged five on each side, and tipped with orange or pale yellow. The hinder part of the body tapers to an obtuse point, is slightly keeled, and sometimes marked with an orange central line. The viscera are seen in a brown or pinkish mass through the transparent skin. There is no cloak, nor are the sides of the body angulated as in the other *Polycera*, but gradually rounded off to the foot. Foot linear, narrow, grooved down the centre, and cloven at the hinder extremity. No spiculæ. The orifice of the sexual organs on the right side.

A few specimens of this elegant and graceful little animal were found in pools among the rocks near low-water mark at Cullercoates.

Occasionally this species is entirely white, the body being semi-transparent and the tips of the appendages opaque. The number of branchial appendages varies, one or two of them being sometimes rudimentary or entirely deficient. One individual spawned while confined in a glass of salt water. The spawn was deposited in a single broad gelatinous band forming a semicircle, and strongly glued to the side of the glass*.

The pulsations of the heart varied from 45 to 75.

The first of the species here described may be considered the type of the genus *Polycera*.

The second agrees with it in the prismatic form of the body, and longitudinal rows of tubercles; in the presence of a veil and of eyes; but differs in the number and form of the branchial lobes, and in having imbedded spiculæ.

The third has much fewer points of resemblance; it agrees with the former in general contour, in the presence of tentacular filaments and of branchial lobes; but the prismatic form of the body and the lines of tubercles are no longer seen. The frontal veil and eyes † are also absent, and the branchial lobes, becoming greatly more numerous, completely encircle the plumes ‡. Taken collectively, these variations from the

* A specimen of *Eolidia rufibranchialis*, contained in the same glass, deposited its spawn in a narrow waved thread, many times convoluted, and forming a pattern something like a true lover's knot. This was in the month of July.

† In none of the individuals I examined did I observe any appearance of eyes. Since the above was written, however, my friend Dr. Johnston had kindly favoured me with a drawing and description of a very similar mollusk discovered by him at Holy Island, in which he observed two "very minute eyes." I must therefore admit the possibility of my having overlooked these obscure organs.

‡ The whole three species agree in all the characters of the genus given by Rang, with the exception of the tentacula being "contractiles dans une cavité;" a character not to be found in any of the British species.

typical form might perhaps be considered sufficient to warrant the establishment of a new genus. Mr. Forbes has stated that the absence or presence of eyes is generic in this group. I am by no means confident of this. In groups where these organs are fully developed, the function performed by them is of sufficient importance to give them a primary character; but where these or any other organs are reduced to their minimum of development, so as, in fact, to become merely rudimentary, their absence then becomes of little importance. In the present case we are unable to prove that these minute black spots perform any of the purposes of vision: why then may they not be mere indications of organs which are to receive a further development in other forms of the same group? Such rudimentary organs, incapable of performing any real function, are not unknown in other departments of zoology, and form a beautiful illustration of the very minute gradations through which the development of organs is carried in the whole range of animated nature.

The number of parts in this class of animals is not to be depended upon in estimating generic distinctions, and, as shown above, cannot even be taken as specific; but at the same time there is always a number so far predominant in each species as to be characteristic of it, though, like the number of arms in Starfish and the leaves of some plants, occasionally varying within certain limits. In the Nudibranchia this variation is most frequently attributable to imperfect development.

Through the whole of this genus the orange colour is predominant; generally adorning the prominent parts in each species. This colour, however (passing on the one side into yellow and into scarlet on the other), is more or less prevalent throughout the family. Colour is sometimes characteristic of species in this group, but cannot always be relied upon. Intensity of colour I take to be of no value.

EXPLANATION OF PLATE IX.

Fig. 1, 2, 3. Polycera quadrilineata, in different positions.

Fig. 4, 5, 6. Variety of the same.

Fig. 7, 8, 9. Polycera citrina.

Fig. 10, 11. Polycera cristata.

Fig. 12. A branchial plume of the same.

The whole of them are magnified; the lines opposite each indicating the natural size.

XXXIX.—Additions to Mr. Wood's Catalogue of Crag Radiaria*. By M. AGASSIZ.

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

GENTLEMEN,

MONS. AGASSIZ a few hours previous to his departure for the continent paid me a very short visit, and was able to determine among my crag *Radiaria* the following genera, which I am desirous should be made known (having his permission), as there are some among them that would scarcely be looked for in that deposit. The list comprises all that M. Agassiz had seen from the crag during his sojourn in this country.

Yours, &c.

S. V. WOOD.

December 8, 1840.

No. of Sp.	DESCRIPTION.	Coralline Crag.	Red Crag.
GENERA.			
1.	Pentacrinus.....	.....	Sutton.
1.	Comatula.....	Sutton.	
2.	Comatula.....	Sutton.	
1.	Asterias	Sutton.	
1.	Echinus	Iken.	
1.	Echinopsis	Sutton.	
2.	Echinopsis	Ramsholt.	
3.	Echinopsis .....	.....	Sutton.
1.	Temnopleurus	Ramsholt.	
2.	Temnopleurus	Ramsholt.	
3.	Temnopleurus .....	.....	Sutton.
1.	Arbacea	Ramsholt.	
1.	Salenia	Sutton.	
1.	Fibularia	Ramsholt.	
2.	Fibularia	Sutton.	
3.	Fibularia	Sutton.	
4.	Fibularia .....	.....	Alderton.
5.	Fibularia .....	.....	Sutton.
1.	Brissus.....	Near Orford.	
1.	Amphidetus	Sutton	Sutton.
1.	Spatangus	Ramsholt.	

* See above, p. 245.

XL.—*On the Existence of Infusoria in Plants.* By CHARLES MORREN, M.D., Professor of Botany in the University of Liege*.

THE perusal of the account of Professor Rœper's Researches respecting the cells of *Sphagnum* and their pores †, brought to my recollection some facts which I witnessed while studying the natural history of our indigenous Algæ, and which I think it useful to make known at present, as they may clear up some doubts which still exist in science.

The labours of Rœper, to which I have just referred, show that the cells of *Sphagnum* are sometimes furnished with openings, which place their interior cavity in communication with the air or water in which they are immersed. This skilful observer satisfied himself, that when circumstances are favourable, the *Rotifer vulgaris*, one of the Infusoria whose organization has been explained by the researches of Ehrenberg, exists in the cells of the *Sphagnum obtusifolium*. This grew in the air in the middle of a turf-pit, but Rœper observed its leaves in water; he does not mention whether the infusorial animal came from thence, or whether it was previously contained in the cavities of the cells. The general purport of the paper seems to imply that these Rotiferi exist in the cells of that part of the plant which was exposed to the air; and in this case, the presence of an animal so complicated, living as a parasite in the cells of an utricular aërial tissue, is a phænomenon of the most curious kind in the physiology of plants, and the more so as this animal is an aquatic one.

I recollected that the last year of my residence in Flanders, I found at Everghem, near Ghent, the *Vaucheria clavata*, in which I observed something similar. M. Unger had already published the following details respecting this plant in 1828: "Beneath the emptied tubercules and at several points of the principal stalk, at different angles, rather narrower branches are produced; these branches are generally very long, and greatly exceed the principal stalk in length. At the end of ten or twelve days after their development, there are seen, towards one or other of their extremities, here and there, at different distances from the summit, protuberances of a clavate form, more or less regular, straight or slightly bent back; and others on the sides of the stalk, which have the form

* From the Bulletin of the Royal Academy of Sciences of Brussels, vol. vi. No. 4.

† Annales des Sciences Naturelles, tom. x., November 1836, p. 314; Flora, 1833, p. 17.

of a capsule or vesicle. These vesicles are at first of a uniform bright green colour, and without increase of size, which exceeds several times that of the branches, they always become of a blackish-green colour, darker towards the base, and then one or two globules of a reddish-brown may be clearly distinguished there, often surrounded by smaller granules, evidently destitute of motion, whilst the great ones move spontaneously and slowly here and there in the interior of the capsule, by unequal contractions and dilatations, whence arise remarkable changes of form. I saw these globules, at the end of eight or ten days after their appearance, still inclosed in the capsule, moving more and more slowly, receiving no very decided increase, whilst the base of the capsule became more transparent; at last I observed that, instead of their expulsion, which I was watching for, the extremity of the capsule, at the end of some days, took an angular form, and subsequently gave birth to two expansions in the form of horns; it remained in this state and became more and more pale, whilst the animalcule became darker and died, and afterwards it ended by perishing at the same time as the other parts of the conferva*.”

Subsequent researches have not succeeded in informing us what this animal might be of which Unger spoke. As this author drew so much attention to the spontaneous movements of the propagula of the *Vaucheria*, and as he admitted the passage from vegetable life, characterized, according to him, by immobility, to animal life, the principal criterion of which was motion, his animalcule was confounded with the propagula, and no one, so far as I know, has returned to this very interesting subject.

When, therefore, I found the *Vaucheria clavata* at Everghem, I was as much surprised as pleased to see the mobile body noticed by Unger better than he did. With the aid of a higher magnifying power, I found it easy to ascertain the true nature of the animal, for it was not a propagulum, but a real animal, the *Rotifer vulgaris*, with its cilia imitating the wheel, its tail, &c.

The first protuberances or vesicles which I saw containing this animal, inclosed but one of them; afterwards they laid eggs and multiplied; but it seems that then they descend the tubes of the *Vaucheria* and lodge themselves in new protuberances, whose development they may possibly stimulate, as the galls and oak-apples are organic transformations attributable to the influence of parasitic beings.

* *Annales des Sciences Naturelles*, ancienne série, t. xiii. 1828, p. 438.

The *Rotifer vulgaris* travels quite at his ease in these protuberances; he traverses the partitions, displaces the chromule and pushes it to the two extremities of the vesicle, so that this appears darker at these parts. One day I opened a protuberance gently: I waited to see the *Rotifer* spring out and enjoy the liberty so dear to all creatures, even to infusorial animals; but no—he preferred to bury himself in his prison, descending into the tubes of the plant, and to nestle himself in the middle of a mass of green matter rather than swim about freely in the neighbourhood of his dwelling.

Some of these protuberances had greenish threads appended to their free end, and others had none: I thought at first that these threads were some *mucus* from within, escaped through some opening which might have served the *Rotifer* as an entrance; but an attentive and lengthened observation convinced me that in this there was no solution of continuity, and that the arrival of the *Rotiferi* in the *Vaucheriæ* was not at all to be explained in this way. How are these parasitic animalcules generated within them? This is what further research has some day to show. Meanwhile, I have thought that it should be made known, that the animalcule found in the *Vaucheriæ* by Unger was the *Rotifer vulgaris* of zoologists.

XLI.—*On the Natural Terraces on the Eildon Hills being formed by the Action of Ancient Glaciers.* By J. E. BOWMAN, Esq., F.L.S. & F.G.S.

SCARCELY could my communication on these terraces in the last Number of the *Annals* have been set in type, when I saw the first announcement, by Prof. Agassiz, of the evidences he had seen of the former existence of Glaciers in Scotland. A little reflection, aided by my own recollections of the Swiss glaciers, and of the general views so ably given by him at the late meeting at Glasgow, soon satisfied me that his theory would meet all the difficulties that had so much perplexed me, and explain the actual appearances exhibited on the hills in the neighbourhood of Galashiels. I regret that I was not aware of his discovery when I wrote my remarks; though it must be allowed that my ignorance of it has saved me from the imputation of any bias in applying it to the phænomena in question.

As the fact of the former existence of glaciers in Scotland is now exciting general attention, and will soon, I doubt not, be firmly established, I might have silently left it to others to consider them as the true cause of these terraces, had not a

recent visit from Prof. Agassiz afforded me an opportunity of giving him the details of my own observations, and of hearing from himself that the appearances I described have often been seen by him on the sides of existing glaciers. I trust, therefore, the subject may be thought of sufficient interest to warrant a second communication.

It would be difficult, as I know from experience, to make intelligible to readers who have not visited Switzerland, the real nature and appearance of a glacier. For years I had read and thought much about them, and fancied I understood them; but, until I actually saw and traversed them, I had no correct idea of their real structure and appearance, and little anticipated the powerful impression they are capable of making upon the mind, when first examined under favourable circumstances. Saussure and other Alpine travellers have given very lively descriptions of their wonderful appearance, but the laws by which many of their phænomena are produced and regulated, were never satisfactorily understood until Prof. Agassiz undertook their examination. The result of five years' arduous and patient investigation by this illustrious savant will be found in papers read before the Geological Society of France, and more at large in his 'Etudes sur les Glaciers de la Suisse,' now just published. His discovery also, since the meeting of the British Association at Glasgow, of the traces of ancient glaciers in Scotland, Ireland, and the North of England has been announced to the Geological Society of London, and is expected to appear in detail in the forthcoming Number of the 'Edinburgh New Philosophical Journal.' It would, therefore, be extremely arrogant in me to attempt to anticipate that communication; but, as I have already raised objections to the received theory from my observations on the Eildon Hills, it seems but fair, now that I am enabled, from the familiar explanations of my distinguished friend, to support as well as answer them by referring the appearances to a more rational cause, that I should be allowed to do so.

As Prof. Agassiz entertains no doubt, from a perusal of the article in Chambers's Edinb. Journal, and of my paper, that most of the terraces on the hills in the neighbourhood of the Tweed, are the *morains* of ancient glaciers, I shall confine myself to a few particulars connected with their origin and mode of formation.

Glaciers occupy the gullies and lateral indentations of high mountain chains; and consist of immense accumulations of spongy porous ice, or half-melted snow again solidified by frost. Their texture near the apex or upper extremity, ap-

proaches the nearest to snow, and the opposite or lower end, to ice, the change being gradual and the consequence of the alternate melting and freezing of the surface. Above the height of about 7000 feet, the temperature of the air is seldom high enough to melt the snow; and as all ice has previously been water, it is clear there can be but little of it in a solid state at still greater elevations. The blocks and fragments of rock that are detached from the surrounding precipices, accordingly sink through the mass to the bottom of the snow. At less elevations, where during summer the melting process is more active on the surface of the glacier, the water percolates between the particles of the porous mass, till it reaches the rocks on which it rests. Here, the temperature being lower, it is reconverted into ice, which cements together the stones and gravel, and by its expansive property in passing into the solid state, has a tendency to detach them from the bottom. Thus a new layer or skin of ice is continually accumulating between the lower surface of the glacier and the face of its rocky bed, which, as it thickens, acts a wedge and imperceptibly keeps forcing up the whole superincumbent mass, and with it the stones and gravel which it had entangled at the bottom. But the cooperation of another agent is necessary to bring them to the surface. This is the heat of the sun, which during summer, especially in the day time, melts the upper layers of the ice, and consequently diminishes its thickness; till at length, by this double action, the stones which lay upon the bottom are lifted up till they lie exposed upon the surface of the glacier. So that here, a kind of circulation or interchange of particles takes place, as in a lake, modified by circumstances; their ascent being retarded while in a state of congelation, and their descent accelerated by the perpendicular cracks and fissures which everywhere intersect the mass.

This expansion from below is going on at the same time in the direction of both the longitudinal and transverse axes of the glacier; and as the whole mass lies in a hollow or inclined trough, the power of gravity prevents it from moving in any other direction than downwards. But the motion is not uniform; the sides advance with greater rapidity than the middle; so that if a row of stones were placed at equal distances in a straight line across the glacier, they would soon arrange themselves into a curve or arch; those at each side being carried down more rapidly, would form the base; while those in the middle having comparatively little motion, would be left behind and form the highest part of the arch. This is owing to the following cause: a slight elevation of temperature in

the air near the lateral edges of the glacier, caused by radiation from the neighbouring rocks, occasions a more copious melting of the ice and snow in those parts, and consequently a greater quantity of water is introduced into what remains unmelted. This water being refrozen at night, produces a greater expansion near the edges than in the central portions of the glacier; and this excess accelerates the motion of the sides downwards. It must be recollected that a glacier is not one solid piece of ice, but is broken up and intersected by many chasms or fissures of greater or less width and depth, which allow an independent motion of its different parts. This greater expansion has a tendency also to divert the descending stones from a rectilinear course, and to carry them toward the point of least resistance, in other words, nearer to the sides; so that a large portion of them, instead of reaching the foot of the glacier, are deposited in longitudinal or irregularly curved lines on the inclined slopes of the contiguous rocks, their peculiar form being modified by local circumstances. It is also evident that the greatest accumulations of these lateral shelves, or *morains*, will be found near and upon the most prominent slopes of rock, especially on the side next to the head of the glacier; because these projections not only arrest the stones in their downward course, but by their agency in causing more radiation, melting and freezing, attract, if I may so say, a greater quantity of surface wreck. Again, as the opposite sides of a glacier at any given point have a general coincidence of level, these *morains* will often be found to correspond in horizontal position; though, for obvious reasons, not so precisely as the opposite shores of a bay or lake. They must also be formed solely of fragments from the higher surrounding rocks, not rounded into pebbles, but more or less angular, or mixed with clay or earth, in proportion to the nature and hardness of the material. Neither sea nor freshwater shells will be found among them. Other *morains* are formed at the foot of the glacier, and often present very different appearances; but as it is to the lateral ones that most of the terraces on the Galashiels hills are to be referred, I shall not pursue the explanation further.

I think a careful perusal of the details given in my former paper will show that a large portion of these terraces, or rather shelves, correspond with the *morains* whose origin I have just been tracing. Their broken and interrupted character on the Eastern Eildon and on Williamlaw; their irregular width and rude horizontality of surface, combined with a general coincidence of level; their angular stones and the total absence of gravel, sand or shells, are precisely such as

the causes now explained would produce, and are at this day producing in Switzerland. Their occurrence also on the spur of Williamlaw, which projects into the valley of the Gala, and on the Eildons facing the great valley of the Tweed, which I attempted to show was incompatible with the laws of tidal action, are thus satisfactorily explained; and I feel persuaded that the theory of their formation by water must be abandoned, and that they must be considered to be the true *morains* of ancient glaciers.

But all the terraces on the hills round Galashiels cannot be exclusively attributed to the cause already assigned. Some of them, it will be recollected, are stated by Mr. Kemp to be as much as 300 feet wide. On requesting from Prof. Agassiz an explanation of these broad terraces, he stated that, as far as he could judge from my description, they probably were not true *morains*, but had been formed by the combined action of a glacier and a lake dammed up by ice, such as once formed the barrier of Glen Roy, and in our own day blocked up the stream at the foot of the glacier of Getroz, which finally burst and devastated the valley. I confess that the height at which these broad terraces occur on the Eildons, appears to me incompatible with such a view, and that if Agassiz himself were to visit the locality, he would find it necessary to modify this explanation. I also pointed out to him Mr. Kemp's description of the indentations on the inclined projecting slopes of Williamlaw; and he replied that he had seen something similar in the cliffs in Glen Roy, which he attributed to the friction of floating ice and blocks of stone.

In conclusion, Prof. Agassiz informed me that in his late travels he had traced repeated instances of the various descriptions of *morains* in different parts of Scotland; in Murrayshire he counted a series of nine terraces similar to those in Selkirkshire. He had also seen them in Ireland, and between Shap and Kendal, in Westmoreland; and he does not doubt they will be recognized, now that attention is directed to the subject, in North Wales, in the Pyrenees, the Apennines, and other high mountain chains. Indeed he believes, from strong evidences scattered over different countries, that at a recent geological period, and not long before the creation of the human race, the whole of Europe, and those parts of Asia and America which lie north of the parallel of the Mediterranean and Caspian seas, were enveloped in snow and ice; in short, consisted of a series of immense glaciers, above which only the highest hills appeared as islands; presenting a character of scenery only to be found in our day in Greenland or Ice-

land. This view, bold as it is, is strikingly supported by the fact ascertained by Mr. Kemp, that the terraces encircle the highest hills in the neighbourhood of Galashiels, almost to their summits. But as my object in this paper was merely to explain the difficulties suggested by my former one, I shall not anticipate the more able communications about to appear on this important and absorbing subject, or the pleasure to be derived from the "Etudes sur les Glaciers de la Suisse" of Prof. Agassiz himself.

J. E. BOWMAN.

Manchester, Nov. 16th, 1840.

XLII.—*Carabideous Insects collected by Charles Darwin, Esq., during the Voyage of Her Majesty's Ship Beagle*. By G. R. WATERHOUSE, Esq.

[Continued from p. 257.]

ALL the species noticed in this communication are from Mal-donado, La Plata.

Genus BRACHINUS.

Sp. 1. *Brachinus maculipes*.

B. niger; capite, thorace, pedibus, pectoreque ferrugineis; genu-bus nigris; antennis fuscescentibus; articulis primo et secundo ferrugineis, tertio quartoque nigris: elytris subcostatis.

B. crepitanti ferè similis, at duplò major.

Long $6\frac{1}{2}$ lin.; lat. $2\frac{3}{4}$ lin.

In form and appearance this species greatly resembles the *Brachinus crepitans*, but its size is much larger; the eyes are rather more prominent, the elytra are black, and in the specimen before me, destitute of the blue or green tint usually observable in that species, and the striæ are a trifle more distinct; it moreover differs in having the apical portion of all the femora black. Like *B. crepitans*, the third and fourth joints of the antennæ are black, but the following joints are pitchy-black, and thus differ from the corresponding joints in that species: the abdomen is black beneath, but the chest is pitchy-red.

But one specimen of this species was brought home by Mr. Darwin: it is readily distinguished from *Brachinus Platensis* by its larger size, the black third and fourth joints of the antennæ, the black tip to the femora, and the darker colour of the elytra.

Sp. 2. *Brachinus Platensis*.

B. ferrugineus; elytris fuscescenti-nigris, subcostatis; abdomine ad apicem nigricante.

B. crepitanti simillimus, sed paulò major.

Long $4\frac{1}{2}$ —5 lin.; lat. 2— $2\frac{1}{4}$ lin.

This species greatly resembles *B. crepitans*: its average size is rather greater—the smaller specimens being about equal in size to the larger-sized individuals of *B. crepitans*—it differs moreover in having the third and fourth joints of the antennæ red instead of black; the thorax is longer and less dilated in front; the elytra are rather wider, have a slight pitchy hue, their elevated ridges are more distinct, and there is scarcely any trace of punctures in the interstices. The body beneath is pitchy-red, the red colour most distinct on the chest, and on the apical portion of the abdomen the pitch colour prevails; the four basal joints of the antennæ are pale testaceous, and the remaining joints are brownish; the legs are pale testaceous; the thorax and hinder portion of the head are very delicately punctured.

In Mr. Darwin's collection are five specimens agreeing with the above description, and a sixth specimen, which differs only in being considerably larger—its length is 6 lines, and width $2\frac{2}{3}$ lines.

Besides these there is a *Brachinus* which in some respects resembles the *B. Platensis*, but is probably a distinct species; as I do not however like to found a species upon a single specimen, unless that specimen possess well-marked characters, I will merely call attention to its peculiarities.

The four basal joints of the antennæ, the head, thorax, legs and chest are red, the elytra are dull black, with an indistinct pitchy hue, and the abdomen is pitchy, and an indistinct pitchy spot is observable on the tip of the femora. The head and thorax, as well as the elytra, are impunctate, and the latter are furnished with slightly elevated ridges. Length $4\frac{1}{2}$ lines.

This insect differs from *B. Platensis*, in having the head and thorax impunctate, the thorax shorter, the femora tipped with pitchy, and the elevated striæ of the elytra less distinct. From *B. crepitans* (which it greatly resembles) it may be distinguished by the impunctate upper surface of the head, thorax, and elytra, the want of black on the third and fourth joints of the antennæ and the dusky tip to the femora; to which may be added the dull black colour of the elytra. For the present it may be called *B. Platensis*, var. ?

Sp. 3. *Brachinus nigripes*.

B. niger; pectore, coxis, capite, thoraceque ferrugineis; antennis fusciscentibus, ad basin nigrescentibus; articulis basalibus ferrugineo pictis; elytris subcostatis.

B. crepitante paulò minor.

Long. 3— $2\frac{5}{4}$ lin.; lat $1\frac{1}{2}$ — $1\frac{1}{3}$ lin.

This species is a trifle smaller than *B. crepitans*, the head and thorax are proportionately rather smaller, the elytra shorter and broader, and the antennæ longer; the eyes are more prominent, and the head is more attenuated behind.

The head and thorax are red, impunctate; the latter with rather a deep dorsal channel, and two somewhat shallow posterior foveæ; palpi black, the extremities of the joints reddish; antennæ with the

basal joint black, tinted with red at the base, the second, third, and fourth joints black, and the following joints pitchy; legs black, the coxæ red, and the tarsi pitchy; chest reddish in the middle, the rest of the body beneath, as well as the elytra, black; the ridges on the elytra are well marked, and their interstices are impunctate.

The collection contains four specimens of this species.

GENUS CHLÆNIUS.

Sp. 1. *Chlænium violaceus*.

C. niger, suprâ violaceus; capite inter oculos punctato; thorace punctato, posticè paulò angustato, foveis duabus impresso; elytris profundè striatis, interstitiis subpunctulatis et paulò convexis.

Long. $7\frac{1}{2}$; lat. $3\frac{1}{4}$.

This species is very nearly equal in size to the *Ch. velutinus* of Europe, which it also somewhat resembles in form. The eyes are a trifle more prominent; in the form of the thorax as well as in the sculpturing these two insects very nearly agree, but the dorsal channel is rather more distinct in *Ch. violaceus*. The elytra in the present species are smaller in proportion to the head and thorax, rather more convex, the striæ are deeper, and the interstices are more convex, than in *Ch. velutinus*: the puncturing in the interspaces of the striæ is moreover rather more distinct, and the punctures are far less numerous.

In one of the two specimens brought by Mr. Darwin the upper surface of the body is of a beautiful steel blue, and the thorax is violet; in the second specimen the whole of the upper parts is violet: the under parts of the body and the lip and antennæ are black, but the latter are tinted with pitch colour at the apex; the palpi are pitchy black. On the fore part of the head are a few scattered punctures, and on the hinder part one of the specimens is rather thickly and coarsely punctured; the other specimen has much fewer punctures on this part. The thorax is rather narrower than the head, and nearly equal in length and width; it is subquadrate, but slightly dilated near the front; its upper surface is coarsely punctured, on the disc these punctures are not very abundant: the dorsal channel is well marked and rather broad; the posterior foveæ are moderately deep. The elytra are subovate, less straight at the sides than in *Ch. velutinus*, rather deeply striated; the interstices are very convex, and distinctly, but rather sparingly, punctured.

Sp. 2. *Chlænium (Platensis) Braziliensis?* Dejean.

C. obscurè niger, suprâ viridis; antennis pedibusque testaceis; capite nitido; thorace punctato, subnitido, posticè attenuato, foveis duabus impresso; elytris striatis, interstitiis planis crebrè et minutissimè punctulatis.

Statura paulò major quàm *Ch. nigricornis*.

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

In size and colouring the *Ch. Platensis* resembles the *Ch. nemo-*
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ralis of North America; the head is larger, and the thorax more attenuated behind.

The head and thorax are either green or brassy—sometimes inclining to copper colour; the head is glossy, and the thorax but little so, it being rather thickly and coarsely punctured, excepting on the disc, where the punctures are less numerous; whilst the head is impunctate, but has on the hinder part some very minute transverse wrinkles; the eyes are rather prominent. The thorax is about one-third broader than the head, has a distinct dorsal channel, and large and somewhat shallow posterior foveæ; it is distinctly attenuated behind, and broadest near the fore part. The elytra are destitute of gloss, of an obscure dusky green colour, and rather delicately punctate-striated; the interstices are flat and densely covered with very minute punctures, and with a moderately strong lens a slight pubescence is observable. The body beneath is black and slightly pubescent, and the apical portion of the abdomen is obscurely margined with testaceous: the legs are pale testaceous; the three basal joints of the antennæ and the palpi are red; the remaining joints of the antennæ are brownish; the labrum is pitchy, sometimes reddish.

This appears to be the most common species of *Chlenius* in the neighbourhood of Maldonado, La Plata; it is possibly the *Ch. Brasiliensis* of Dejean's Supplément, but that insect is described as six French lines in length, and it is not improbable, therefore, that it is a nearly allied but larger species. Five specimens are in the collection of Mr. Darwin.

Sp. 3. *Chlenius Westwoodii*.

C. obscurè niger, suprà obscurè viridis; antennis pedibusque testaceis; antennis ad apicem tarsisque fusciscentibus; capite subnitido; thorace angustato, posticè paulò attenuato, foveis duabus, punctulisque minutissimis, impresso; elytris striatis, interstitiis planis crebrè et minutissimè punctulatis.

C. Platensi ferè similis et paulo minor et thorace angustiore.

Long. $5\frac{1}{2}$ lin.; lat. $2\frac{3}{4}$ lin.

I have applied the name *Westwoodii* to two specimens of *Chlenius* brought from Maldonado by Mr. Darwin, which in size nearly agree with the common English species (*Ch. vestitus*); as regards the form they approach more nearly to the *Ch. Platensis* just described, having the head and thorax longer in proportion to the elytra, but the thorax is considerably narrower than in either of these insects, being scarcely broader than the head.

The head green, somewhat glossy, and covered above with most minute rugæ, which are scarcely discernible unless through a strong lens; the eyes are prominent; the labrum and base of the mandibles are pitchy-red. The thorax is but little broader than the head, longer than broad, and slightly attenuated behind; the dorsal channel is but faintly marked, and the posterior foveæ are shallow and rather long; the upper surface of the thorax as well as that of the elytra is green and destitute of gloss; the punctures on the thorax are very minute and scattered; the striæ of the elytra are rather

faintly marked, and the interstices are flat and covered with extremely minute punctures and a delicate pubescence—this, however, is very indistinct. The under parts of the insect are black; the legs, palpi, and three basal joints of the antennæ are red; the remaining joints of the antennæ are brownish.

I have named this species after my friend the Secretary of the Entomological Society.

Genus *GEOBIUS*.

Sp. 1. *Geobius pubescens*, Dejean, Syst. Général des Coléoptères, tom. v. p. 606. Supplément.

Three specimens of this insect were brought by Mr. Darwin from Maldonado, La Plata.

Dejean states that in all the specimens examined by him, the anterior tarsi are simple: as the three specimens above-mentioned also have the anterior tarsi simple, it would appear that the sexes do not differ in this respect.

[To be continued.]

XLIII.—*Notices of British Fungi*. By the Rev. M. J. BERKELEY, M.A., F.L.S.

[With Five Plates.]

[Continued from Annals, vol. i. p. 264.]

138. *Agaricus Mappa*, Willd., Fr. Epicr. p. 6. Hitherto confounded with *A. Phalloides*, from which it is distinguished by its less developed volva, which instead of being cup-shaped, is little more than a mere rim fringing the bulb. The figures of Sowerby and Curtis quoted in Eng. Fl. under *A. Phalloides*, belong to this species.

*139. *A. Mariæ*, Kl. in Linn. Since the discovery of this species by Klotzsch at Glasgow, it has been found by Mr. Henderson at Milton, Norths., and Mr. C. Babington at Bree-don, Leic. I have no doubt that it is the plant figured under the name of *A. asper* in *Abbildungen der Schwamme*, t. 21. (consequently *Amanita aspera*, Pers. Syn.), and by Krombholz, t. 29. fig. 18—21; but it is not apparently the plant of Fries, who does not quote Krombholz's figure in his 'Epicrisis,' though most of his figures are cited; and certainly not the plant of Bolton or Vittadini, which is the species described in the 'English Flora,' and which Fries I believe has in view, who refers to their figures in his 'Epicrisis.' It is most probable that Letellier's observations (*Ann. des Sc. Nat. n. s. vol. iii. p. 87.*) on *A. asper* apply to *A. Mariæ*, which is far better arranged in *Lepiota* than *Amanita*. Fries, indeed, who refers the species to *A. acute-squamosus*, Weinm., has done so, and quotes *A. asper* of Ficinus as a synonym.

140. *A. gambosus*, Fr. Syst. Myc. 1. p. 50. Common in exposed pastures in May and June. *A. graveolens*, Sow., which has been long doubtful, is certainly a synonym of the species before me, as appears from the original drawing, dated May 10, which gives the colouring very correctly. In the plate, unfortunately, one uniform ochraceous tint is given, which ought to have been confined to the centre of the pileus. This, or some nearly allied species, is the St. George's *Agaric* of Clusius, Hist. p. 264. Dr. Johnston's *A. graveolens* is probably some species of the same group.

141. *A. griseus*, Fr. Syst. Myc. 1. p. 158. Sherwood Forest. King's Cliffe.

142. *A. integrellus*, Fr. Syst. Myc. 1. p. 161. King's Cliffe.

143. *A. Belliæ*, Johnst. MSS. Pileo sicco, membranaceo, cupulæformi, ligneo-pallido, lamellis crassis unà cum interstitiis venosis, decurrentibus, pallidioribus; stipite tenui, fistuloso, cartilagineo, suprâ pallido, deorsum brunneo, basi floccosâ adhærente. On dead stems of the common reed. Gathered by Lord Home, October 6, 1837, at the Hirsell, Berwickshire. Pileus membranaceous, inverted, deeply cyathiform, half an inch broad, smooth, waved and furrowed at the edges, of a wood-brown hue, becoming paler when dry. Gills adnato-decurrent, at least in the inverted pileus, one line broad, rather distant, thick, more or less undulated, wrinkled on the sides and in the interstices with flexuous veins, once or twice divided near the edge, of a dull chalky white. Spores oblong, colourless, pellucid. Stem $1\frac{1}{2}$ inch high, about 1 line thick, fistular throughout, erect, stiff and elastic, smooth, white or very pale wood-brown above, towards the base of a dirty dark brown, becoming paler when dry, when it appears covered with a white mealiness. It is composed of two distinct strata, as will be seen by the figure. Root slightly incrassated, bent and fixed to the matrix by a dense cottony web.

A very remarkable and graceful species. The inversion of the pileus commences at a very early period, and together with the vein-like gills, gives it somewhat the appearance of a *Stylobates*, in which genus the pileus is completely obliterated. Its place in the system is near that of *A. tricolor*, A. & S., *A. stellatus*, Sow., &c., but its immediate affinities are not evident. It has analogies with several *Collybiæ* and the cognate species of *Marasmius*, as *M. erythropus*, Fr. The gills are very peculiar.

The above account is in great measure compiled from some notes kindly transmitted to me, together with a figure, by Dr. Johnston, who has named the species "in grateful remembrance of the assistance he has received from the Misses Bell



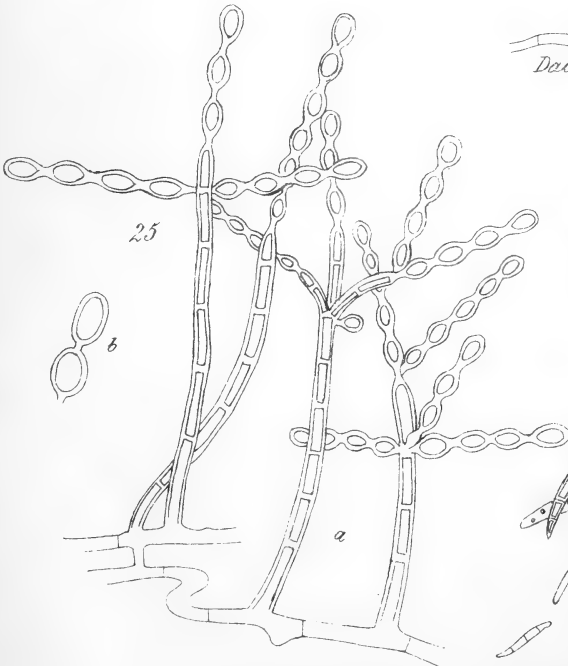
24

Botrytis terrestris.



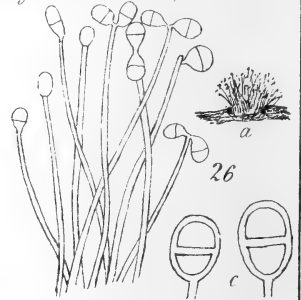
27

Dactylium sphaerocephalum.



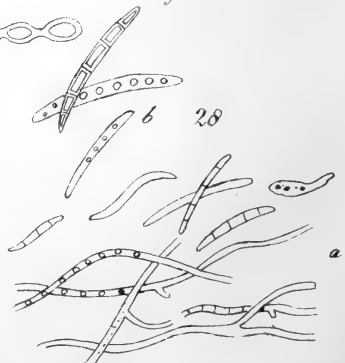
25

Penicillium subtile.



26

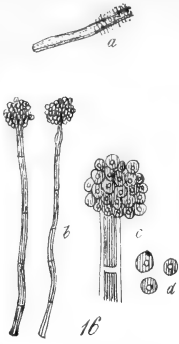
Dactylium obovatum.



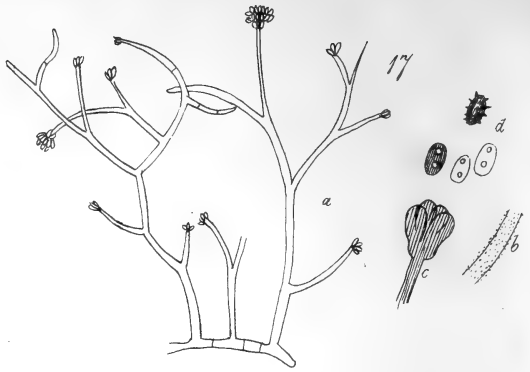
28

Fusisporium nudum.

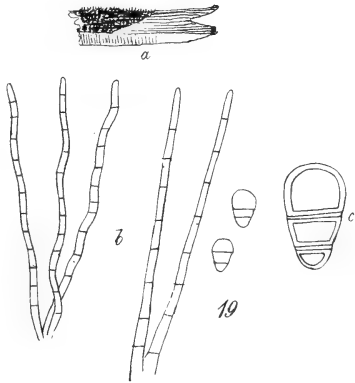




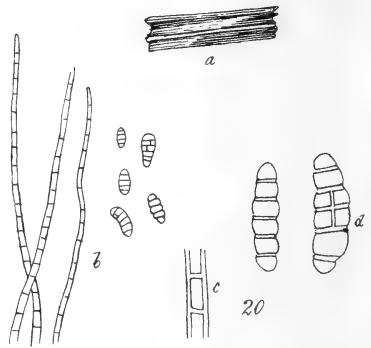
Sporocybe nigrella.



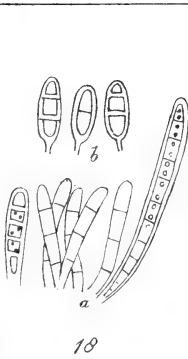
Sporocybe lobulata.



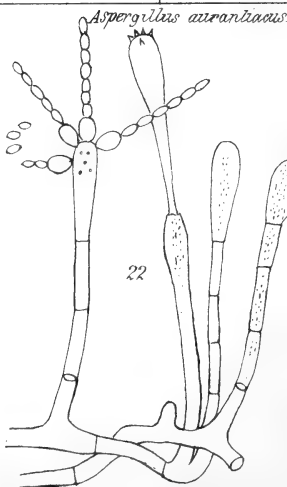
Helminthosporium obovatum.



Helminthosporium delicatulum.



Helminthosporium Tribae.

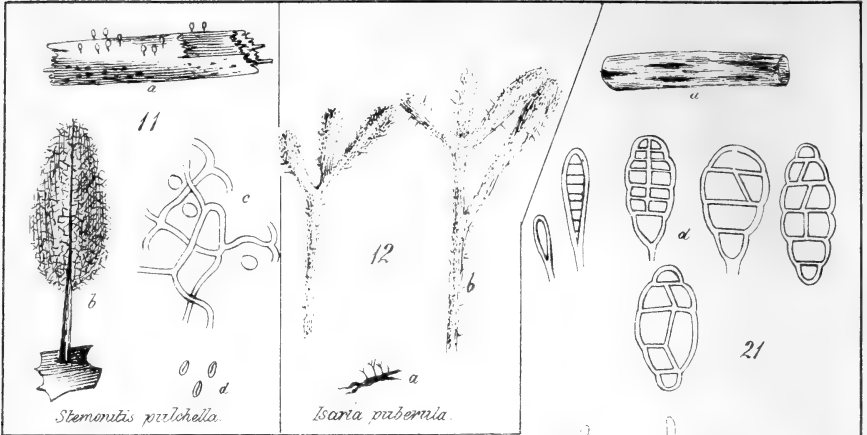


Aspergillus aurantiaeus.



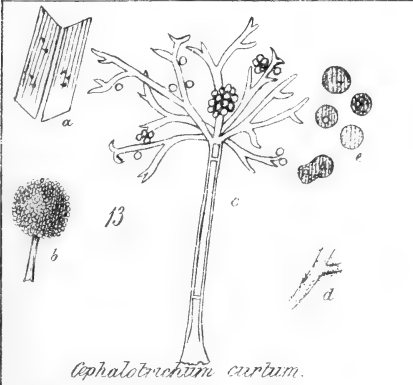
Botrytis destructor.





Stemonitis perlorella.

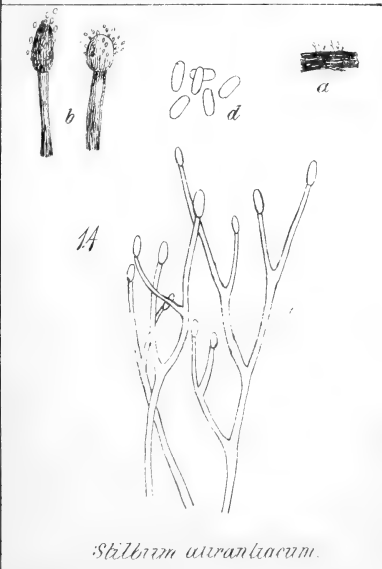
Isaria puberula.



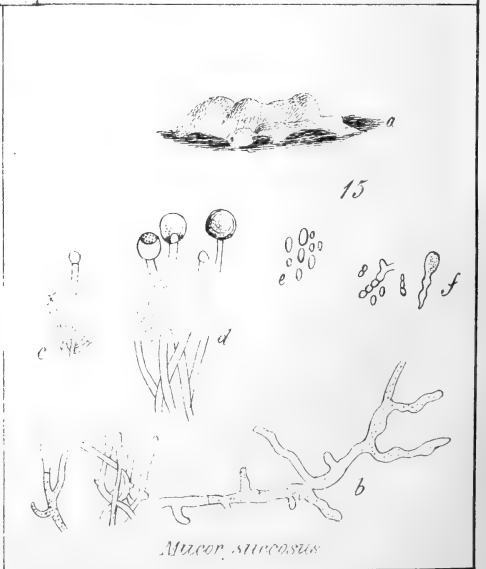
Aphalobrochium curvum.



Macrosporium concinnum.

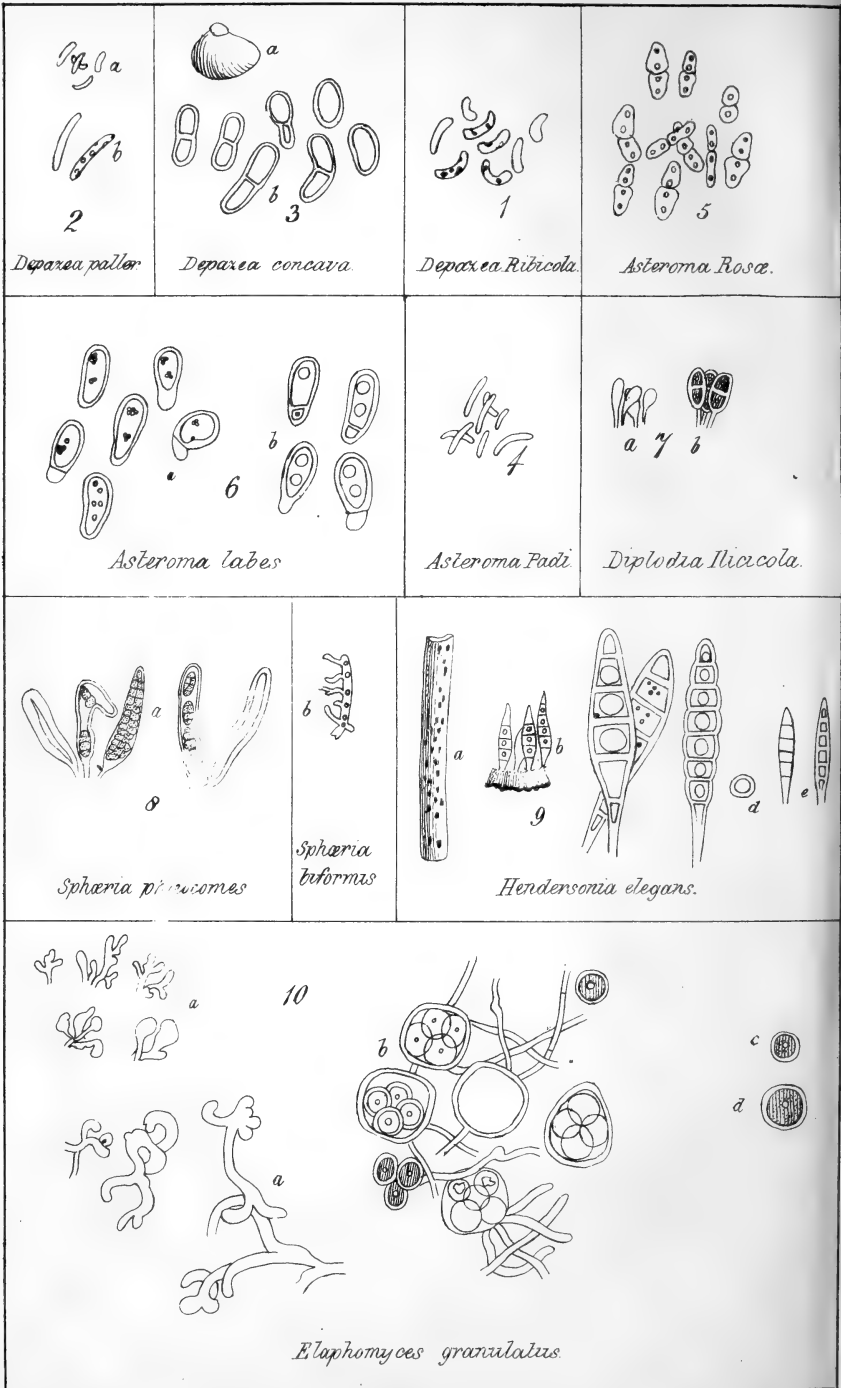


Stilbium ultrantiacum.



Mucor stucosus.





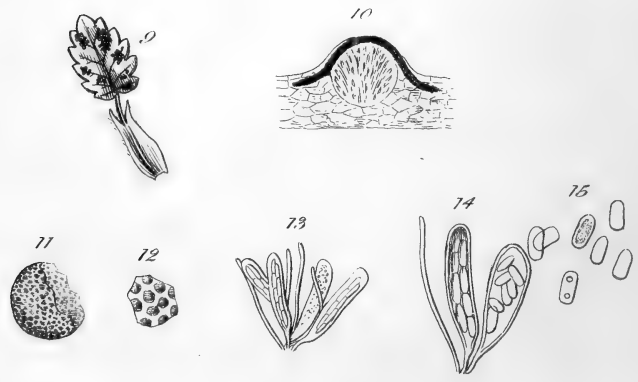




Peziza succosa.



Agaricus Belliae.



Sphaeria Rhytismoides.

of Coldstream in his attempt to ascertain the Fungi of Berwickshire.”

TAB. X. fig. 1. *A. Belliæ*; 2, vertical section; 3, transverse section of the stem magnified; 4, spores highly magnified.

*144. *A. pyxidatus*, Bull. Abundant on the lawn before the Earl of Westmoreland's house at Apethorpe. It is to be observed that the specimens published in the First* Fasciculus of dried Fungi under this name, are *A. umbelliferus*, L., a very different and common species, of which several forms are described in Eng. Fl. I do not know by what accident the name was substituted.

145. *A. lampropus*, Fr. Syst. Myc. 1. p. 203. Common in pastures.

146. *A. serrulatus*, Fr. Syst. Myc. 1. p. 204. Ross-shire. Mr. Churchill Babington. Remarkable for its black-margined serrated gills.

147. *A. echinatus*, Roth. Cat. 2. t. 9. f. 1. *A. fumoso-purpureus*, Lasch in Linnæa. My *A. hæmatophyllus* is undoubtedly this species, as also *A. oxyosmus*, Mont. in Ann. d. Sc. Nat. The spores are sometimes abortive and colourless, which circumstance led me to place it in *Lepiota*. Fries in his 'Epicrisis' says, "Sporidia ex Lasch brunnescenti-spadicea, sed è fundo variant; in albo fusco-virent! in nigro argillaceo-albicant, hinc Amic. Berkeley per litt. nuperius retulit se legisse similem *Leucosporum*, i. e. analogiam offeret cum duplici *A. cepæstipite*." My plants, though differing from the cause above-mentioned as to the colour of the spores, were evidently of the same species.

148. *A. cretaceus*, Fr. Syst. Myc. 1. p. 280. non *Bulliardi*. A single specimen was found in the present summer by Mr. J. Henderson in a hot-house at Milton. Distinguished from *A. campestris* by its gills, which remain for a long time white, and are at length rose-coloured. By which circumstance, again, it is distinguished from *A. excoriatus*, which it somewhat resembles.

149. *A. ericæus*, Pers., Fr. Syst. Myc. 1. p. 291. Common in exposed pastures after rain. Summer and autumn.

150. *A. sterquilinus*, Fr. Syst. Myc. 1. p. 308. King's Cliffe. Gills entirely destitute of utricles.

151. *Merulius pallens*, n. s. Totus effusus, tenuis, non separabilis, pallido-rubidus, carnosus-subgelatinosus, plicis poriformibus, margine indeterminato. On fallen decayed branches.

* I am happy to be able to state that the second edition of the First Fasciculus appeared on the 1st of November. The only species I have not been able to procure again is *Stilbum piliforme*.

Sherwood Forest, Notts. Grace Dieu Wood, Leic. Found by myself and Mr. C. Babington.

Forming large entirely resupinate effused patches several inches long and broad. Distinguished from every state of *M. tremellosus* by the total absence of a pileus, its thinness and its minute pores.

*152. *Thelephora tabacina*, Fr. Syst. Myc. 1. p. 437. (non Sowerbei.) Abundant in Grace Dieu Wood upon dead hazel stems. *Auricularia tabacina*, Sow., as I have ascertained from an inspection of the very specimens figured, is *Thelephora spadicea*, Fr. I have seen an authentic specimen of Persoon's *T. tabacina*, Myc. Eur. p. 118, in M. Desmazières's Herbarium, which is undoubtedly *T. spadicea*, Fr., with the following note in the handwriting of Persoon attached to it: "On confonde-roit volontiers cette espèce avec le *T. hirsuta* en ayant le même port, mais la couleur est constamment ferrugineuse, et la villosité déprimée." I cannot find any separate notice of *T. spadicea* either in the 'Synopsis' or 'Myc. Eur.'

*153. *T. lactescens*, Berk. Eng. Fl. vol. v. part 2. p. 169. This appears from an authentic specimen in M. Desmazières's Herbarium to be *T. salicina*, Pers. Myc. Eur. 1. p. 132, a species referred by Fries in his 'Index Alphabeticus' doubtfully to *T. mollis*. It should seem, however, to be very different. The species is common, and occurs on various kinds of wood.

154. *Clavaria flaccida*, Fr. Syst. Myc. 1. p. 471. Klotzsch exs. n. 122. King's Cliffe.

155. *C. rufa*, Fl. Dan. t. 775. f. 1. Abundant at Tansor, Norths., in a grass field. My specimens accord exactly with what is figured in Fl. Dan., except that the tint is not so deep. It appears a very distinct species.

156. *Peziza* (Al. Helv. Pust.) *succosa*, n. s. Media, integra, sessilis, hemisphærica, pallidè cereo-brunnea, extus pallidior, margine inflexo; carne flavo-succosâ. On the naked ground in woods, generally dispersed, but seldom abundant. Cup one inch in diameter, hemispherical or subglobose, with the margin incurved; within of a pale waxy brown, without paler and mealy. The flesh when broken pours out a yellow juice. Asci elongated, slightly flexuous, containing eight elliptic sporidia, each of which contains two sporidiola. Paraphyses linear.

TAB. X. fig. 5. *P. succosa*, nat. size; 6, vertical section; 7, asci and paraphysis; 8, sporidium.

*157. *P. furfuracea*, Roth, Cat. Bot. 2. p. 257. A small variety only of this is mentioned in Eng. Fl. Mr. C. Babington finds the state figured by Roth very abundant on twigs of alder at Thringstone, Leic.

158. *P. Ciborioides*, Fr. Syst. Myc. 2. p. 117. On oak leaves, King's Cliffe, and at Speke, Lancashire. My plant is exactly that of Montagne in Ann. des Sc. Nat., from whom I have specimens.

159. *P. versiformis*, Pers. Ic. et Descr. 1. p. 25. On old stumps of ash for two successive years at Apethorpe, Norths., in company with *Sphæria Bombarda* and *Bulgaria sarcoïdes*. A very fine and distinct species, nearly allied to *Patellaria*. Montagne informs me that *Patellaria pulla*, Fr., is the same plant. The sporidia are elongated and obtuse at either end.

160. *P. Ledi*, A. & S. t. 10. f. 7. On *Arbutus Uva Ursi*. Found by Mr. Churchill Babington in Glen Coe, Sept. 1838.

161. *Cenangium ferruginosum*, Fr. Syst. Myc. vol. ii. p. 187. Found abundantly at Milton, Norths., on branches of fir, *P. Pinaster* var. *maritima*, which have been accidentally broken off, but never on decayed branches.

162. *Stictis Phacidioides*, Fr. Syst. Myc. 2. p. 198. Found by Mr. Churchill Babington on dead leaves of *Arbutus Uva Ursi*, Lubcroy, Sutherlandshire.

166. *S. Lichenicola*, Mont. Ann. des Sc. Nat. n. s. vol. v. p. 281. t. 13. f. 3. This very curious production occurred abundantly at Wareham in 1832, and Mr. C. Babington has found it in the Isle of Skye. I am not at all sure that it is a true Fungus. Its sporidia, as Montagne remarks, and my own observations confirm the fact, are exactly like those of *Urceolaria scruposa*.

167. *S. nivea*, Pers. Myc. Eur. 2. p. 337. Desm. n. 763. On *Pinus Pinaster*, var. *maritima*, Milton, Norths.

168. *Sclerotium cepivorum*, n. s. Densè gregarium, l. conglomeratum, minutum, globosum, nigrum, è subiculo albo mucedineo emergens. Very common on onions at the point from which the roots spring, and often very destructive. Commencing with a white mucedinous patch about the fibres which decay, and in consequence the onion becomes loose, and is said to be mildewed. In this subiculum arise minute globose black bodies, either simply gregarious or conglomerated, which become at length in a greater or less degree free. Far smaller than *Sclerotium semen*, from which it differs in its mode of development, and several other points. Young specimens, when dry, are much collapsed, but more advanced individuals are slightly rugose.

163. *Sclerotium roseum*, Kneiff. in Moug. and Nest. n. 884. Found by Mr. Churchill Babington at Thringstone, Leic., with *Leptostroma junceum*, in the pith of *Juncus conglomeratus*.

164. *Acrospermum graminum*, Libert., Cord. Ic. part 3. fig.

73. King's Cliffe. Found by Mr. Churchill Babington and myself, July 1840. Corda has admirably illustrated the genus *AcrospERMUM*, and shown its affinity to *Sphaeronema*. His analysis exactly accords with one sent by myself to Fries in 1837. The contents of the perithecia, which consist of very long linear bodies, are at length discharged at the apex. The structure is not at all that of *Sclerotium*. Dr. Greville's figure is correct enough as far as it goes, but he has not used glasses of sufficient power to show the structure accurately.

*165. *Coryne turbinata*, Schum., Corda Ic. Fasc. 2. t. 14. My *Tubercularia albida*, Eng. Fl. vol. v. part 2. p. 354, appears to be this species, with the figure of which it accords. At any rate I committed an error in referring the plant to the genus *Tubercularia*.

169. *Sphaeria argillacea*, Fr., Obs. 1. t. 2. f. 5. On fallen ash branches. King's Cliffe, Norths., Speke, Lanc. There can be no doubt that the plant originally intended by Persoon in his 'Icones' is the present species. The perithecia are immersed and almost free on the same stick, and even in the same specimen.

170. *S. lutea*, A. & S. t. 1. f. 1. On very decayed branches. Clifton, Notts. A most interesting addition to the British Flora. At present I have found only a few specimens.

171. *S. scabrosa*, Dec., Fr. Syst. Myc. 2. p. 360. On the trunk of a maple. Morehay Lawn in Rockingham Forest.

172. *S. quercina*, Pers., Fr. Syst. Myc. 2. p. 362. King's Cliffe. This species, for which various plants, especially *S. leiphæmia*, are substituted in collections, has occurred once only.

173. *S. dissepta*, Fr. Syst. Myc. p. 392. On willow and ash. King's Cliffe and at Coleorton, by Mr. Churchill Babington.

174. *S. cucurbitula*, Tode. Fr. Syst. Myc. 2. p. 415. On small dead shoots of ash. King's Cliffe.

175. *S. pulicaris*, Fr. Syst. Myc. 2. p. 417. Common on dead branches of fig, elder, &c.; also on decayed cabbage stalks.

176. *S. scoriadea*, Fr., El. 2. p. 87. On birch twigs, Rose Hall, Sutherlandshire. Mr. Churchill Babington. I believe this production to be a *Verrucaria*. The contents of the perithecia are grumous, containing biseriate fusiform sporidia. I have seen only a single British specimen, and the fructification was not quite perfect enough to authorize me in removing the species at once to *Verrucaria*.

177. *S. conferta*, Fr. Syst. Myc. vol. ii. p. 435. On the leaves of *Vaccinium uliginosum*, Glen Coe. Mr. Churchill Ba-

bington, who proposes to substitute for the specific name "conferta" that of "mesiota," as there is another species in the 'Systema Mycologicum' previously published by Schweinitz with the same name.

178. *S. (Confertæ) Rhytismoides*, Bab. in Abstr. Linn. Trans. p. 32. Peritheciis tenuissimis globosis, sparsis l. confertis, epidermide nigrefactâ politâ tectis; gelatinâ salmoneo-rubrà faretis, ostiolo minimo obsoleto. On leaves of *Dryas octopetala*, Inchnadamff, Assint, Sutherlandshire. Mr. Churchill Babington, Sept. 1838.

Epiphyllous, occupying the whole surface or detached portions of the leaf. Perithecia generally scattered, sometimes confluent; in the former case the epidermis between them is cinereous, but that part immediately lying above them, where it is raised into a little hemispherical dot, jet-black and shining, from a thin carbonaceous layer situated immediately beneath the cuticle. Perithecia extremely thin, transparent, membranous, dotted with raised salmon-coloured areolæ; ostiolum simple, very minute. Contents of perithecia salmon-coloured, containing clavate asci with linear paraphyses. Sporidia biserial, oblong, obtuse, sometimes containing two sporidiola. The species does not appear to be very nearly allied to any hitherto described; its most obvious affinities, however, are with *Confertæ*.

Tab. X. fig. 9. Plant nat. size on *Dryas octopetala*; 10, vertical section; 11, portion of the delicate perithecium; 12, ditto more highly magnified; 13, 14, asci and paraphyses; 15, sporidia.

*179. *S. ceuthosporoides*, Berk. in Eng. Fl. vol. v. part 2. p. 258. Mr. C. Babington finds this little-known species at Coleorton, Leic.

*180. *S. aquila*, Fr. Syst. Myc. vol. ii. p. 442. In consequence of the inspection of some incorrectly named specimens, I have been led into error about the plant named *S. byssiseda*, Fr., in the English Flora, which is undoubtedly *S. aquila*, Fr. (*S. byssiseda*, Kz.), and that named *S. aquila*, Fr. is *S. thelæna*. *S. aquila* is not very uncommon at the bottom of stakes, and sometimes occurs on sticks and trunks of trees. *S. thelæna* is far more uncommon, and has hitherto been found only by Capt. Carmichael.

*181. *S. tristis*, Tode. Fr. Syst. Myc. vol. ii. p. 444. Since the publication of Eng. Fl. I have met with the collapsed form of this species.

182. *S. fulva*, Fr. El. 2. p. 90. On box leaves, Milton, Norths., Mr. J. Henderson. Two forms occur, one of a dull straw colour, the other of a brick red.

183. *S. mastoidea*, Fr. Syst. Myc. vol. ii. p. 463. On dead twigs of ash still remaining on the tree. King's Cliffe, Norths.

184. *S. vilis*, Fr. Syst. Myc. vol. ii. p. 466. On rotten oak wood, Morehay Lawn, Norths.

185. *S. lanata*, Fr. Syst. Myc. vol. ii. p. 482. *S. ossea*, Carm. MSS. Appin, Capt. Carmichael.

186. *S. epidermidis*, Fr. ! Scler. Suec. n. 19. A common species on the epidermis of *Lonicera*, *Sambucus*, &c. It is, however, a matter of doubt whether it be not more properly a *Verucaria*.

187. *S. epimyces*, Fr. Syst. Myc. vol. ii. p. 499. On decayed *Thelephora comedens*. Milton.

188. *S. arbuticola*, Fr. Syst. Myc. vol. ii. p. 500. Common in Scotland on *Arbutus Uva Ursi*. Mr. Churchill Babington.

189. *S. acuminata*, Sow., Fr. Syst. Myc. vol. ii. p. 506. Common on thistles. This is a very distinct species. *Sp. acuta*, Hoffm. has no asci, but the contents of the perithecia consist of very minute subelliptic corpuscles. The plant figured by Dr. Greville is not *S. acuta*, but *S. coniformis*, Fr. At least the analysis belongs to that species, as M. Desmazières has very justly observed. *S. acuminata* has extremely long sporidia, not septate as in *S. coniformis*.

190. *S. coniformis*, Fr. Syst. Myc. vol. ii. p. 508. Common in company with *S. acuta*.

191. *S. cruciferarum*, Fr. Syst. Myc. vol. ii. p. 525. Desm. ! exs. 985. Common on *Erysimum officinale*.

192. *S. (Depazea) stemmatea*, Fr. Syst. Myc. vol. ii. p. 528. On *Vaccinium Vitis Idæa*. Scotland. Mr. Churchill Babington.

S. (Depazea) Ribicola, Fr. l. c. Very common on currant leaves. Spores discharged in a little irregular mass, strongly curved, larger than those which are common to the genus *Cytispora*, obtuse at either end, containing a few nuclei.

TAB. XI. fig. 1. Spores highly magnified.

193. *S. (Depazea) pallor*, n. s. Maculis pallidis, subrotundis; peritheciis sparsis, immersis, pallidis, epidermide supra ostiolum obsoletum prominulo; sporis linearibus curvulis. On living bramble shoots. May, 1838. King's Cliffe, Woodnewton, Norths. This remarkable species forms subrotund, sometimes confluent pale spots, sprinkled with little elevated dark-bordered dots, which indicate the situation of the perithecia. Perithecia extremely delicate, of a pale fawn-colour, filled with linear slightly curved spores, much larger than those in the genus *Cytispora*, some of which contain an obscure row of nuclei.

TAB. XI. fig. 2. *a, b.* Spores more or less magnified.

194. *S. (Depazea) concava*, n. s. Maculis subrotundis, excavatis, cervinis, margine fusco; peritheciis subcentralibus, tenerrimis, fuscellis, ostiolo brevissimo, ore rotundo; gelatinâ subcirrhosâ; sporis oblongis, uniseptatis, medio contractis. On pods of the garden pea, and occasionally on the leaves and petals. King's Cliffe. It was also pointed out to me by Captain Carmichael at Appin in 1824.

Very destructive in damp seasons to peas, in the pods of which it forms little round fawn-coloured pits studded in the centre with the short subcirrhiform masses of the spores. The plant is just the same on the leaves, except that in consequence of their less succulent nature the depression is not so evident. On the petals there are no spots, but merely scattered perithecia, especially upon the veins. Perithecia very delicate, but certainly present. Spores oblong, contracted in the middle, uniseptate, with occasionally a single nucleus in each cell. Other forms, arising from the total or partial suppression or elongation of one of the cells, will be seen in the figure.

TAB. XI. fig. 3. *a*, perithecium from petal; *b*, spores. Both highly magnified.

195. *S. (Depazea) Convolvulicola*, Dec., Fl. Fr. 6. p. 148. On *Convolvulus arvensis*. King's Cliffe. This species has been communicated to correspondents under the name of *S. fuscella*, n. s.

*196. *Sphaeronema blepharistoma*, Berk. in Mag. of Zool. and Bot. vol. i. p. 512. *Sphaeronema vitreum*, Corda, Ic. Fasc. 1. f. 297.

There is no doubt that my plant and that of Corda are the same, though their habitats are so very different. I find it, however, not only on decayed *Ag. adustus*, but also on nettle roots. I do not know which name has the priority, mine or Corda's. But as the preface of M. Corda's Fasciculus is dated Aug. 1836, although not published till 1837, in which year also my paper appeared, it will be better at once to adopt Corda's name, especially as it is very descriptive.

197. *Phoma concentricum*, Desm. ! ined. *Depazea Agaves*, Mont. Ann. des Sc. Nat. n. s. 1. p. 344. Common on leaves of *Yucca*. This plant has been communicated to correspondents under the name of *P. circinans*. I have, however, specimens from M. Desmazières under the name adopted above, and under which it is possibly already published*. It is a true

* Ann. des Sc. Nat. n. s. t. xiii. p. 189.

Phoma. *P. salignum* and *P. pustula*, it is to be observed, are species of *Sphæria*, possessing perfect asci.

198. *Dothidea Sphærioides*, Fr. Syst. Myc. 2. p. 552. On dead twigs of ash. Common.

199. *D. pyrenophora*, Fr. l. c. On fallen apple and pear trees. King's Cliffe, Apethorpe. These two species belong to Fries's genus *Dothiora*, which is, I believe, at present not characterized.

200. *D. Chætomium*, Kz., Fr. Syst. Myc. 2. p. 563. On leaves of different species of *Rubus*, but especially *R. Ideus* and *R. cæsius*. Grace Dieu, Leic. Mr. Churchill Babington. Rockingham Forest.

*201. *Asteroma Padi*, Grev.! Fr. El. 2. p. 151. Arisaig. Mr. Churchill Babington. Spores at length oozing out, linear, very minute, slightly curved. I cannot account for the difference between my figure of the spores and that of Madame Libert in the Transactions of the Linnæan Society of Paris, where they are drawn as clavate, with a septum.

TAB. XI. fig. 4. Spores of *A. Padi* highly magnified.

202. *A. Rosæ*, Lib., *Erysiphe radiosa*, Fr.! Scler. Suec. On rose leaves. Autumn. Very common during the present and past autumn.

Fries remarks, that no one has hitherto seen the perithecia perfect. Madame Libert, however, figures spores in the Transactions of Linn. Soc. of Paris for 1826. My observations, however, do not accord with Madame Libert's, who probably used a compound microscope of the old construction. They are of a very curious form, consisting of two obovate cells attached by their broader ends, and each containing two nuclei.

TAB. XI. fig. 5. Spores of *A. Rosæ* highly magnified.

203. *A. labes*, n. s. Maculis indefinitis, fuscis, non fibrillosis; gelatinâ subcirrhosâ; sporis subpyriformibus, obsolete uniseptatis. On poplar leaves. Rushton, Norths., July 1840. Forming irregular brown patches, scattered, or occupying almost the whole of the upper side of the leaf. There are no distinct fibres, but the stroma when held up to the light and examined carefully, is found to be disposed in a fibrillose form, so as to resemble the seaweed-like spots in mocha stones. Spores forming short tendrils, subpyriform, with an obscure septum (not always however visible) at the contracted part of the spore. The spores in the fresh plant showed little granules, generally disposed in two patches, but when dry I find two

large nuclei in the upper cell, and sometimes one in the lower cell*.

TAB. XI. fig. 6. *a*, spores from fresh plants; *b*, ditto from dry plants. Both highly magnified.

204. *A. Brassicæ*, Chev., Fl. Par. 1. p. 449. On decayed cabbage leaves. Common. This has quite the habit of a *Depazea*. There are no fibres, but they do not seem to constitute by themselves the essential character of the genus. *Dothidea Alchemillæ* has fibres sometimes, though the contrary is stated in the 'English Flora,' and it is then externally an *Asteroma*, but it has true asci; and the perithecia, as in *Dothidea Chætomium*, are beset with short bristles, which are however to be seen only on very close examination.

205. *Leptostroma vulgare*, Fr. Syst. Myc. vol. ii. p. 599. On dead stems of *Artemisia*. Berwick. Dr. Johnston.

206. *Diplodia Illicicola*, Desm.! exs. n. 988. On small branches of holly. Milton, Norths. The true distinction between this genus and that of *Sphæria* is, that the fructifying bodies are not asci containing sporidia, but spores produced on sporophores, exactly as in the analogous genus *Melanconium*, which differs principally in having no perithecium.

TAB. XI. fig. 7. *a*, young spores; *b*, perfect spores on their sporophores. Both highly magnified.

207. *D. Viticola*, Desm.! exs. n. 989. On vine branches. King's Cliffe. I have also found a *Diplodia* on branches of raspberry. *Stilbospora biloculata*, Johnst.! belongs to this genus. The species at present have not been sufficiently studied, and it will probably be found that many are forms of *Sphæria mutila*. In an early stage of growth the perithecia are filled with a delicate white cellular tissue, when they resemble small *Sclerotia*. This gradually vanishes in the centre, and the portion towards the circumference becomes fertile. This is also the case with certain species of *Sphæria*, which will hereafter probably constitute a new genus. Amongst them is the curious *S. phæocomes*, which I have found in fructification, and of which I have given a figure. Tab. XI. fig. 8.

* I have used the term nuclei to include oil drops or real granules, as it is not always certain what is the nature of the bodies commonly called sporidiola. They certainly have some important influence on the vegetation, like the cytoblasts of higher plants. I have seen a sporidium of *Sphæria bififormis* germinating while yet in the perithecium, and opposite to every nucleus a distinct filament was given off. See Tab. XI. fig. 8. *b*.

[To be continued.]

XLIV.—*A List of Mammalia and Birds collected in Assam by John McClelland, Esq., Assistant Surgeon in the service of the East India Company, Bengal Establishment: revised by T. Horsfield, V.P.L.S., &c.*.*

“ON the return to Calcutta,” says Dr. Horsfield, “of the Deputation sent to Assam for the purpose of investigating the nature of the Tea Plant, Mr. McClelland delivered his collection of Mammalia and Birds, accompanied by a Descriptive Catalogue and drawings of many subjects, to the Bengal Government, to be forwarded to the Court of Directors. These subjects arrived safely in England, and are now, with few exceptions, prepared and exhibited in the Company's Museum at the India House.

“In his official correspondence with the Bengal Government, Mr. McClelland explains the object he principally had in view in making the collection in the following terms: ‘Having been invited to offer any suggestion I may have to submit, as to how this portion of my labour may be disposed of with most advantage, I shall, in venturing an opinion, keep in view the objects with which my collections were made: these were, to procure as much information as Upper Assam is calculated to afford, in elucidation of the circumstances under which the Tea Plant is found in that country.

“‘Next to the relations of the plant in regard to soils, and its association with other vegetable productions, the *zoology* of the province is entitled to careful examination; so that all its productions may be compared with those of the tea districts of China.

“‘The accompanying Catalogue of animals will be found to display an interesting balance numerically in favour of the extension of species from the eastward, a point that ought to be carefully examined, as bearing upon the main question; for in proportion as the Tea Plant is associated in Assam with the prevalence of Chinese forms, the prospect of its successful cultivation becomes the more certain.’ —*Extract from Mr. McClelland's letter to the Secretary of the Bengal Government.*

“Mr. McClelland then expresses his desire that his Descriptive Catalogue, before publication, should be revised in England, in order to prevent the introduction of mere nominal species, and to conform the nomenclature to the latest discoveries in science. In accordance with this desire, the entire collection has been carefully compared with subjects from India contained in the British Museum and in the Museums of the Zoological Society and the East India Company, as well as with the drawings and descriptions lately published in various zoological works to which Mr. McClelland had no access.

“The following catalogue now exhibits Mr. McClelland's collection, with those alterations which the progress of discoveries required, and with a partial modification of the arrangement; and in performing this task the only object has been to secure to Mr. McClelland

* Communicated by Dr. Horsfield to the Zoological Society of London, Oct. 22, 1839, and extracted from the Proceedings of the Society.

the discoveries he has made, and to bring before the public a faithful statement of his zoological observations in Assam, and of the zeal and ability with which he has executed the charge confided to him."

MAMMALIA.

Order I. QUADRUMANA.

Genus HYLOBATES, Illig.

1. *Hylobates Hoolook*, Harlan, Trans. Amer. Philos. Soc.

The first authentic account of this animal is contained in the fourth volume of the Transactions of the American Philosophical Society. Dr. Harlan here describes and figures, from a prepared specimen, an adult male, which was brought to Philadelphia in 1832 by Dr. M. Burrough, together with a large collection of rare and valuable skins of quadrupeds and birds, obtained on the plains of the Burhampooter river, near Assam. The specimen described, with another adult and a young subject, was presented to Dr. B. by Capt. Alex. Davidson, of the Hon. East India Company's station at Goalpura, in the latitude of 26° north on the Burhampooter. They were taken on the Garrow Hills, in the vicinity of that station; they soon became tamed, especially the young one; they were docile and affectionate, and rather inclined to melancholy. They lived some time in the possession of Dr. B., but died on his voyage down the river to Rangoon.

A specimen of this species was brought from India by General Hardwicke, and presented to the museum of the Zoological Society, where it is exhibited. Living individuals are at present in the Society's Gardens in the Regent's Park.

"The colour of the Assam animal is uniformly black, except the eye-brows, which are white. Some individuals are grayish-yellow. Its length is not much above two feet. It is possessed of the most wonderful activity, making use of its arms in swinging from tree to tree: nor is the female in any way restrained in her movements by the young, which she carries suspended to her body.

"Inhabits the Cossiah Mountains and valley of Assam."—*McClelland's MS.*

Genus MACACUS, *La Cép.*

2. *MACACUS ASSAMENSIS* *. *Fulvo-cinereus, suprâ saturator, gastræo artuumque latere interiore canis; capillitio pilis paucis nigris sparso; facie natibusque carneis; caudâ partem tertiam longitudinis totius superante omnino pilis tectâ.*

"Bluish-gray, with dark brownish on the shoulders; beneath light gray: face flesh-coloured, but interspersed with a few black hairs: length $2\frac{1}{2}$ feet: proportions strong: canine teeth long, and deeply grooved in front; the last of the cheek-teeth in the upper jaw blunt."—*McClelland's MS.*

* The names used in this paper, where no authority is given, are those of Mr. McClelland's MS.

Order II. CHEIROPTERA.

Genus PTEROPUS, Briss., &c.

3. PTEROPUS ASSAMENSIS. *Capite anticè toto ex saturato rufescente fusco, posticè zonâ pallidiore in aureum vergente cincto; collo omni, nuchâ, interscapulio, pectore abdomineque e xerampelino aureis, plagâ laterali saturatiore; vellere in his elongato sublanuginoso; notæo e saturato fusco-nigricante pilis albis commisto; patagio nigro; auriculis elongatis acuminatis; axillis humerisque lanugine fusco vestitis.*

The face and the whole anterior part of the head are deep chestnut-brown, with a slight tendency to tawny; the back part of the head is surrounded by a belt of a lighter tint, inclining to orange, which also includes the throat. Around the entire neck, to the origin of the membrane, is a broad collar of rusty-yellow, inclining to orange, diversified with deeper rufous shades; the same colour, with its variation of tints, embraces the interscapulium, and extends to the breast and anterior part of the abdomen; the lower portion of the abdomen and the vent are rufous-brown. The back is deep blackish-brown, with a scanty admixture of white hairs; the fur, though slightly appressed, is more soft and silky than in the other species belonging to this section of *Pteropus*. The membrane is blackish. The flanks, armpits, and the bones of the shoulders and arms, are covered with a soft, silky, lengthened down, of a rufous-brown colour. The ears are long and pointed. The entire length is eight inches.

This species, although it resembles the *Pt. edulis* and *Edwardsii* (or *medius*) in habit, distribution of tint, and in the form of the ears, is nevertheless distinguished from them by the character of the fur on the neck, breast, and adjoining parts. This is not short and rigid, as in the species mentioned, but long, soft, and silky, furnished at the base with a close down, of a dark colour: in this particular it approaches to the second section of this genus, which is characterized by a lengthened, silky, frizzled fur, and of which the *Pteropus dasymallus*, Temm., is the type. The toes and claws are proportionably large.

There are in Mr. McClelland's collection two specimens of this species, for which he has proposed the specific name of *Assamensis*: this, notwithstanding the objection raised to local names, has been retained, in order to direct naturalists in India to the country where it was discovered, and thus to determine, by future search, its rank as a distinct species, and also the existence of other species of both groups, typified by *Pteropus edulis* and *Pteropus dasymallus*.

Genus VESPERTILIO, Auct.

4. *Vespertilio* — ?

A single specimen of *Vespertilio* has been received, which is not sufficiently perfect to determine its true character.

Order III. FERÆ.

Genus URSUS, Linn., &c.

No opportunity was afforded to determine the species of *Ursus* found in Assam.

Genus MANGUSTA, Oliv.

5. *Mangusta auropunctata*, Hodg. Journ. Asiat. Soc. V. 1836, p. 235.

Genus FELIS, Linn., &c.

6. *Felis Tigris*, Linn.

“There are other species of this genus, but their characters I have not had an opportunity of examining.”—*McClelland's MS.*

Order V. PACHYDERMATA.

Genus ELEPHAS, Linn.

7. *Elephas Indicus*, Linn.

Genus SUS, Linn.

8. *Sus Scropha*, Linn.

“The size the wild boar attains in Assam may be conceived, from one of the skulls of the animal in my collection, containing a tusk which measures in length twelve inches.”—*McClelland's MS.*

Genus RHINOCEROS, Linn.

9. *Rhinoceros Indicus*, Cuv.

Order VI. RUMINANTIA.

Genus CERVUS, Linn.

10. *Cervus porcinus*, Zimmerm.

“The *Cervus porcinus* is not a rare animal, as has been supposed; I have seen it in the Tarrai, at the foot of the Kemaon mountains, as well as in Assam, where it is the commonest species of the genus. I had in my collection a curious instance of an albino of this species, for which I was indebted to Mr. Hugon of Assam. It was a female, every part of it white; but it was shot and prepared before I had an opportunity of examining the irides. It is an interesting proof that the change of colour in the fur of animals is not dependent on the cold of northern latitudes.”—*McClelland's MS.*

11. *Cervus Pumilio*, Hamilt. Smith, Griff. Anim. Kingd. V. No. 788.

“A small portion of the skull of this animal has been procured by me.

“There are other large species of *Cervus* in Assam, and several smaller kinds, but which I have not been able to procure.”—*McClelland's MS.*

Order VII. RODENTIA.

Genus SCIURUS, Linn., &c.

12. *Sciurus bicolor*, Auctor. *Sciurus giganteus*, McClelland's MS.

"Upper part of the head, the nose, the ears, outer and hinder portion of the fore-legs, the feet, tail, and back, deep glossy-black; beneath yellowish-white; two small spots on the chin; cheeks white; a rudimental thumb, covered by a flat nail. Body fifteen, tail sixteen inches long.

"The above description has been derived from seven or eight specimens procured during the course of three months. Among the various individuals I have seen there appeared to be no difference.

"It differs from the *Sciurus maximus* by the absence of the marone colour on the head, and from *Sciurus Leschenaultii* by its greater size, its deep black colour above, without any diminished intensity of shade on the anterior part of the head and nose; and from *Sciurus bicolor* of Sparrmann by the uniform blackness of the upper parts of the body, extending to the extremity of the tail, which is entirely black."—*McClelland's MS.*

Individuals of this species, agreeing in all particulars with those collected in Assam by Mr. McClelland, have been observed in other parts of India by Dr. Francis (Buchanan) Hamilton and by Dr. Finlayson. The latter forwarded several specimens to the Museum at the India House. The specific character originally constructed by Sparrmann, and subsequently adopted by all systematic writers, defines accurately the animal as described by Dr. Hamilton and by Mr. McClelland. Schreber's figure also agrees with the same, while the animal from Java (represented in Horsfield's *Zoolog. Res.*), and indicated as a variety in Fisher's 'Synopsis Mammalium,' appears to differ from the continental species by the variations to which its tint is subject. It remains therefore for further research and observation to determine, whether these two varieties may not be specifically distinct, and whether the name proposed by Mr. McClelland should not henceforth be applied to the species observed in Continental India by himself and by Hamilton and Finlayson.

13. *Sciurus hippurus*, Isid. Geoff. Guerin. Mag. Zool., Pl. VI.

"Gray above, on the cheeks, on the outside of the limbs, and base of the tail: feet grayish-black: throat and lower part of the body reddish-brown: posterior third of the tail reddish-brown in a single specimen procured by Mr. Griffith in the Cossia mountains, but black in five specimens procured by myself in Upper Assam: tail as long as the body. Entire length of the animal eighteen to twenty inches. Inhabits the Cossia mountains, as well as the eastern parts of Assam."—*McClelland's MS.*

14. *Sciurus Lokriah*, Hodg., Journ. Asiat. Soc., Bengal, V. 1836. p. 232.

"Above brown, sprinkled with yellow, the hairs being dark at their bases, but towards their extremities alternately barred with fulvous. A broad irregular yellowish stripe extends from the chin

to the tail, and is broadest on the throat. Ears rounded, and nearly naked: tail nearly equal to the body in length: body eight inches long, and of stout proportions."—*McClelland's MS.*

One imperfect specimen sent by Mr. McClelland agrees precisely with Mr. Hodgson's description, referred to above.

15. *Sciurus Lokrioides*, Hodg., Journ. Asiat. Soc., Bengal, V. p. 232.

"Light gray, with a yellow tinge on the sides of the thorax; silver-gray beneath; hairs above alternately barred with light and dark gray. Tail scarcely so long as the body: ears short, but pointed upwards: length eight inches."—*McClelland's MS.*

16. *SCIURUS MCCLELLANDII*, Horsfield. *Suprà fuscus fulvo tenuissimè irroratus notæo saturatiore; subtus ex sordido fulvo canescens; dorso summo lineâ rectâ atrâ; lineâ insupèr utrinque laterali fuscâ læto fulvo marginatâ, anticè saturatiore, ad oculos extensâ, posticè obsoletâ in uropygio utrinsecus approximâtâ; caudâ mediore subcylindrico-attenuatâ nigro fulvoque variegatâ; auriculis atris barbâ niveâ lanuginosâ insigni circumscriptis; vibrissis longis nigris.*

"A black line extends along the spine, with a double-shaded line of yellow and brown on each side, softly relieved from the remaining upper portion of the body (which is most minutely variegated fulvous and brown); yellowish-gray beneath: tail slightly tapering, shorter than the body and legs, more bulky than in Squirrels in general: length three and a half inches, exclusive of the head, which measures one inch.

"It inhabits Bengal as well as Assam, and is the only one of the foregoing species possessed of pencilated tufts on the ears. They have each long black beards."—*McClelland's MS.*

GENUS LEPUS, Linn.

17. *Lepus timidus*, Linn.

"This Hare is found in Assam, but its size is degenerate, measuring only from seventeen to nineteen inches in length. It is not esteemed as an article of food. The ears are more uniformly gray than in the European variety."—*McClelland's MS.*

18. *Lepus hispidus*, Pearson.

This species is admitted by Mr. McClelland, on the authority of J. T. Pearson, Esq., late Cur. Mus. As. Soc., who described it in the Calcutta Sporting Magazine.

"Its hair is harsh and bristly; ears very short, not projecting beyond the fur: length eighteen inches: colour more dusky-gray than that of the Hare. Inhabits Assam, especially the northern parts of the valley along the base of the Boutan mountains.

"I am indebted to Lieutenant Vetch of Assam for the skin of this animal, but unfortunately the skull is wanting; but according to Mr. Pearson it is the same as the skull of the common Hare."—*McClelland's MS.*

Order VIII. EDENTATA.

Genus MANIS, Linn.

19. *Manis brachyura*, Erxl.

"This animal has fifteen rows of scales, extending longitudinally over the body; those on the back are longest, and are rounded posteriorly, but they are narrow below, and carinose; while on the back they are simply striated at the base. Bristly hairs pass out between the scales.

"Lower parts of the head, the throat, and a line extending along the lower portion of the body to the tail, and the inner sides of the legs, without scales, but covered with a scanty coarse white hair."—*McClelland's MS.*

A V E S.

Order I. RAPTORES.

Fam. FALCONIDÆ. Sub-Fam. AQUILINÆ.

Genus HALIAËTUS, Sav.

1. *Hal. Macei*. *Falco Macei*, Temm. Pl. Col. Pl. 8.

"A Fisher Eagle. Throat and nape yellowish-white, covered with long pointed feathers; crown and base of the neck grayish-yellow (feathers of the latter obtusely pointed), all other parts of the bird brown, except a broad band across the tail, which is white. The tarsi are naked two-thirds of their length: wings long, extending nearly to the extremity of the tail: length thirty-three inches.

"This eagle preys on fish, and is particularly active during a storm, when it is found soaring over the lee-shore, descending on such fishes as are driven into shallow water. During fine weather it spends the principal portion of its time on some high solitary bank, quite motionless."—*McClelland's MS.*

2. *Hal. Pondicerianus*. *Aquila Ponticeriana*, Briss. Pl. enlum. 416. *Falco Pondicerianus*, Gmel. Linn. I. 265. Lath. Ind. Orn. I. p. 23.

Genus SPIZAËTUS, Vieill.

3. SPIZ. RUFITINCTUS. *Suprà fuscus capite saturatiore, notæo nebulis dilutioribus vario; caudâ fusco et cinerescente latè fasciatâ; subtùs albo fuscoque varius, collo pectoreque vittatis, abdomine femoribusque fasciatis; tarsi ultra medium plumosi.*

"Upper part of the body dark brown, with slight undulations of a deeper tint: breast and throat longitudinally striped with brown: belly and under surface of the wings white, transversely barred with brown: tarsi feathered to the lower third, each feather marked with five transverse bars: tarsi shielded: the beak short, much hooked, and sharp: claws and toes strong and formidable.

"It inhabits the banks of the Burhampooter and other rivers in Assam, where it conceals itself in bushes and grass, along the verge of the water, seizing such fishes as approach the surface within its reach."—*McClelland's MS.*

Sub-Fam. FALCONINÆ.

Genus FALCO, Linn., &c.

4. *FALCO INTERSTINCTUS*. *Suprà lætè ferrugineus nigro fasciatus; subtus dilutior subflavescens; pectore abdomineque nigro vittatis; capite nigro lineato; reatricibus pogoniis singulis nigro fasciatis, fasciâ caudali terminali latiore ferrugineo marginatâ; remigibus nigris margine fasciisque interioribus ferrugineis.*

“Brown striated Falcon. Upper part of the body and wing coverts brown, with blackish bars across the feathers, but on the head the stripes are longitudinal; quill-feathers blackish; inner margin barred with pale ferrugineous; tail-feathers transversely barred with black; below paler, inclining to dusky-yellow, except the breast and sides, which are marked with longitudinal brown spots. Entire length fourteen inches.”—*McClelland's MS.*

The bird here described, to which Mr. McClelland has given the specific name of *interstinctus*, agrees in many points with the female of *F. Tinnunculus*; but from the observations hitherto made, it would appear that it is entitled to distinction by the fact that the sexes have not the same difference in markings and external character which belongs to the European and Asiatic Kestrels. The researches made by Col. Sykes in the Dukhun confirm the determination of Mr. McClelland. Col. S. mentions, in the Catalogue of Birds from Dukhun, “his being in possession of a male bird exactly like the female Kestrel in plumage and size, and consequently larger than the male Kestrel; and as this was shot from a party of five or six perched on the same tree, and without a male Kestrel in company, he is induced to believe that there is a distinct species, in which both sexes have the plumage of the female European Kestrel.”

The museum of the East India Company has received specimens from Madras agreeing accurately with those collected by Mr. McClelland, but further observations are required to determine whether Mr. McClelland's bird deserves to be ranked as a distinct species.

Sub-Fam. BUTEONINÆ.

Genus CIRCUS, Auct.

5. *Circ. melanoleucus*. *Falco melanoleucus*, Gmel. Linn. I. 274. Black and White Indian Falcon, Penn. Ind. Zool., Pl. 2. Engl. Ed.

“This bird is a fisher, like the *Brown Spizaetus* above described; but instead of inhabiting the banks of rivers, it is found in low inundated places, where it feeds, with Waders, on Reptiles and Mollusca, as well as on Fishes.”—*McClelland's MS.*

Sub-Fam. MILVINA.

Genus MILVUS, Auct.

6. *Milvus Govinda*, Sykes?

“The primary quill-feathers are blackish-brown at their tips; every other part of their plumage is brown. It is a common Kite in Assam, as in every other part of India.”—*McClelland's MS.*

Note.—A single specimen of this bird, not well preserved, was found in the collection: some uncertainty respecting the species to which it really belongs still remains.

Fam. STRIGIDÆ. Sub-Fam. NOCTUINA.

Genus, ATHENE, Boie: NOCTUA, Sav.

7. *Athene cuculoïdes*. *Noctua cuculoïdes*, Gould's Cent. Himal. Birds, Tab. IV.

Sub-Fam. BUBONINA.

Genus SCOPS, Sav.

8. *Scops Lempiji*. *Strix Lempiji*, Horsf. Trans. Linn. Soc. XIII. p. 140.

[To be continued.]

BIBLIOGRAPHICAL NOTICES.

Preparing for publication:

Dr. Johnston's History of British Sponges and Corallines.

To be printed and illustrated in the same style as the 'History of the British Zoophytes,' to which this new work may be considered a Supplement. It will contain a very full account of all that has been hitherto written on the subject, and an original figure of every species and remarkable variety will be given. Dr. Johnston intends at the same time to avail himself of this opportunity of adding many new figures of Zoophytes, contributed by his friends and acquired by himself, since the volume on British Zoophytes was published. The wood-cuts are already far advanced.

Memorie di Matematica e di Fisica della Societa Italiana delle Scienze residente in Modena. Tomo xxi. Parte I.

This part contains the following articles of botanical interest.

1. *Descrizione di un nuovo genere e di una nova specie di pianta Gigliacea*; del Prof. A. Bertolini.—*Strangweja* (in honour of the Hon. W. T. H. Fox Strangways, secretary to the British embassy at Vienna). "Perigonium simplex, campanulatum, sexfidum, laciniis apice recurvis. Androphorum sexantheriferum, inferne hinc conatum cum perigonio, inde tegens ovarium, superne in teniolas sex sectum, quarum unaquæque apice emarginata, ferens in emarginaturæ medio filamentum brevissimum, antheriferum. Antheræ oblongæ, incumbentes, biloculares. Ovarium liberum, trigonum, tectum. Stylus staminibus brevior. Stigma simplex, obtusum. Capsula trilocularis, trivalvis.—Bulbus simplex. Folia linearia, radicalia, flaccida. Scapus simplex, nudus. Flores spicati.—Sp. *Strangweja hyacinthoides*.—Patria ignota."—(With a coloured illustration.)

2. *Descrizione d'una specie d'Elæagnus.*

3. *Sulla Cornacchinia fragiformis.*

4. *Catalogo di Piante Egiziane raccolte dal Naturalista G. Raddi.* Three articles from the pen of the meritorious Prof. Savi (senior).—

“*Elaagnus spadicea* : foliis ovato-lanceolatis subundulatis, subtus lepidoto-spadiceis, ramis spinescentibus, floribus axillaribus solitariis pedunculatis.” This plant was contained in the catalogue of Burdin, seedsman in Turin, under the name of *Capparis Breynii*.—“*Cornacchinia* = Syst. sex : Didynamia Gymnospermia = Fam. Nat. Verbenaceæ.—*Calyx* monosepalus, persistens, subirregulariter quinquefidus. *Corolla* hypocrateriformis, tubo elongato gracili, limbo patente, subirregulariter quinquelobo. *Stamina* quatuor, longe exserta, quorum duo paullo breviora. *Antheræ* ovales. *Stylus* staminibus longior, filiformis, stigmatibus acuto bifido. *Ovarium* liberum. Fructus *Capsula* subglobosa lignosa, sarcocarpo suberoso rimoso in lobulos prominulos obtusos irregulares oblongos discriminato, sulcis duobus, versus apicem, normaliter intersectis notata; bilocularis (abortu unilocularis); bivalvis, valvis maturis ad medium usque bifidis? *Dehiscencia* septicida. *Troposphermum* lignosum, dissepimento duplici adnatum utrinque concavum. *Semina* duo (altero abortiente) unum in quavis cavitate trophospermi, ejusque margini prope apice suspensum. *Testa* membranacea. *Embryo* aperispermicus, orthotropus.—Sp. unica : *Cornacchinia fragiformis*, Habitat secus ripam occidentalem Nili in Nubia, prope Abdelherim (?), ubi Érg-Elmena vocatur.” It was collected by the late Sig. Raddi.

Thirty-six notes are appended to the catalogue of Egyptian plants, in which species already known are explained, or new species provided with diagnoses. The latter are here reprinted. = No. 10. “*Aristida Raddiana* : foliis convolutis recurvis rigidis ad faucem vaginæ ciliatis, culmo pilosiusculo, panícula racemosa, valvulis inæqualibus acuminatis, arista articulata tripartita, lacinia media majore unica plumosa apice nuda, calycis longitudinem quadruplam vix subæquante.”

New diagnoses are given for the following species : “*Aristida ciliata*, *plumosa*, *capensis*, *pungens* ; and for *Acacia vera*, *Seyal*, *Raddiana* and *albida*.—*Coronopus Raddii* : fructibus compressis subcymbæformibus glabris tuberculato-rugosis, foliis spatulato-dentatis, caule patulo.”—*Ruta glabra* and *Ruta tuberculata*, Viv. pl. æg. decad. are made synonyms with his *R. ciliata*, to which the following diagnosis is assigned : pilosa v. glabriuscula, foliis integris, inferioribus obovato-spatulatis, vel lanceolato-obtusis, superioribus lanceolatis, subtus, caulibus, capsulisque tuberculato-glandulosis, corymbis dichotomis, calyce minimo, filamentis ciliatis. From the notes we select the following. Savi’s *Scirpus lateralis* is *Sc. supinus*, Roth. ; his *Cyperus pallidus* is synonymous with *C. Tenori*, Presl. and Bertol., and *C. Tenorianus*, R. Sch.—The genus *Polyogon*, Desf. (1800) was already established in 1798 in the eighth volume of these Memoirs, under the name of *Santia*, by Savi. *Aristida ascensionis* is declared to be not different from *A. cærulescens*. His *Poa ramosa* (Mem. d. Soc. Ital., tom. ix. tav. 7.) is *Calotheca repens*. These three memoirs are followed by a short notice on *Acacia bimucronata*, DC., which after examination of perfect specimens of the fruit brought by Raddi from Brazil, is declared to be a true *Mimosa*. Of the two plates, one represents *Elaagn. spadicea*, the other *Cornacchinia fragiformis*.

Species Hepathicarum. Recensuit, partim descripsit, iconibusque illustravit J. B. G. Lindenberg. Fasc. I. Jungermanniæ Plagiochila.

The study of the interesting family of the Liverworts, which for a long time had been but slightly cultivated, has of late acquired many friends and active attention. The author of the present work, already well known to us from his love to this group, at present favours us with the commencement of a work which will supply what has long been a desideratum. There were descriptions enow of Liverworts, but accurate and good drawings were highly desirable, and a complete comparison of all known species was still entirely wanting. As a systematic order of succession could not be followed throughout in this work, the author has preferred to take the species generically, and thus form a series of monographs, which, at the conclusion, will be connected by the requisite synopsis and Index, in which the other relations also of the family will be treated of in general. The present part contains the genus *Plagiochila*, Nees et Mont., with eighteen species. The drawings resemble those of the mosses by Schwägrichen, but are lithographed and partly coloured. The whole work is exceedingly well got up, and will, undoubtedly, meet with a good reception from the botanical public. The text is arranged in the following order: diagnosis, synonymy, country, with discoverer, descriptions, then observations, and lastly, explanation of the figures.

Die Naturlichen Pflanzensysteme, geschichtlich entwickelt, von Dr. H. L. Zunck.—A Prize Memoir crowned by the Philosophical Faculty of Leipzig.

An historical exposition of the development of the natural system, carried out with great ability. The author, after having established the difference between artificial and natural system, gives a condensed review of the progress of botanical knowledge from the time of the Greeks and Romans to the establishment of natural classes and families; then estimates the attempts of various authors, from Adanson to Endlicher; and lastly, gives a tabular synopsis of the systems after their classes. We could have wished, for the sake of completeness, that the author had mentioned the attempts of Fries, Wilbrand, Aspegren and others; and that at the conclusion he had represented in a table, by adposition of the allied classifications, the relations they bear to one another.

Florula Caprariæ, sive Enumeratio Plantarum in insula Capraria vel sponte nascentium vel ad utilitatem latius excultarum, auctoribus J. Moris et J. de Notaris. Taurini, 1839. Accedunt Stirpes Sardoæ novæ aut minus notæ, auct. J. Moris.

This memoir is printed separately from the Memorie della R. Accademia delle Scienze di Torino for 1839, in which volume has likewise appeared a phyto-physiological memoir by Amici and Savi, jun.

The plants from which this Florula has been composed were collected by the active De Notaris on the island Capraja ($43^{\circ} 0' 10''$ N. lat. $7^{\circ} 29' 55''$ east long. Par. meridian : 16 geographical miles in circumference), on occasion of a second journey through Sardinia. The Phanerogamia have been worked out by Prof. Moris ; the Cryptogamia exclusively described by De Notaris, who has thus boldly entered the field of Algologists. On the whole, there are 466 species for the first section, 245 species for the second. The following are new :—

Senecio calvescens (page 74*), Tab. I. S. caulibus erectiusculis, ramosis, basi suffrutescentibus foliisque subtus arachnoideo-villosis subtomentosis, demum glabratis, supremis subdivisis, ceteris pinnatipartitis, omnibus membranaceis, semiamplexicaulibus basi que auriculatis, partitionibus sinuato-dentatis pinnatifidisve, lobis denticulatisve summis confluentibus ; corymbo composito campanulato, capitulis radiatis (flavis). Involucris basi vix bracteolati arachnoideo-subtomentosi moxque glabrati, ligulis 10–14, lineari-oblongis, planis, acheniis angulatis, læviusculis ; pappo 1-seriali, flosculos subæquante.—*Centaurea gymnocarpa* (page 76*), Tab. II. C. caulibus erectiusculis, ramosis, foliisque incano-cineraceove tomentosus, inferioribus subbipinnatipartitis, summis capitulorum basim bracteantibus, involucris ovatis squamis adpressis, exterioribus vix arachnoideo-villosis, apice fusciscentibus, brevissime mucronulatis infimis integerrimis, mediis parce breviterque ciliatis, supremis intimisque in appendiculam scariosam breviter ciliatam denticulatamve abeuntibus ; pappo nullo.—*Crepis insularis* (page 85*), Tab. III. Fig. 1. C. villosopubescens ; caule monocephalo, erecto ; foliis remote denticulatis, acutis rigidulis, inferioribus oblongo-ovatis in petiolum attenuatis, ceteris sessilibus, lanceolatis, supremis linearibus subintegris ; involucris pedunculisque glandulifero-pubescentibus ; calyculi squamis lineari-lanceolatis linearibusve, subpatulis ; receptaculo piloso-fimbrillifero.—*Linaria capraria* (page 98*), Tab. II. Fig. 2. L. glaberrima, glaucescens, decumbens, ascendensve, foliis crassiusculis lineari-lanceolatis linearibusve, acutiusculis, inferioribus subverticillatis, ceteris sparsis ; racemo laxiusculo, calycis partitionibus linearibus, acutis, calcare corolla majuscula brevior ; stylo apice incrassato, stigmatibus submarginatis ; seminibus triquetro-angulatis rugosotuberculatis.—*Jungermannia* (*Lophocolea*?) *fragrans* (page 177*), Tab. VI. Fig. 1. (1–8). J. caulibus vage ramosis, decumbentibus ; foliis succubis subhorizontalibus, patulis approximatis, subimbricatisve, ovato-subtrapeziformibus obtusis, truncato-emarginatisve, aut subdentatis, integris, amphigastriis ovatis, bifidis, sinu obtuso, laciniis subulatis, rectis, acuminatisve, extus plerumque unidentatis.—*Parmelia atra* β . *subimmarginata* (page 185).—*Bryopsis tenuissima* (page 203*), Tab. VI. Fig. 3. (1–5). Br. filis tenuibus, dense cæspitosis, implexis, simplicibus furcatisve.—*Ectocarpus paradoxus*, Montagn. in litt. (page 206*), Tab. V. Fig. 1. (1–3). Ect. filis viridibus, tenuissimis, ramosissimis, ramis erectis, articulis basi diametro brevioribus, supremis sextuplo longioribus, sporangiis ovatis sessilibus.—*Polysiphonia opaca* (*Hutchinsia* Agdh.—page 208*), Tab. V. Fig. 2. (1–7).—*Polysiphonia tenella* (*Hutchin-*

sia Agdh.—page 209*), Tab. IV. Fig. 1. (1–4).—*Calothrix minutissima* (page 214*), Tab. IV. Fig. 2. (1–2). C. filis simplicibus, fasciculato-cæspitulosis varie flexis, breviusculis, læte viridibus.—*Mesogloia Bertolonii* (*Fucus Nemalion* Bertol.—page 215*), Tab. IV. Fig. 3. (1–2).—*Cryptosporium stilbosporium* (page 227*), Tab. IV. Fig. 4. (1–3). C. perexiguum, punctiforme, sed ob pallorem matricis cui innascitur valde enitens. Astromaticum, sporidia, glomerula subrotunda efficientia, immersa, ex epidermide perforata demum evacuata. Glomerula inter se discreta juxta strias culmi vaginarumque in series parallelas disposita. Sporidia elliptico-fusiformia, obtusiuscula, sub acri vitro subinde obscure vageque septata, subolivacea.—In the appendix, “*Stirpes Sardoæ*,” three species are treated of by Prof. Moris, of which are *Hypocheris linearifolia* and *Daucus serratus*, the latter very remarkable from its fruit; the third species, *Veronica brevistyla* is founded on *Ver. triphyllus* β . *romana*, Bertol. Fl. Ital. I. 97.

Skandnaviens Fiskar. Nos. 1 to 6. 4to. Stockholm, 1836 to 1840.

The sixth part of this excellent work on the Fishes of Scandinavia, with coloured figures of the species, has lately been received in this country. The text of the first five parts was supplied by B. F. Fries and C. U. Ekström, but the lamented death of M. Fries interfered for a time with the continuation of the work.

Under a new arrangement Professor C. J. Sundevall takes the place of M. Fries, and the sixth part has been put forth with additional claims to our praise. In the former parts the whole of the text was given in the Swedish language, but with the sixth part descriptions in Latin are also added, which will be continued in the future parts, and we have no doubt the authors will find their account in thus rendering their work more generally useful.

Six coloured plates are included in each part; the fishes are most correctly drawn on stone by Mr. W. Wright, an English artist residing at Stockholm, and all are beautifully as well as faithfully coloured. This work is calculated to be particularly serviceable to the Ichthyologist, as it will contain excellent figures of all the Scandinavian fishes known to Linnæus; while its value to the English naturalist may be inferred from the fact, that of the 47 coloured figures contained in the 36 plates, 44 are faithful representations of fishes belonging to the British islands.

The six parts, with six coloured plates to each, contain 140 pages of letter-press in the Swedish language, with 16 pages of descriptions in Latin; there are besides, 44 pages of letter-press and three extra uncoloured plates, devoted to the description and illustration of nets and other instruments of capture, with the modes of employing them.

Two parts of this work are now promised every twelve months. Nos. 7 and 8 are to appear in the course of the year 1841.

PROCEEDINGS OF LEARNED SOCIETIES.

CAMBRIDGE PHILOSOPHICAL SOCIETY.

Nov. 30, 1840.—The President, Dr. Hodgson, in the Chair.

Prof. Henslow gave an interesting lecture upon the diseases of wheat, in which after pointing out the differences of effect of the *Uredo caries* or *Bunt*, and the *U. segetum* or *Smut*, he showed that the *U. rubigo* or *Rust* is only an earlier state of the *Puccinia graminis* or *Mildew*, having traced the progress of the plant from the state described under one of these names to that denominated by the other, and even found the simple, not septate, and nearly or quite sessile sporidia of the *Uredo* in the same sorus with the clavate, constricted and septate sporidia of the *Puccinia*. The Professor stated that he had submitted specimens to Mr. Berkeley, and that that eminent algologist had confirmed his conclusion that the two plants (referred to different genera) are in fact only states of one species. This is a conclusion that must cause great alteration in our ideas of the subcuticular Fungi. He then pointed out the distinctions between the *Æcidium Berberidis* and the blights of wheat, and thereby showed the improbability of the Berberry having any agency in the causing of blight in wheat. He stated, that it might possibly be the case, that the same soils and situations that are favourable to the production of *Uredo* are also appropriate for the growth of the Berberry, and that the Berberry had thus obtained the bad name which has been so unjustly attached to it.

The next point brought under notice was the prevalence of *Ergot* in *wheat* in that part of Suffolk in which Prof. Henslow resides; and he expressed it to be his opinion, that the presence of *Ergot* in the flour might be the cause of many of the grievous sores to which the poor are liable; he also stated that he had placed some of the wheat *Ergot* in the hands of eminent medical men, in order that they might ascertain if it possesses the same valuable medicinal properties for which the *Ergot* of rye is so celebrated. He concluded his very valuable communication by giving the history of the *Eur-Cockle* caused by the *Vibrio tritici*, and also of the *Wheat Midge*. The whole was illustrated by excellent magnified drawings and numerous specimens.

BOTANICAL SOCIETY OF EDINBURGH.

President, David Falconar, Esq., M.W.S.

Vice-Presidents, Robert Graham, M.D., Regius Prof. Bot. of Edinb.; Daniel Ellis, Esq.; Robert Kaye Greville, Esq., LL.D.; Prof. Traill, M.D.

Council, Prof. Christison, M.D.; H. Ivory, Esq.; D. Steuart, Esq.; Patrick Neill, Esq., LL.D.; William Scott, Esq.; W. C. Trevelyan, Esq.

Treasurer, W. Brand, Esq.—*Secretary*, W. H. Campbell, Esq.—*Corresponding Secretary*, J. H. Balfour, M.D.—*Foreign Secretaries*,

E. Forbes, Esq. ; J. Macaulay, M.D.—*Curator*, G. Atkin, M.D.—*Artist*, J. M'Nab, Esq.

The Society met on Thursday, 10th December, when the following papers were read :—

1. Sketch of an Excursion to the Clova mountains in July and August last, giving an account chiefly of the Cryptogamic plants of that district. By Messrs. William Gardiner, jun., and William Jackson, jun., Dundee.
2. Remarks on *Aspidium spinulosum* and *Aspidium rigidum*. By Mr. J. Riley, Papplewick, Nottinghamshire.
3. Notice regarding the specific characters of *Asplenium Ruta-muraria* and *alternifolium*. By the Rev. T. Blizard Bell.
4. Notice of the discovery of *Phascum Flörkeanum*, Schwæg., a Moss new to Britain, on the coast of Durham. Communicated in a letter to the Secretary, by Mr. T. J. Bowman, Richmond.
5. Notice of the Cypresses in the gardens of Xeneralife, near the Alhambra. By Dr. James Macaulay.
6. Observations on *Jungermannia* found in the neighbourhood of Dumfries. By Mr. James Cruickshank.

The most important notice perhaps is the discovery of a Moss new to Britain, *Phascum Flörkeanum*, Schwæg., which will keep us in mind, that notwithstanding the many zealous botanists who have been lately engaged in investigating our Flora, there yet remains an open field which will not be carefully searched without its reward. Specimens of the Moss were exhibited ; and Dr. Greville, with other muscologists present, had no doubt of the identity of this minute plant with the species to which Mr. Bowman had referred it.

The regular quarterly Reports, furnished by the kindness of the Secretary, will be published as soon as they are received.

ROYAL SOCIETY OF EDINBURGH.

President.

Sir T. MAKDOUGALL BRISBANE, Bt., G.C.B., G.C.H.

Vice-Presidents.

The Hon. Lord GLENLEE.

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Dr. ALISON.

Sir JOHN ROBISON, K.H.

Sir HENRY JARDINE.

Sir JOHN M'NEILL, G.C.B.

JOHN SHANK MORE, Esq.

Professor SYME.

The Society has again commenced its ordinary Meetings ; and at the first, on Monday the 7th of December, the following com-

munications were made, after the address to Her Majesty on the birth of the Princess Royal had been carried by acclamation :

1. On certain Physiological Inferences which may be drawn from the study of the Nerves of the Eyeball. By Dr. Alison.
2. On the Plane and Angle of Polarization at the Surfaces of Crystals. By Professor Kelland.

TWEEDSIDE PHYSICAL AND ANTIQUARIAN SOCIETY.

The Quarterly Meeting of this Society in its new apartments, Nov. 23, His Grace the Duke of Roxburghe in the Chair, was numerously attended.

The following donations to the Museum in the department of Natural History were reported :

From Mr. Burgess, Fochabers.—Minerals and fossil organic remains from Banffshire.

From a lady (through Mr. Stuart, surgeon).—Calc-tufa, quartz with olivine, limestone, &c., from Madeira and Gibraltar.

From His Grace the Duke of Roxburghe.—Egyptian Ichneumon (*Viverra Ichneumon*).

From Robert Wilkie, Esq. of Ladythorn.—Sea Eagle (*Aquila albicilla*), in excellent plumage; Sapphirine Gurnard (*Trigla Hirundo*).

From an anonymous contributor, who continues his valuable donations to this department.—Snowy Owl, female (*Strix nyctea*); Tengmalm's Night Owl, male and female (*Noctua Tengmalmi*); Little Owl, male (*Scotophilus nudipes*); Grasshopper Warblers, male and female (*Salicaria locustella*); Wryneck, female (*Yunx torquilla*); Whimbrel (*Numenius Phaeopus*); Velvet Duck, male (*Oidemia fusca*).

Other specimens have been received from Mr. Beckwith, Yetholm Hall; Mr. Scarth, Aberdeen, &c. &c.; and some valuable additions to the library and the collection of antiquities &c.

A list of the birds still required has been lately extensively circulated, and will serve as a guide to those who may be inclined to assist the Society in this interesting department of its labours.

In Entomology a most valuable and extensive contribution has been received from Mr. Selby of Twizell, one of the Vice-Presidents.

A fresh subscription has been opened for the liquidation of the sum remaining due for the building and internal fittings, some of the principal farmers in the neighbourhood having already contributed. The Meteorological observations, instituted under the auspices of Sir T. Brisbane and the Duke of Roxburghe, are ably carried on by Mr. Ferguson; and an agreement has been entered into with certain eminent cultivators of natural science for sending abroad an experienced naturalist, to form a collection of objects of natural history, to be forwarded to this country, and divided among the several subscribers. For the means of effecting this, they have been indebted to the generosity of their President, Sir Thomas Brisbane. In the Ornithological department their collection now amounts to upwards of 300 specimens, illustrating nearly 200 different species of British

birds. In the selection of these, the greatest attention has been paid to the perfection of the plumage; and by far the greater part of them have been preserved by the skilful hand of Mr. Heckford, the Society's Conservator.

DUBLIN NATURAL HISTORY SOCIETY.

At the usual monthly meeting held on Friday the 4th of December, Mr. Allman called attention to a curious parasitic Entozoon discovered by him in the abdominal muscles of the Hake. Mr. H. Dombrain gave a notice of ornithological rarities which had lately occurred, among which four specimens of *Ibis falcinellus* had been shot during the last autumn. Mr. Andrews read an account of a botanical excursion through a portion of Clare and Kerry, and as this contained several new localities for some rare Irish plants, we add an abstract which has been forwarded to us by the author.

“Having been requested by my friend, Mr. Dombrain, to give a sketch of a hurried excursion which I made, in company with my friend Mr. Moore, through a portion of Clare and Kerry this autumn, I have to beg the indulgence of the meeting for any omissions I may make. I can only give a brief outline of our range, and state other interesting localities for plants that have been considered rare or not frequent in this country. Our steps were first directed to Clare, proceeding from Kilrush to Dunbeg, a small village on the coast; and we had to regret that the very unfavourable state of the weather prevented our making such collection of Algæ as the shores of that bay so promisingly offered. The *Fucus tuberculatus*, rare in the north, was there abundant, and *Cystoseira ericoides*, and *Chondrus norvegicus* frequent. In the great bog of Mon Mor, which extends over a considerable tract of country, we noticed, in the range between Killard and Moyasta, most of the rare bog plants of Connemara: the *Eriocaulon septangulare* in great abundance; *Carex filiformis* and *limosa*, *Rhynchospora fusca*, and *alba*, *Alisma natans*, *Utricularia minor* and *Scutellaria minor*, *Drosera rotundifolia*, *longifolia* and *anglica*, *Pinguicula lusitanica*, this plant appearing more general there, and also in Kerry, than the *vulgaris*. Near Tullaher Lake, the *Centunculus minimus* was found, and in the lake in abundance *Elatine hexandra*, *Eriocaulon septangulare*, and *Lobelia Dortmanna*. Mr. Murphy informs me that he has seen the *Eriocaulon* in Donegal, and I have heard of its having been noticed in Kerry; thus establishing an interesting connecting link along the western coast of a plant that has hitherto been considered limited to Connemara. The same remark is applicable to the *Asperula cynanchica*, this beautiful little plant displaying its white rose-tinged flowers, set off by its thickly-set dark shining leaves, in great abundance on the sand-hills of Dough-mor. It occurs frequently in the limestone district of Burren, and on the sand plains of Ferriter's Cove and Smerwick Harbour in Kerry, and I have no doubt its range may yet be observed more northerly than Clare. The *Viola lutea* seemed to be confined to a portion of the sand-hills bounding the northern side of Screeveleen river. In our rambles further west, along that narrow

peninsula beyond Carrigaholt towards Loop Head, the country is uninteresting to the botanist, consisting of moory hills and bogs. The cliffs and hills of the coast, chiefly quartzite, amphetamine, and clay slate, are very unproductive; but the numerous little bays offer fine scope for the algologist, particularly that of Ross, lying three miles to the north-east of Loop Head. Its sheltered and extensive reefs and extreme westerly situation no doubt would afford many new and interesting species. In Reinvellagh Bay were found fine plants of the rare *Gigartina acicularis*, and the *Dictyota dichotoma* β . *intricata*. At Rehy Hill the *Scirpus Savii* and *Rubia peregrina* were abundant; and in the bogs the delicate and pretty *Radiola millegrana* appearing in great quantity in those newly cut. In Scatterry Island, opposite to Kilrush, the *Pimpinella magna*, the *Radiola* was also noticed; and in Hog Island, *Ruppia maritima*. Thus time permitted but a superficial view of a small portion of Clare; and I am satisfied that the limestone barony of Burrin, and those hills and numerous lakes eastward of Miltown Malbay, may still give accessions to our flora. Crossing the Shannon to Tarbert opportunity permitted but a hasty examination of the Salt Marsh, beyond the Revenue Station, where we obtained in abundance that beautiful and singular alga, *Rhodomela scorpioides*, only before collected by Mr. Moore, and but sparingly, in the north. In our drive from Tralee to Dingle, bordering the roadside for a mile beyond Blennerville, we noticed *Verbena officinalis*, and east of Dingle, a station already recorded, the *Bartsia viscosa*. From Dingle our walk was directed up the old mountain road to the summit of Connor Hill, remarking as we passed the beautiful little *Sibthorpiu europaea*, and occasionally plants of *Pinguicula grandiflora*. From the point where this road terminates, or forms its junction with the new line, words cannot describe the awful grandeur and wildness of mountain scenery that burst upon our gaze. On one side Giant Brandon with its towering companions enveloped in rolling masses of dense clouds. On the other Connor Hill, and the range leading around the Lake of the Pedlar's Well to lofty Ben-uisgeach—following the course of the winding stream that appeared like a line in the deep valley beneath, we look seaward to the Magherrees, view the headlands of the broad-rolling Shannon, Kerry, and Caun-lean, and even catch a glimpse of the Hag's-head, the southern termination of the cliffs of Moghur on the coast of Clare. In our rear lay Dingle's beautiful bay, skirted by a long line of Iveragh's mountains, which, mass upon mass, and ridge upon ridge, appeared like huge billows of the ocean—Valencia Island stretching to the southern entrance, the dark and gloomy great Blasquet guarding the northern.

I've wander'd long, and wander'd far,
 And never have I met,
 In all this fairy Western land,
 A scene so wildly savage yet.

On Connor Cliffs were obtained the plants before discovered, with the accessions of *Jungermannia Woodsii* and *ciliaris*. The awful fogs and rain storms of Brandon did not intimidate my friend Moore from

facing the almost inaccessible precipices that present themselves on that side where stands the village of Clehane. Unweariedly he pursued his way, and sundry were his risks, ere the summit was attained, where he did penance around the cell of the patron saint. Here all those rarities were found, whose first record is due to the unbounded zeal, acuteness, and perseverance of my friend Mr. Mackay, and well did he explore those wearisome wilds. The rare *Saussurea alpina*, the elegant little alpine *Alchemilla*, the several interesting species and varieties of Saxifrage—to these have been added new stations for the *Aspidium lonchitis*, *Grimmia spiralis*, and new to our flora the *Hypnum rugulosum*. In all the mountain range the *Wilsoni* was the only species of *Hymenophyllum* detected. At Mount Eagle, seven miles from Dingle, the most western highland in the county, the rare *Trichomanes speciosum?* was found in the chasm of a moist but exposed cliff, unprotected by brushwood, and at a much greater elevation than the sheltered and shaded locality of these beautiful ferns at Turk. The *Jungermannia Woodsii* was again there met with, and at the foot of the mountain the *Bartsia viscosa*. This mountain appears to consist of coarse gray conglomerate similar to that of Brandon. North-easterly and northerly of Mount Eagle are the beautiful bays of Smerwick and Ferriter's Cove, rich in Algæ. Here were seen magnificent specimens of *Cystoseira ericoides* and *faniculacea*, *Gigartina acicularis*, *Griffithsia*, and *erecta*: and abundantly at the Cove *Polyphonia violacea* and *Griffithsia corallina*—the former only before noticed by Dr. Drummond at Cairnlough Bay, coast of Antrim. Our tarrying was brief—Killarney our next station; but so often has that fairy ground been trodden, that what in a botanical way could be said after Mackay, Taylor, and Wilson? I may venture to add that another station verging on Turk has been discovered of the much-sought *Trichomanes*; its continued existence, therefore, is safely secured. At O'Sullivan's Cascade the *Hymenophyllum Tunbridgense* grows most luxuriantly; the *Wilsoni* exceedingly scarce, and the rare and beautiful *Sticta macrophylla* appears frequent at the Kenmare side of Killarney. Many are the doubts and varied the opinions of botanists touching the *Arbutus*, the pride of Killarney's lakes. Although now growing spontaneously, particularly on limestone and on a reddish talcose slate, yet I am inclined to think it not strictly native, but introduced from Spain by the monks. In the fourth century monastic institutions were first formed in Ireland, and in the sixth this island had attained such fame for piety and learning, that numbers came from Spain and Italy for the object of leading a more strictly religious life, and acquiring the knowledge which had so distinguished it. Thus we find Saint Finnian, the leper, eminent for his extraordinary learning, knowledge of Holy Writ, and great sanctity, founded the abbeys of Innisfallen, Aghadoc, and Ardfinnian in Tipperary. Innisfallen became a place of great wealth; numerous and valuable presents were contributed, and the stranger monks introduced from their own countries whatever would prove useful, either medicinally, culinary, or ornamentally.

Hence some of our rare plants are met with in the vicinity of such religious buildings. The *Arbutus* grows luxuriantly when planted in Ireland; yet nowhere does it attain the size as in the neighbourhood of Killarney. The extreme western position, the wild and humid atmosphere, with the continued vegetation that exists throughout the year, unchecked by frosts, materially favours its propagation. Its beautiful berries arriving at maturity, greedily fed on by birds, we may well conjecture the seeds can be conveyed by them to most inaccessible places, where they vegetate in situations almost destitute of soil. In the island opposite O'Sullivan's Cascade, Mr. Mackay measured the stem of an *Arbutus*, which equalled in girth the bulk of the beautiful Yew-tree inclosed within the abbey walls of Mucross. This exuberance of growth exceeds by far that of its native countries, even where it is so luxuriant, as in Candia. In the reign of Elizabeth, Philip, king of Spain, sent to that queen a splendid collection of orange trees. The vessel was wrecked on the coast of Glamorganshire, in the Bristol channel; and as Lord of the Manor, one of the Mansels of the Margam estate became possessed of the freight. The trees were planted in the gardens of Margam, at the foot of the lofty Mynydd Mawr, and thus was formed the finest and most magnificent orangery in the kingdom. The rare *Pisum maritimum*, its only locality the shores of Castlemain bay, owes its introduction to the wreck of a vessel which stranded on the shallows of Inch. Cork terminated our botanical tour, and although not in so successful a manner as our sanguine expectations led us to anticipate, yet the novelty of our movements, and the exceeding kindness of our friends, rendered it altogether one of great gratification and pleasure. However, views have been formed of the general features of the interesting country through which we have passed, that have led to most reasonable and satisfactory conjectures as to what may yet be effected in parts of those unfrequented and still unexplored wilds. Near Cork, towards the range of the neat village of Douglas, we visited the noted bog of Ballyphehane, the interesting ground of many of Mr. Drummond's rarest plants, their habitats now fast disappearing before the plough and the harrow. There we saw the *Pinguicula grandiflora* in abundance (but I fear ere this extinct), the *lusitanica* and *vulgaris* nowhere appeared. At Sunday's Well we noticed the station of the *Sedum dasyphyllum*, and near the city jail brought to light the long and much-doubted *Linaria minor*. Accompanied by my friend Alexander, the detector of the *Senecio squalidus*, we traced it on the walls and houses in the old parts of the city, and it is astonishing how so distinct and abundant a plant could have escaped the attention of former botanists, and of that of the active Drummond."

LEEDS PHILOSOPHICAL AND LITERARY SOCIETY.

The Annual Report of this Society has just been forwarded to us at the close of its *twentieth* session. "The ordinary funds of the Society are in a satisfactory state. For the first time for many years
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the receipts have exceeded the expenditure." And this is even after having defrayed the cost of printing Transactions, which have not yet had time to make any return. £1020. 9s. has been raised by subscription to effect alterations and improvements in the Museum, which have been completed, and now display to advantage a collection of very considerable value and extent.

GEOLOGICAL SOCIETY.

Fossil Trees.—The President's Address contains the following account of a communication of Mr. Hawkshaw, read June 5, 1839.

We have received an interesting communication from Mr. Hawkshaw respecting a remarkable disclosure made in the Bolton Railway, six miles north of Manchester, of five fossil trees in a position vertical to the plane of the strata in which they stand. The roots are imbedded in a soft argillaceous shale immediately under a thin bed of coal. Near the base of one tree, and beneath the coal, more than a bushel of hard clay nodules was found, each inclosing a cone of *Lepidostrobus variabilis*. The bark of the trees was converted to coal, from one quarter to three quarters of an inch thick; the substance which has replaced the interior of the trees is shale; the circumference of the largest of them is $15\frac{1}{2}$ feet at the base, $7\frac{1}{2}$ at the top, and its height 11 feet. One tree has spreading roots, four feet in circumference, solid and strong. By the care of Mr. Hawkshaw these trees have been preserved, and a covering is erected over them. The attendant phænomena seem to show that they grew upon the strata that lie immediately beneath their roots*.

Feb. 26.—A paper was first read, entitled "Further observations on the Fossil Trees found on the Manchester and Bolton railway;" by John Hawkshaw, Esq., F.G.S.

Since Mr. Hawkshaw's former communication, another fossil tree has been found on the opposite side of the railway. It is about three feet in height, and three feet in circumference, and stands on the same thin stratum of coal as those first discovered, and perpendicularly to the surface of the bed. Mr. Hawkshaw is, therefore, strengthened in his belief, that the trees grew in the position in which they are found.

After this notice of the recent discovery, he proceeds to describe the effects produced in hot and moist climates on felled or prostrated solid dicotyledonous trees. The tropical forests with which he is acquainted from personal examination, are situated in Venezuela on the shore of the Carribean sea, and between the 8th and 10th degrees of north latitude, and the 65th and 70th of west longitude. In these forests a few months are sufficient to destroy the interior of the largest tree, little more being left than an outer shell, consisting chiefly of the bark. Mr. Hawkshaw noticed this peculiarity more frequently in dicotyledonous trees, having a proper bark,

* See the abstract of this paper in L. & E. Phil. Mag. vol. xv. p. 539.

than in monocotyledonous vegetation, excluding necessarily those always hollow; and he does not remember to have seen a single instance of a palm similarly acted upon. Sometimes the portion of the dicotyledonous tree remaining on the ground, presented very much the appearance of the founder's mould, when the pattern has been withdrawn from the sand, and before the metal has been run in; and by this kind of decay, a cavity is formed from which a fac simile of the tree might be cast. In other cases, prostrated trunks having the appearance of being solid, have yielded to the pressure of his feet, and proved to be only hollow tubes. Dangerous accidents have also occurred from temporary bridges constructed of dicotyledonous trees having given way beneath the passenger, though there was no outward indication of decay. The bark of these trees had changed but little, though nothing of the interior remained but dust, and a few remnants which crumbled beneath the slightest touch.

The low and flat tracts in which this destructive operation goes on most rapidly, are those in which, from the deep rich soil and excessive moisture, all below the tall forest trees and larger palms is occupied by canes, bamboos, and minor palms. Such tracts would be most easily submerged; and in Mr. Hawkshaw's opinion they might hereafter present a seam of coal, which would afford but few distinct traces of palms and forest trees. These phenomena, he says, may explain in part, why so few distinct forms remain of the numberless forest trees, which must have formed a portion of the vegetable kingdom, at the time of the accumulation of our coal deposits.

Mr. Hawkshaw does not attempt to explain the process by which dicotyledonous trees are rendered hollow in tropical forests. He expresses doubts respecting the probable nature of the Calamites of the coal measures, and offers no explanation of the means by which they have been preserved in so great abundance. If the coal be considered as the debris of a forest, he says, it is difficult to account for not finding more trunks of trees than have been discovered in our coal basins; and he observes, it is only perhaps by allowing the original of our coal seams to have been a combination of vegetable matter, analogous to peat, that the difficulty can be solved. In this case, he is of opinion, but a few isolated trees might be expected to be found, and that the remains of vegetable forms most frequently discovered, would only be confirmative of the antiseptic qualities of their original nature, as previously advanced by Professor Lindley, and not of the number or importance of their particular genera at the time of their deposit.

In conclusion, Mr. Hawkshaw says, that whatever opinion may be drawn from what is conjectural in his paper, it will be obvious, that though fossil remains may be found filled with a mechanical deposit, and containing traces of other vegetables, yet that this condition does not prove, that the plants were originally hollow, nor even render it the most likely hypothesis, as they may have been hard wood-trees, the centre of which had been removed by natural processes.

A paper was then read, "On the characters of the fossil trees lately discovered near Manchester, on the line of the Manchester and Bolton railway; and on the formation of Coal by gradual subsidence;" by John Eddowes Bowman, Esq., F.L.S. communicated by the President.

The paper commences with a few preliminary remarks on the theory of repeated subsidences of the land during the carboniferous æra; and on the drift theory, the author being of opinion that the former receives much support from the phænomena presented by the fossil trees found near Manchester, and that it affords in return great assistance in explaining the peculiarities of their position. Mr. Bowman does not deny that plants may have been carried into the water from neighbouring lands, as in the instances of fern-fronds and other remains scattered through the sandstones and shales; but he conceives it is difficult to understand whence the vast masses of vegetables necessary to form thick seams of coal could have been derived, if drifted; and how they could have been sunk to the bottom, without being intermixed with the earthy sediment which was slowly deposited upon them. He is of opinion also, that without a superincumbent layer of mud or sand, to retain the hydrogen during the process of bituminization, ordinary caking coal could not have been formed. Another difficulty, connected with the drift theory, Mr. Bowman says, is the uniformity of the distribution of the vegetable matter, throughout such great areas as those occupied by the seams of coal, extending in the instance of the lower main seam of the great northern coal field, over at least 200 square miles; and in that of a thin seam below the gannister, or rabbit coal, in a linear direction of thirty-five miles from Whaley Bridge to Blackburn. On the contrary, he believes, that it is much more rational to suppose, that the coal has been formed from plants, which grew on the areas now occupied by the seams,—that each successive race of vegetation was gradually submerged beneath the level of the water, and covered up by sediment, which accumulated till it formed another dry surface for the growth of another series of trees and plants,—and that these submergences and accumulations took place as many times as there are seams of coal. He also explains the thinning out of the seams and other strata of the coal measures, by irregularities in the mode or extent of the depressions.

Mr. Bowman then proceeds to the examination of the phænomena presented by the fossil trees discovered on the line of the Manchester and Bolton railway, and described by Mr. Hawkshaw in the preceding communication: it will be necessary to notice therefore only those points which did not claim that gentleman's more particular attention. Mr. Hawkshaw describes generally the markings on the internal casts of the trees; but as it is difficult to convey a correct notion of their waved and anastomosing characters either verbally or by reduced drawings, Mr. Bowman applied paper to the surface of the stems and carefully traced the grooves or furrows by following them exactly with an instrument. The only indications of scars, which he could find after a long and close search, were at

one point near the base of the largest tree, and though indistinct, his practised eye recognised them to be those of a *Sigillaria*. He detected also in some parts, on the ribs of the same tree, the fine wavy lines so often visible on decorticated specimens of that family. In describing the second tree, he alludes to a deep wedge-shaped rift on the south-east side, which had been coated with coal, and is strongly marked with wavy lines, like those on the surface of the alburnum of a gnarled oak. On the fifth tree, he discovered a longitudinal concavity on the north side, and he states that it resembles the impression which would be left in a dicotyledonous tree, by the pressure of a parasitic plant. The characters of the roots are also detailed at considerable length, particularly their mode of bifurcation, and position with respect to the horizon.

From a careful consideration of the phenomena presented by the fossils, Mr. Bowman is convinced that they stand where they originally flourished; that they were not succulent, but dicotyledonous, hard-wooded forest trees; and that their gigantic roots were manifestly adapted for taking firm hold of the soil, and in conjunction with the swollen base of the trunks to support a solid tree of large dimensions with a spreading top.

Towards the close of 1838, in forming the railway tunnel at Claycross, five miles south of Chesterfield, a number of fossil trees were found, standing at right angles to the plane of the strata. The tunnel passes through the middle portion of the Derbyshire coal measures, which there dip about 8° to a little north of east. The bases of the trees rested upon a seam of coal fifteen inches thick. The exterior of the stems consisted of a thin film of bright coal, furrowed and marked like the *Sigillaria reniformis*; and the interior consisted of a fine-grained sandstone. Mr. Conway, who supplied Mr. Bowman with an account of the discovery, infers, from the information which he obtained, that there must have been at least forty trees found, and judging by the area excavated, he is of opinion that they could not have stood more than three or four feet apart. There were no traces of roots, the stems disappearing at the point of contact with the coal. Several specimens of *Stigmaria ficoides* were also noticed by Mr. Conway, lying horizontally and about three feet in length.

With reference to fossil trees in general, and especially to those near Manchester, Mr. Bowman proceeds to show still further; 1st, that they were solid, hard-wooded, timber trees, in opposition to the common opinion that they were soft or hollow; 2nd, that they originally grew and died where they have been found, and consequently were not drifted from distant lands; and, 3rd, that they became hollow, by the decay of their wood, from natural causes, similar to those still in operation in tropical climates, and were afterwards filled with inorganic matter, precipitated from water.

1. In stating his reasons for believing that the coal measures' casts were solid timber trees, Mr. Bowman alludes to the rifting of the bark of modern forest trees, in consequence of the expansion caused by the annual addition of a layer of wood between the bark and the alburnum; and to the thickening or swelling of the base of the trunk

and main roots, and the apparent lifting up of the latter out of the soil, in old trees, by the greater annual increase of the upper part or that nearest to light and heat. These phænomena in vegetation were illustrated by a diagram, which exhibited the form of the base of the stem and the root of a sapling, and of a full-grown tree. The author, in applying these characters to the fossils of the Manchester and Bolton railway, alludes to the irregular, longitudinal and discontinuous or anastomosing furrows on their surface, to the swelling out at the base of their stems, and to the divergence as well as the angle of dip or downward direction of their roots. These characters, he says, are not observable in soft monocotyledonous trees, their stems never expanding laterally, and being as thick when only a few years old and a foot high, as when they attain the height of 60 or 100 feet. Their roots also, instead of being massive and forking, generally present a dense assemblage of straight succulent fibres, like those of an onion or hyacinth. Analogy, therefore, as far as outward shape and habit are concerned, he adds, is strongly in favour of the fossils having been solid timber trees.

Mr. Bowman then combats the view, generally entertained, that fossil stems with perpendicular furrows, as in the *Sigillaria*, were succulent or hollow plants*. He states, that good specimens of decorticated *Sigillariæ* exhibit fine straight, and curled or gnarled striæ, similar to those on the alburnum of many modern forest trees; and that this character, in conjunction with others, renders it almost certain, that the fossils had a separate bark,—a feature which is considered in vegetable physiology to be a proof of a woody structure. He also alludes to the existence in many of the decorticated parts of their fossil trees of little prominences like those in barked timber; likewise to the scars left by the disarticulation of leaves; and he accounts for the general absence of the latter on large and old trunks, by their having been obliterated, in consequence of irregular expansion from the deposition of new layers of wood: he notices moreover the absence in small *Sigillariæ* of the irregular furrows observed on large specimens, and due in his opinion to the unequal expansion by the addition of new layers of wood. In support of these proofs of the original solid nature of the trees, Mr. Bowman exhibited polished slices mounted upon glass of portions of a similar fossil tree discovered in sinking a shaft 300 or 400 yards N.W. of those found on the line of the railway. The slices were made from a portion which exhibited within the carbonized bark, a patch browner, heavier, and more compact than the rest. In these slices, made under Mr. R. Brown's direction, that gentleman discovered in the transverse section, the uniformity of vascularity which is evidence of coniferous structure; and in the longitudinal section parallel to the medullary rays, the ex-

* Specimens of recent dicotyledonous wood from New Zealand, lent to the author by Mr. R. Brown, were exhibited on the table of the Meeting Room. They displayed both upon the bark and the naked wood, longitudinal ribs and intermediate furrows as regular as those on *Sigillariæ*; and therefore prove that these characters are not incompatible with a dicotyledonous structure.

istence of these rays. The slices therefore exhibit proofs of dicoyledonous structure, and considerable probability of that structure being coniferous. The important evidence however of coniferous structure deducible from discs in sections parallel to the rays, was not obtained, the vessels having apparently undergone some alteration.

2. With respect to the second point, that the trees grew and died on the spots where they are now found, and that they were not drifted from distant lands, Mr. Bowman says, the arguments in favour of the formation of beds of coal by a series of subsidences of the surface on which the vegetables that produced the coal grew, naturally lead to the inference that the trees associated with the coal also flourished on the same spots. In opposition to the opinion that trees would naturally float in an upright position in consequence of the greater specific gravity of the base and roots, he asserts, that the trees would maintain that position only as long as they floated, and that they would fall and lie prostrate when grounded on shoals or cast ashore. He agrees with Mr. Hawkshaw in the opinion, that it is more difficult to account for a number of great trunks being deposited in the position of the fossils in the Manchester railway, than to imagine that they grew on the surface of the bed on which they now stand. Their position on a bed of coal is another proof, Mr. Bowman conceives, that the trees were not drifted, for if they had been transported by currents of water they might equally have been imbedded in the alternating shales or sandstones. If beds of coal are the accumulated remains of many generations of a luxuriant vegetation, the rich compost thus formed, Mr. Bowman argues, would be well suited for the growth of trees. Again, the angle at which the roots of the fossil trees, particularly of that distinguished by him as No. 2, dip towards the bed of coal, is considered by the author evidence of the trees being in their original position, because, had they been drifted, the roots would have been bent upwards, by the downward pressure of the trunk, when the water had left them. The appearance of the roots being cut off, where in contact with the coal, he is of opinion, may be explained by the fermentative process having dissolved the vegetable texture below the surface. The stems and upper portions of the roots standing above the coal, he explains by reference to similar phenomena in peat marshes, in which the bases of the trunks of ancient forest trees stand with the roots exposed, owing to the shrinking of the surrounding peat.

3. In discussing the third point, that the trees became hollow from the decay of their wood, and were filled with sedimentary matter after their immersion, Mr. Bowman refers to the facts recorded in the preceding paper by Mr. Hawkshaw (see *ante*, p. 386.) ; and in confirmation of them states, that Mr. Schomburgk during his four years' travels in Surinam repeatedly observed similar phenomena. Mr. Bowman then proceeds to explain the processes by which he conceives the fossil trees were gradually submerged—their upper branches torn off—their interior removed by natural decay,—their bark converted into coal,—their central cavities filled with sediment ; and the whole buried beneath the stratum of shale or sandstone in

which the trees were discovered. He afterwards applies the phenomena which he believes these processes produced to the condition and position of the trees and the arrangement of the surrounding sedimentary matter. The author then enters into the inquiries, 1st, the time which the trees may have required to attain their dimensions; and consequently the minimum of years requisite for the accumulation of the vegetable matter; and, 2ndly, what thickness of vegetable matter was necessary to form the stratum of coal nine inches thick, over which the trees stand. Mr. Schomburgk is of opinion that a dicotyledonous tree which would require in temperate climates one hundred years to attain a certain diameter, would arrive at the same dimensions within the tropics in sixty or eighty years. The largest of the fossil trees forming the immediate subject of the paper is equal in circumference to an oak of 130 years growth in this climate, or about 100 for a climate equal in temperature to that of the tropics. Allowing therefore that some time elapsed after the commencement of vegetation on the surface of the then dry land before the trees began to grow, Mr. Bowman infers, that 100 years must be the minimum of time which would be required for the production of the vegetable matter out of which the nine inches of coal were produced. With respect to the depth of the stratum of vegetable matter from which it was formed, Mr. Bowman takes for his data, the thickness of the bed of coal, nine inches; the distance between the top of the seam and the bottom of the trunk under the arch formed by the roots, fifteen inches; and for the distance to the surface of the ground, four inches, or in all twenty-eight inches; whereby he infers that the thickness of the solid coal is equal to about one-third that of the vegetable matter out of which it was produced.

June 10.—A paper was read on the polished and striated surfaces of the rocks which form the beds of Glaciers in the Alps, by Professor Agassiz.

This paper was accompanied by a series of plates intended to represent the effect of glaciers upon the rocks over which they move.

These effects, consisting of surfaces highly polished, and covered with fine scratches, either in straight lines or curvilinear, according to the direction of the movement of the glacier, are constantly found, not only at the lower extremity, where they are exposed by the melting of the glaciers, but also, wherever the subjacent rock is examined, by descending through deep crevices in the ice. Grains of quartz and other fragments of fallen rocks, which compose the moraines that accompany the glaciers, have afforded the material which, moved by the action of the ice, has produced the polish and scratches on the sides and bottom of the Alpine valleys through which the glaciers are continually, but slowly descending. It is impossible to attribute these effects to causes anterior to the formation of the glacier, as they are constantly present and parallel to the direction of the movement of the ice. They cannot be considered as the effects of an avalanche, for they are often at right angles to the direction in which an avalanche would descend; they are constantly sharp and fresh beneath existing glaciers, but less distinct on surfaces which

have for some time been left exposed to atmospheric action by the melting of the ice. In the valley of the Viesch, the direction of the scratches is from north to south, or towards the Rhone; the direction of those which accompany the glacier of the Rhone is from east to west; that of those beneath the glacier of the Aar is first from west to east, as far as the Hospice of the Grimsel; and then from south to north, from the Grimsel to the Handeck. If we would account for these scratches by the action of water, we must imagine currents of enormous depth filling these highest Alpine valleys, and descending in opposite directions from the narrow crest that lies between them. In the upper part of the valley of the Viesch, is a glacier, beneath which runs a rapid torrent, co-extensive in length with the great current, to which the above hypothesis would attribute the polish and scratches on the rocks of the valley. This small torrent corrodes the bottom of the valley into sinuous furrows and irregular holes, and polishes the sides of its bed; but the polish is of a different aspect from that produced by the action of the ice, and of the stones and sand which it carries with it. The polished surfaces beneath the ice are often salient and in high relief. The sides also of the valleys adjacent to the actual glaciers are frequently polished and scratched at great heights above the ice, in a manner identical with the surface beneath it, but different from the polish of the bed of the torrent.

The amount of polish and scratches varies with the nature of the rocks. In the valley of Zermatt and Riffelhorn, rocks of serpentine are most exquisitely polished; so also are the granites on the sides of the glacier of the Aar, where they have not been long exposed to the action of the air. Gneiss and limestone do not preserve their polish under similar exposure, but retain it while they are protected by ice or a covering of earth.

These facts seem to show, that the striated and polished condition of rocks beneath and on the sides of glaciers, is due to the action of the ice, and of the sand and fragments of stone forming the moraines which accompany it.

ROYAL BOTANIC SOCIETY AND GARDEN.

The first meeting for the season was held November 10, at which a *résumé* of the proceedings of the General Meetings of the last season was read by the Secretary, who prefaced his extracts from the papers which had been read by stating that the principal objects of the Society were the formation of a Botanical Garden for illustration and reference, and the diffusion of botanical information of a general character, rather than the illustration of abstruse points, which are successfully pursued by societies with which the Botanic Society does not desire to interfere. Of the eleven meetings held in the spring and summer three had been purely for business, and among other things, that of obtaining the Charter, and endeavouring to procure from the Government some reduction of the high rent, which is a great obstacle to the progress of the Institution. At the

third meeting an introductory address was read by Dr. Sigmond. After stating the objects of the Society, and the necessity there is for a garden within reach of those lovers of the works of Nature who are found for a great part of the year congregated within this vast metropolis, but who have hitherto been denied so great and healthful a luxury, the Doctor entered upon a historical review of the gardens of antiquity; he referred to both sacred and profane history to show, that whenever Man was painted in a situation of pure felicity and of virtue he was placed in one of these delightful spots: such were the gardens of Eden, of the Hesperides, of Adonis, of Alcinous. He then traced the history of gardens from Grecian and Roman authorities; and showed that our Saxon ancestors were repositories of botanical knowledge; he referred to the reigns of Henry the First, Henry the Third, Richard the Second, and Elizabeth, to show that the cultivation of flowers had always been carried on with singular avidity. The discovery of the New World, and the persecution which drove the Protestants from the Netherlands, gave a great impetus to botanical research in England. Charles the First created the place of Royal Herbalist. Gardens have been established in various parts of England, at Oxford, in 1632, at Chelsea, in 1673, &c.; but still a garden so near the metropolis as to serve as a school for the rising generation, and a source of recreation to all classes, has been long a desideratum.

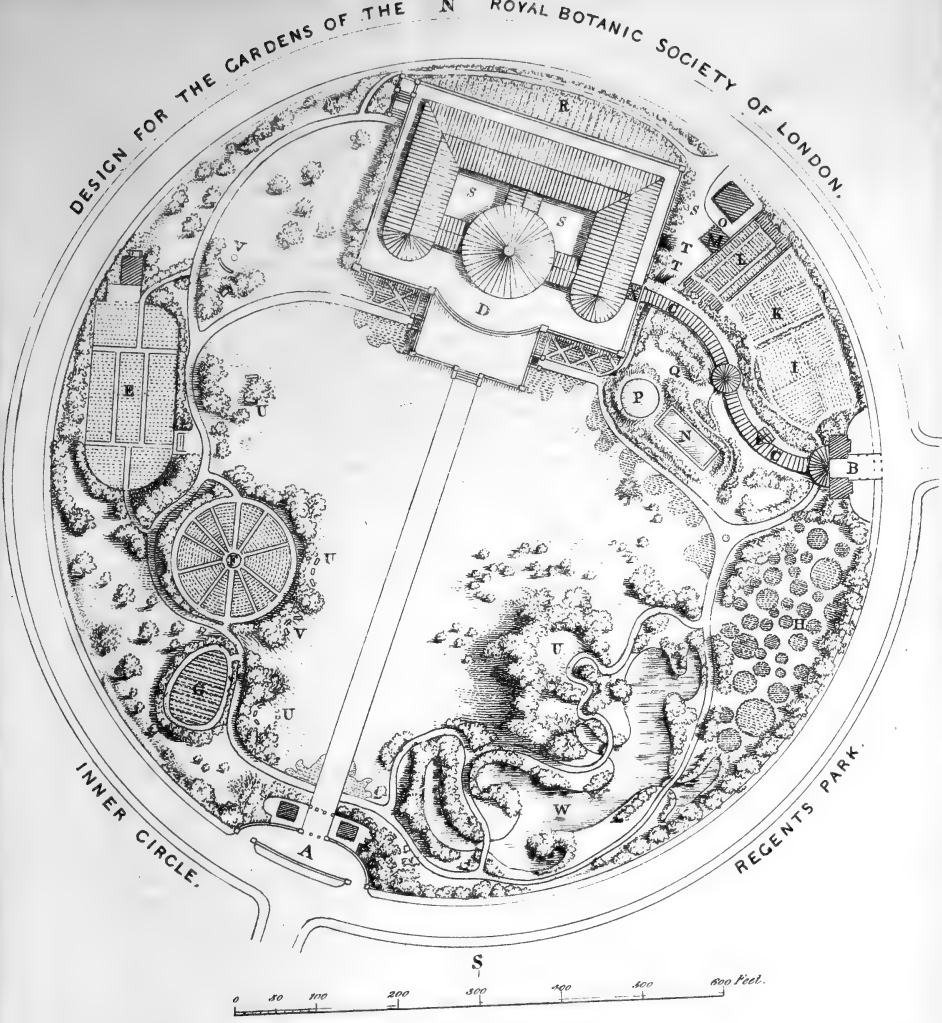
[It is surely much to be wished that this Society should meet with due encouragement, as the greatly increasing number of those students in the medical schools and the colleges now established in the metropolis, and others, of whose studies and recreations Botany forms a part, makes a well-stocked garden in the immediate vicinity exceedingly desirable; and no spot could have been selected within the same distance so well adapted as the Inner Circle of the Regent's Park, or likely to retain its salubrious air so long unimpaired by surrounding buildings. A plan of the Garden is annexed to our present Number. Its attraction as a scene of healthy and delightful relaxation may well be made tributary to the interests of science in behalf of a numerous class whose opportunities of pursuing botanical studies at a greater distance from town must necessarily be much less frequent than a garden so readily accessible would afford.—R. T.]

MISCELLANEOUS.

A new species of the Australian genus *ALCYONE*.—It is thus characterized: *Alcyone ruficollaris*; plumage glossy green; upper parts and sides blue; under parts rufous; chin of a lighter red; a semi-collar of rufous feathers on the nape of the neck. Wings short; third and fourth quills longest. Tail short. Bill black at the base, shaded to dark brown at the tip. Legs reddish-yellow. Claws of all the toes longitudinally furrowed. Seven inches in length from the tip of the bill to the extremity of the tail.

Habitat, mangrove trees, Port Essington. It is active, and so

DESIGN FOR THE GARDENS OF THE ROYAL BOTANIC SOCIETY OF LONDON.



DESCRIPTION.

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|--|--|
| A. Principal Entrance from the Bridge..... | M Engine House & Well to feed N..... |
| B. Winter Entrance fr. Chester Terrace, Museum, Library &..... | N the Reservoir for the supply of the Gardens. |
| C. Walk cover'd with Glass..... | O Curators House..... |
| D. Conservatory or Winter Garden upon raised Terraces..... | P Reservoir belonging to the Crown..... |
| E. Agricultural Department..... | Q British Plants & Rockwork..... |
| F. Geographical arrangement..... | R Nursery..... |
| G. Plants used in the Arts Manufactures &c..... | S.S.S Yards for Sheds Stables &c..... |
| H. Jussieuan Arrangement..... | T.T Underground Passages..... |
| I. Medical Garden..... | U.U Mounds for Shelter & Variety..... |
| K. Linnæan Arrangement..... | V.V Seats..... |
| L. Experimental Garden..... | W. Water..... |



wild, that it is with difficulty one can obtain proximity to it when disturbed in its avocations among the crooked roots of the mangroves.—R. A. BANKIER, Acting Surgeon, Port Essington.

Freshwater shells collected in Wexford.—As our catalogue of the land and freshwater shells of Ireland is far from complete, perhaps the following list of a few species, collected by myself in Wexford, may prove not unworthy of insertion in your valuable Magazine, as tending to show the distribution of species, and adding several to those mentioned by Mr. Gray in his excellent tabular arrangement of localities in Turton's Manual.

Limax maximus.	Zua lubrica.
Vitrina pellucida.	Pupa umbilicata.
Helix pulchella.	Clausilia nigricans.
—— aculeata.	Limnæus pereger.
—— hispida.	—— truncatulus.
—— virgata.	Ancylus fluviatilis.
Zonites rotundatus.	Physa fontinalis.
—— alliaris.	Variety figured 110* Gray's Manual.
Bulimus acutus.	

SYLVANUS HANLEY.

Newington Green, November 30th, 1840.

Capture of some Rare Birds on the Cotswold Hills.—June 1839. I had sent me a male and female Honey Buzzard (*Pernis apivorus*), and, about three weeks afterwards, another female was killed. The pair would no doubt have bred here, had they not been destroyed. The female had nearly the whole inside of her mouth diseased, being covered with a tough leathery substance, of a pale colour, and which I had considerable difficulty in removing. This matter had begun to extend itself down the throat, where, however, it was less firm in its texture. The bird was thin.

The other birds obtained here, were three specimens of the Rough-legged Buzzard (*Buteo lagopus*); two were taken in December 1839, and the other in January 1840.

24th October, 1840, was shot, near Cheltenham, the Black Redstart (*Sylvia Tithys*).

In January 1840 the Fire-crested Wren was shot near Cheltenham (*S. ignicapilla*, Brehm.).

The last two birds are in the possession of N. Skelton, bird-preserver at Cheltenham.—J. BROWN.

Cotswold Hills, December 4, 1840.

Remarkable Habit in a Fish.—While at San Joaquim, on the Rio Breneo, I was frequently warned by the inhabitants to be cautious while bathing of a small fish called *Cancliru*, which they said entered the urethra and rectum, chiefly if one, while in the water, should satisfy nature; that the greatest difficulty attended the extraction of this little fish, which often caused most dangerous inflammation, and even death. Although these accounts were given to me by persons whom I had no reason to disbelieve, I could not find any one who had been an eye-witness of such an uncommon event, and I

began to doubt its possibility. Since my return to Europe I have perused Spix and Martius's *Reise in Brasilien*, and it is there stated (vol. iii. p. 956,) that a similar report exists in Para; and this is given upon the authority of an eye-witness, a Dr. Lacerda. The fish was described to me to be about half an inch in length, and to be gregarious. MM. Spix and Martius consider it to be a species of *Cetopsis*.—*Schomburgk's MSS.*

[We trust that Mr. Schomburgk will make this one of his desiderata in "inquiry," as soon as he can, on returning to Guiana, and will endeavour to send specimens of the animal to Europe. IS IT A FISH?—ED.]

Aquilegia vulgaris.—The Scotch habitats for this plant are generally of suspicious character, near to some old mansion or garden. On the rugged banks of the *Garple*, a small mountain stream, a tributary to the Evan water in Annandale, Dumfries-shire, "far in a wild," and removed from horticulture, the *Aquilegia* was noticed many years since; and on revisiting the station in October last, in company with Mr. C. Babington and Dr. Lankester, it was again discovered in considerable abundance, growing from the crevices of dripping rocks, in company with *Rubus saxatilis* and *Hymenophyllum Wilsoni*, but confined to a space not exceeding forty yards in extent.—W. J.

Mr. Gutch has sent us the following corrections and additions to his communication in p. 236. The latter are from particulars furnished to him by Mr. Dillwyn:—

No. 7, Somerset Place, Stoke.

The Stints were shot on Tuesday, October the 6th, on the muddy and sandy bed of the river Plym, in this neighbourhood, about low water: on the 9th we again visited the same spot, and saw but two; on the 10th we again went, not meeting with even one specimen, and on subsequent visits have equally failed. I presume, therefore, that they have migrated.

Jan. 3.—A Lesser Spotted Woodpecker, *Picus minor*, in a wood at Ynysygerwn, by L. L. Dillwyn, Esq. A Gannet (*Sula Bassana*), caught when floating on the water at the entrance to Port Talbot.

Feb. 16.—After a heavy storm myriads of the *Medusa Velella* were cast on the shore between Swansea and the Mumbles.

April 7.—A Hoopoe (*Upupa Epops*), shot by L. L. Dillwyn, Esq., on his lawn in front of Burrows Lodge.

July 1.—A male Torpedo (*Raia Torpedo*), caught in one of the Swansea wiers, and purchased whilst still alive by L. L. Dillwyn, Esq.; it died in a few hours: when alive the length of it was $41\frac{1}{2}$ inches; greatest breadth $29\frac{1}{2}$; breadth of the caudal fin at its extremity 9 inches, and the weight about 45 pounds.

July 29.—The Sting Ray (*Raia Pastinaca*), taken in a sein-net between Swansea and the Mumbles, weighing about 38lbs.

Aug.—Another specimen of the Hoopoe, shot at St. Helens, near Swansea.

The former existence of Glaciers in Scotland.—The late visit of M. Agassiz to Scotland during the meeting of the British Associa-

tion, seems to have set all our geologists off upon a new scent—glacier hunting. That distinguished zoologist and geologist, by his interesting work and illustrations on the Glaciers of Switzerland*, has, we think, proved that they formerly existed at a much lower level than they do now on the Alps of the continent, and anxiety to examine a country where glaciers no longer existed was the immediate motive of his visit to Scotland during the last autumn. In company with accomplished English and Scotch geologists, the examination was accordingly made, and the same appearances which characterize the rocks under the European glaciers being observed in various parts of the higher mountain ranges of Scotland, induced M. Agassiz to believe that they formerly existed in these mist-clad regions, and that many of the phænomena attributed to the action of water, such as the parallel rods of Glenroy, &c. were caused by their influence: and he writes thus on the subject to Professor Jamieson:—

“After having obtained in Switzerland the most conclusive proofs, that at a former period the glaciers were of much greater extent than at present, nay, that they had covered the whole country, and had transported the erratic blocks to the places where these are now found, it was my wish to examine a country where glaciers are no longer met with, but in which they might formerly have existed. I therefore directed my attention to Scotland, and had scarcely arrived in Glasgow, when I found remote traces of the action of glaciers, and the nearer I approached the high mountain chains these became more distinct, until, at the foot of Ben Nevis, and in the principal valleys, I discovered the most distinct *moraines* and polished rocky surfaces, just as in the valleys of the Swiss Alps, in the region of existing glaciers; so that the existence of glaciers in Scotland at early periods can no longer be doubted. The parallel roads of Glen Roy are intimately connected with this former occurrence of glaciers, and have been caused by a glacier from Ben Nevis. The phænomenon must have been precisely analogous to the glacier lakes of the Tyrol, and to the event that took place in the valley of Bagne.”

At one of the early meetings of the Geological Society of London M. Agassiz read a paper, illustrating his views and their application to Scotland. This was followed on the 4th November by a long paper from Dr. Buckland, on the same subject, and which was concluded at the meeting of the 18th, but reserving its more minute details for a subsequent evening: while Mr. Lyell has also commenced the reading of a paper “On the Geological Evidence of the former existence of Glaciers in Forfarshire.” Dr. Buckland, in his paper, gives a general account of his late tour in Scotland, and among the more remarkable parts of his communication is the announcement that the traces of ancient glaciers are apparent in Crickhope Linn, in Nithsdale, Dumfries-shire, upon the rocks of Stirling and Edinburgh castles, and upon Corstorphine, the Calton, and Law

* *Etudes sur les Glaciers*, par L. Agassiz, dessinées d'après Nature et Lithographies par J. Bettannier, 1840, Neuchatel.—See above, p. 392.

hills, near Edinburgh. This theory, as applied to Scotland, is comparatively new; and in the animated discussions to which it has just given rise, has been combated, or strictly scrutinized, by Messrs. Greenough, Sedgwick, Murchison, Whewell, Phillips, and De la Beche. We have no doubt that the traces, as stated by the Professor, exist in all the above-named localities; but while such is the case, it becomes most important to ascertain if these appearances, at so low an elevation, *could have been produced by any other action than that of ice.*

On a new Species of Hygrocrocis.—In a discourse “Dello studio degli organismi inferiori e dei principali fatti per esso scoperti,” Dr. Giuseppe Balsamo Crivelli, Prof. Nat. Hist. at Milan, has given the description of the following new species of Alga:—

Hygrocrocis punicea, filamentis hyalinis in peticulum dense implexis, ramis divaricatis aliquando ramosis, articulis diametro duplo longioribus.

Upon paste made from starch.

Anthus Richardi.—Extract of a letter from Mr. S. Mummery of Margate.—“I was out following my occupation of bird-collector on the 25th of November of the present year, along the shore between Birchington and St. Nicholas Coast Guard Station, in the Isle of Thanet, when I met a gentleman, a lover of natural history, who directed me to a locality called Minnis Pond, where he had seen a bird unknown to him, and described it to be like a Water Wagtail in shape, though not in colour. Some time had elapsed before he fell in with me; but as soon as he stated to me what he had seen, we proceeded together to the spot. The Minnis Pond is situated in a bay just where the chalk cliff terminates, and the shore gradually falls to the level of the marshes behind the beach, forming only a bank. Several heaps of sea-weed have been collected near the pond, where they lie to rot, which continually harbours numerous insects. The spot therefore is a favourite resort for many small birds, as Wagtails, Pipits, Stints, &c.

“On arriving we could not see anything of the bird, but our presence disturbed several Larks and Rock Pipits; at last one flew up different from the rest, and something like a Wagtail. On its settling about forty yards from me I shot it, and it proved, on being examined by several naturalists, and compared with the work of Mr. Yarrell and Mr. Jenyns, to be *Richard's* Pipit, a very rare bird, and to answer exactly to their descriptions. Our opinion has been confirmed by the Rev. J. Streatfield, and I have stuffed the bird, which is a male specimen.

“I have also been able to obtain for our lately-established museum a pair of Black-throated (?) Redstarts; and having been a collector of birds for seventeen years, I have a good collection of skins and stuffed specimens for sale or exchange.

“I am, Sir, your obliged and obedient servant,

“STEPHEN MUMMERY, Naturalist.”

“3, Back Road, Margate, Kent,
Monday, December 14, 1840.”

Facility of Water Communication in the Northern Parts of South America.—A short portage of about seven to eight hundred yards separates the basin of the Amazon from that of the Essequibo; and by traversing this portage during the rainy season the river Amazon and the upper Orinoco may be entirely reached from Demerara by inland navigation. So great is the facility for water communication in that part of South America, that by traversing the portage above alluded to, and by constructing a canal of about three miles' length, between the Guapore, a branch of the Marmore and Madeira, and the Rio Aquapehi, a branch of the Jaura and Paraguay, an inland navigation would be opened between Demerara and Buenos Ayres over an extent of forty-two degrees of latitude. The river Napo offers communication with Quito, the Ucayali with Cuzco, the Huallaga with Lima. Ascending the Rio Negro, and entering the Orinoco by the natural canal the Cassiquiare, its tributary the Meta offers an uninterrupted navigation to New Grenada, and within eight miles of Santa Fé de Bogota.—*Schomburgk's MSS.*

METEOROLOGICAL OBSERVATIONS FOR NOV. 1840.

Chiswick.—November 1. Foggy: rain. 2. Showery: fine. 3. Foggy. 4. Dense fog: clear and fine. 5. Rain: fine: rain at night. 6, 7. Rain. 8. Clear and fine. 9. Boisterous. 10. Cloudy and fine. 11. Hazy: rain. 12. Clear. 13. Boisterous with rain; barometer very low. 14. Clear. 15. Fine. 16. Cloudy and windy. 17. Stormy with heavy rain. 18. Heavy rain. 19. Rain: fine. 20. Very fine. 21. Stormy with rain. 22—24. Fine. 25. Dense fog. 26. Sharp frost. 27, 28. Very dense fog. 29. Foggy: fine. 30. Overcast.

Boston.—Nov. 1. Fine: lightning P.M. 2. Stormy. 3, 4. Cloudy. 5. Rain: rain early A.M. 6. Cloudy: rain A.M. 7. Cloudy. 8. Fine. 9. Cloudy: rain early A.M.: rain A.M. 10, 11. Fine. 12. Cloudy. 13. Rain and stormy: rain early A.M. 14. Cloudy. 15. Fine. 16. Cloudy: rain early A.M. 17. Cloudy: rain A.M. and P.M. 18. Fine. 19. Cloudy: rain A.M. and P.M. 20. Fine. 21. Rain and stormy. 22. Cloudy: rain early A.M. 23. Rain: rain early A.M. 24—30. Fine.

Applegarth Manse, Dumfries-shire.—Nov. 1. Dull, cloudy, and moist. 2. Showery all day. 3. Very fine. 4. Wet nearly all day. 5, 6. Occasional showers. 7. Wet A.M.: cleared up. 8. Slight showers. 9. Rain A.M.: cloudy all day. 10. Rain A.M.: moist P.M. 11. Thick fog all day. 12. Cloudy and watery. 13. Wet and stormy. 14. Fair after rain during night. 15. Fair and fine: frosty morning. 16. Rain and high wind. 17. Fair but dull and threatening. 18, 19. Frost: clear. 20. Thaw: cloudy. 21. Heavy rain A.M.: cleared. 22. Fair all day. 23. Rain early A.M. 24. Fair throughout and warm. 25. Drizzling day. 26. Frost. 27. Frost: very hard. 28. Frost: threatened change. 29. Cloudy: drizzling. 30. Moist without rain.

Sun shone out 21 days. Rain fell 16 days. Fog 1 day. Frost 6 days. Wind north 1 day. North-east $\frac{1}{2}$ day. East-north-east 1 day. East 5 days. East by south 5 days. South-east 2 days. South 2 days. South-west 5 days. West-south-west 1 day. West 1 day. West-north-west 3 days. North-west $2\frac{1}{2}$ days. North-north-west 1 day.

Calm 14 days. Moderate 7 days. Brisk 3 days. Strong breeze 2 days. Boisterous 1 day. Stormy 3 days.

Mean temperature of the month 41°·20
 Mean temperature of November, 1839 ... 43 ·37
 Mean temperature of spring-water 45 ·60

Meteorological Observations made at the Apartments of the Royal Society by the Assistant Secretary, Mr. ROBERTSON; by Mr. THOMPSON at the Garden of the Horticultural Society at Chiswick, near London; by Mr. DUNBAR at Applegarth Manse, Dumfries-shire.

Days of Month, 1840, Nov.	Barometer.				Thermometer.				Wind.				Rain.			Dew point, Lond.: Roy. Soc. 9 a.m.						
	Chiswick.		Boston, 8 1/2 a.m.		Lond.: Roy. Soc. Self-register.		Chiswick.		Lond.: Roy. Soc. 9 a.m.		Dumfries-shire.		Boston.		Chiswick.		Dumfries-shire.					
	Max.	Min.	Max.	Min.	Fahr. 9 a.m.	Max.	Min.	Max.	Min.	E by S.	S.	W.	N.	E by S.	S.		W.	N.	Sum.			
																				9 a.m.	8 1/2 p.m.	Max.	Min.	Max.	Min.
1.	29.644	29.592	29.337	29.25	29.40	47.2	53.7	44.9	56	46	52 1/2	42 1/2	E	NE	calm	E by S.	...	...	...	...	...	47
2.	29.538	29.515	29.455	28.95	29.16	51.2	53.3	46.5	57	45	47	50	SE	S.	calm	E.	...	...	...	...	...	46
3.	29.432	29.404	29.343	29.04	29.30	51.5	56.6	47.6	56	40	49	53 1/2	NE	E.	calm	E.	...	...	...	...	...	48
4.	29.288	29.339	29.200	28.80	29.04	50.3	55.6	49.0	56	46	49	48	S.	W.	calm	E by S.	...	...	...	...	...	49
5.	29.202	29.232	29.152	28.69	29.01	50.3	55.8	48.8	55	41	50	46 1/2	S.	W.	calm	E by S.	...	...	...	...	...	49
6.	29.056	29.073	28.921	28.72	29.00	48.0	54.4	45.8	51	41	45	45	SE	SW.	SW.	E by S.	...	...	...	...	...	45
7.	29.138	29.154	29.083	28.63	28.78	48.8	51.7	48.0	58	41	49.5	49 1/2	SSW.	SW.	NW.	S.	...	...	...	...	...	45
8.	29.360	29.336	29.299	28.85	29.06	47.0	55.3	44.7	55	41	42	47 1/2	S.	SW.	calm	S.	...	...	...	...	...	47
9.	29.106	29.406	29.077	28.64	28.90	48.8	53.8	46.0	53	41	47	45 1/2	S.	SW.	NW.	NW.	...	...	...	...	...	45
10.	29.074	29.263	29.046	28.63	28.92	44.5	53.5	44.2	51	37	39	45	SSW.	NW.	calm	WNW.	...	...	...	...	...	46
11.	29.332	29.308	29.216	28.88	29.10	44.2	50.3	42.2	49	36	38	44	S.	SW.	calm	E by S.	...	...	...	...	...	45
12.	29.528	29.516	29.480	29.08	29.32	41.3	49.8	40.6	54	39	36	44	S.	S.	calm	E.	...	...	...	...	...	43
13.	28.828	28.818	28.669	28.55	28.90	48.7	51.0	41.7	55	44	44	43	S.	S.	calm	E.	...	...	...	...	...	45
14.	29.044	29.287	28.992	28.41	28.69	46.2	53.4	45.0	50	28	44	44 1/2	S.	W.	W.	WNW.	...	...	...	...	...	45
15.	29.512	29.509	29.463	29.05	29.28	39.3	50.6	38.6	56	38	39	43 1/2	S.	SW.	calm	WSW.	...	...	...	...	...	49
16.	29.084	29.234	29.059	28.47	28.74	48.7	57.9	38.5	62	44	55	49	S.W.VAR.	SW.	S.	SW.	...	...	...	...	...	39
17.	29.600	29.547	29.138	29.04	29.33	29.58	48.2	40.6	56	38	48	47.5	S.	W.	ENE.	ENE.	...	...	...	...	...	47
18.	29.814	29.789	29.605	29.39	29.69	41.2	54.6	41.4	44	34	35	38	NW.	NE.	calm	NENW	...	...	...	...	...	43
19.	29.800	29.939	29.771	29.46	29.89	30.00	39.8	42.4	37.2	44	30	40	N.	NE.	N.	N.	...	...	...	...	...	47
20.	30.112	30.078	30.061	29.70	29.85	29.88	35.7	44.7	35.0	43	37	33	NW.	N.	calm	NENW	...	...	...	...	...	43
21.	29.794	30.033	29.778	29.42	29.89	42.3	44.3	35.0	46	39	42	45	NW.	W.	calm	NNW.	...	...	...	...	...	33
22.	29.070	30.056	29.980	29.61	29.74	38.4	43.5	35.6	44	30	41	43 1/2	S.	SW.	NW.	NNW.	...	...	...	...	...	38
23.	30.140	30.242	30.088	29.68	30.00	50.0	51.2	38.2	56	28	45	51	S.	SW.	N.	NW.	...	...	...	...	...	33
24.	30.424	30.400	30.372	30.00	30.24	41.0	54.3	38.3	46	24	35	46	W.	NE.	calm	SW.	...	...	...	...	...	43
25.	30.460	30.433	30.382	30.05	30.30	37.4	47.0	36.0	44	22	32	41	N.	SE.	calm	SW.	...	...	...	...	...	40
26.	30.430	30.400	30.368	30.02	30.30	30.28	34.5	44.0	34.3	23	30	35 1/2	E.	E.	calm	E.	...	...	...	...	...	35
27.	30.406	30.395	30.328	30.04	30.20	32.8	44.5	32.8	35	22	27.5	41	NE.	NE.	calm	SE.	...	...	...	...	...	35
28.	30.336	30.326	30.185	29.94	30.02	29.79	30.8	30.3	36	30	31.5	48 1/2	NE.	NE.	calm	SE.	...	...	...	...	...	32
29.	30.084	30.066	29.932	29.58	29.72	46.7	47.7	30.3	54	50	45	51	S.	SW.	calm	SW.	...	...	...	...	...	35
30.	29.639	29.676	29.528	29.18	29.434	44.1	50.7	40.8	49.96	36.46	41.3	45.8	S.	SW.	calm	SW.	...	...	...	...	...	42
Mean.	29.639	29.676	29.528	29.18	29.434	44.1	50.7	40.8	49.96	36.46	41.3	45.8	Sum.	3.59	2.03	Mean.	2.942	3.26	42			

THE ANNALS
AND
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No. 39. FEBRUARY 1841.

XLV.—On *Saxifraga umbrosa* and the Kerry Saxifrages. By
the Rev. W. T. BREE.

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

GENTLEMEN,

IN the review of Baines's 'Flora of Yorkshire' (Annals and Mag. of Nat. Hist. for Nov., p. 217), mention is made of *Saxifraga umbrosa* being "exceedingly abundant in the west and south-west of Ireland." This, I cannot help thinking, is an error; at least, I can confidently state from close inspection on the spot, that the plant which occurs in such profusion in the "Gap of Dunloe," e. g., and on the "Reecks" and many other places in the neighbourhood of Killarney, is not the true *S. umbrosa*, but an allied species; or perhaps it might be more correct to say, that these Kerry Saxifrages consist of several species, two forms or varieties of which are figured in 'English Botany' under the names of *S. Geum* and *hirsuta*; but whether they correspond with the Linnæan species so named, admits, I think, of great doubt. On the mountains of the county of Kerry these plants (be they of two, or more, or only of one species) occur, as I have said, in very great abundance; and the varieties, differing in the size, shape, and hairiness of the leaves, and in the length of the petiole, between what may be considered the two extreme links of the chain or series, are absolutely interminable*. But after the most diligent personal search, I was unable to discover *S. umbrosa* on the Irish mountains, when I visited that country in the year 1814; and from the best information I could obtain from persons most competent to form a judgement on the subject, I was led to believe that the latter species was not there known as a native of Ireland. Is it, in fact, a *genuine* native of Britain? Some years ago I was at no inconsiderable pains to settle this question, or, in other words, to meet with *S. umbrosa* growing

* See Haworth's Saxifragearum Enumeratio.

truly wild and at large. I recollect to have once found a very small weak plant of it upon the celebrated "Bowder Stone" in Borrowdale, which at the time I thought a treasure; but I was soon afterwards informed, that some person in the neighbourhood had been ornamenting this interesting rock by planting garden-flowers upon it, of which, no doubt, this crumb of "London Pride" was a remnant. Mr. Russell, I see in your Number for Dec. (p. 314), states that he had received the plant some years ago from Clovelly, and that he has this year "verified the locality himself," and "is much inclined to admit the station as a true one." Of the correctness of this statement I do not mean to venture an opinion, not having visited the place myself. But with this exception, if it prove to be one, I am much disposed to coincide with Mr. Baines's reviewer (p. 216), that the plant in question "is hardly found in England, except in Yorkshire." I have visited the wild sequestered station, "Hessleton Gill," in that county, and have there found *S. umbrosa* growing luxuriantly and apparently wild, though occupying a space of no very great extent, and am not surprised at any botanist asserting that here, at any rate, the plant is truly native. I could, however, assign reasons, which yet it would be tedious to detail at length, for *suspecting*, if not for believing, that even here, in this retired spot, the plant is not truly indigenous, but introduced by the hand of man; and, in short, that *S. umbrosa*, the "London Pride" of our gardens, is not of native but exotic origin, though it has been, in a manner, naturalized in various parts of our island.

I am, Sir, yours faithfully,
W. T. BREE.

Allesley Rectory, near Coventry, Dec. 22, 1840.

XLVI.—*On some new or rare Fish occurring on the Coast of Ireland.* By FREDERICK M'COY, Esq., M.G.S., &c.

THE following notices of new or rare fish found on the coast of Ireland, have been drawn up from specimens contained, for the most part, in the Museum of the Royal Dublin Society, and which have been, with few exceptions, taken during the last winter by Mr. William MacCalla, a very intelligent and successful collector of marine productions. Besides the subjects of the present communication, he has enriched the Society's collection with many rare and interesting species of Crustacea and naked Mollusca from different parts of the coast, which may, perhaps, form the subject of a

future paper. To my friend Dr. Scouler, Geological Professor to the Dublin Society, I am indebted for many valuable notes on the habits, &c., of the various species now treated of, as well as for his kindness and polite attention whenever I wished to examine any of the specimens under his care.

Trigla Blochii. This is a rare fish with us, but several specimens have been brought to me from Kingstown, Dublin.

Cottus Grænländicus (Richardson's Fauna, Br. Ann. p. 297, pl. 95, fig. 2). A fine specimen of this fish, nearly 10 inches long, is in the collection of the Royal Dublin Society, from Kingstown, near Dublin; two other specimens were taken during the last week in the bay, and are now in my possession; and last evening I procured a beautiful specimen near the mouth of the river Liffey, which is also in my collection. I believe this fish is new to the European Fauna.

Thynnus Pelamys, Bonito. A splendid specimen of this rare fish, taken off the coast of Dublin, is now in the collection of the Royal Dublin Society.

Mugil Chelo and *Mugil Capito* have occurred to me in nearly equal abundance at some periods of the year in Dublin bay. These species are very nearly allied. Specimens of both are in the Museum of the Royal Dublin Society.

Gobius fuliginosus (M'Coy).

Length 2 inches, depth 4 lines. Dorsals continuous: rays very long, second and third longest; first ray half a line shorter than the second; third ray $3\frac{1}{2}$ lines in length in the second dorsal; third and fourth rather the longest in the first dorsal; pectoral, when laid flat against the side, reaches to opposite the third ray of the second dorsal; from the anterior base of the ventral fins to the vent, 6 lines; from the same point to the apex of the ventral fin, $3\frac{1}{2}$ lines: eyes moderate, half their diameter apart. Lower jaw longest; the gape, when the mouth is shut, extending obliquely upwards from the external angle: forehead and nape convex, no sulcus; beneath white, sides and back dusky; a few obscure spots on the lateral line: ventral fin white, the rest dusky with blackish margins; snout and space between the eyes blackish, and a few blackish spots on the chin (in spirits).

D. 6. 16; C. 17; A. 13; P. 20; V. 9.

The posterior rays of the anal fin longest, last somewhat shorter.

The only specimen I have seen was from Connamara, taken in company with *G. niger*.

Gobius reticulatus. Two specimens of this most beautiful Goby were taken by dredging in shallow water in Dublin bay.

The beautiful rosy tint of the dorsal fins first attracted my attention. This fish has not, I believe, been discovered in the British seas before; I have only seen these two specimens, one of which is in the Museum of the Royal Dublin Society, and the other in my own collection. The species is known to ichthyologists only by the descriptions of Cuvier and Valenciennes, who had an opportunity of seeing but one specimen brought by M. Bibron from Sicily, and preserved in spirits, when it had lost some of its characteristics, particularly the pink colour of the dorsal fins; a description, therefore, from living specimens may not be unacceptable, particularly to the British naturalist, to whose Fauna it is now added.

Length 2 inches and 1 line; depth at base of first dorsal 4 lines: head depressed; snout very short, tumid, convex; lower jaw longer than the upper: eyes very large, approximate; a sulcus or groove runs from between the eyes to the base of the first dorsal; cheeks tumid; eyes within a third of their diameter apart; from the anterior edge of the orbit to the tip of the upper jaw, less than the diameter of the eye; first dorsal with the second ray longest, the others gradually decreasing.

D. 6. 10; P. 19; A. 10; C. 15; V. 10.

The head is one-fourth the entire length; the depth at the base of the pectorals one-sixth the entire length; width at base of the pectorals one-sixth the entire length, caudal fin included; the ventral fin reaches as far as the posterior margin of the vent; the pectorals scarcely further. Colour (in spirits), body pale fulvous yellow, reticulated with black lines, something paler below: fins white, the anal and ventral in the adult fish being slightly margined with dusky; the pectoral, ventral, anal and caudal fins without spots; the two dorsals, when the fish was alive, were of a very beautiful rose colour; these two fins are thickly marked with large black spots, placed, for the most part, between the rays. On the anterior dorsal there is a series of six very large black spots extending from the posterior angle to about the middle of the anterior ray; this row is consequently midway between the body and the margin of the fins; beneath these there is another series of four smaller black spots communicating at the anterior ray, and between the longest set and the margin of the fin there are a few straggling black spots inferior in size to those of the first series; beneath these there is, anteriorly, a set of five or six smaller black spots; above each of the spots in the principal row is a small black dot. The second dorsal has nearly the same arrangement of the spots, but has them in greater number.

Crenilabrus Cornubicus. Rare in Dublin bay.

Merlangus virens. Rare in Dublin bay.

Motella tricirrata. Very common in Roundstone bay, Connemara.

Platessa microcephala. Scarce in Dublin bay.

Rhombus megastomus. Kingstown; not uncommon.

Monochirus minutus. Little Sole. And also the variegated Sole occur in tolerable abundance, right off Dublin bay, between the light-ship and the harbour.

Ammodytes Tobianus. This fish is frequent in the sand at Malahide, county Dublin, in company with the common species.

Acus anguineus. This elegant species is common in certain localities in Connemara.

Raia radiata. Starry Ray. A small specimen of this Ray, five inches in breadth, taken with the species mentioned below, in Dublin bay, is remarkable for having the body almost destitute of spines; those, however, which are found on the snout and anterior margin of the pectorals, preserve the peculiar character of the species. This want of spines on the body is the more remarkable, as Donovan's original specimen was of even smaller size, and was abundantly supplied with spines. In all other respects the specimens are identical.

Raia intermedia. Two specimens of this rare Skate, taken in Dublin bay, agreed perfectly with each other; neither of them were spotted; besides the one large spine before the eye, it had another of equal size behind the orbit, and one small blunt one external, and a little anterior to the one before the eye; upper surface of the body rather brownish, lower purplish grey. Those two specimens it will be found agree perfectly with two fishes obtained by Dr. Parnell at Queensferry, considered by him as a mere variety of his *R. intermedia*. Length 13 inches; it varies slightly in the proportions of length to breadth; the number of spines on the tail also varies, being in one of the specimens before me 15, in the other 16, to the base of the anterior dorsal: Dr. Parnell's specimens had 18; the two dorsals separated by a spiny tubercle. In other respects perfectly identical.

Raia? I will now describe a Ray, which I cannot identify with any of those described. It is a small species, seldom exceeding 17 or 18 inches in length, and 9 or 10 in breadth. It possesses the peculiar outline of the Sandy Ray of Couch; it likewise possesses the semicircle of spines on the inner margin of the eye, the spines at the tip of the snout, and the four short rows of spines in the middle of the back, and the teeth precisely as in that species; all the specimens I have seen had one spot on each pectoral fin, as is commonly seen in the Homelyn Ray; that is, a circular spot of chocolate-

brown surrounded by a circle of white irregular spots, and some irregular white markings in the centre, instead of the numerous small white spots of the Sandy Ray; but as colouring is of no manner of importance in this family, I need only mention that the species of which I now write appears to me to differ from the Sandy Ray in having the surface of the body covered with minute spines directed backwards, and by the length of the tail, which measures, from the vent to the tip of the tail, two-sevenths more than the length of the body measured from the same point to the tip of the snout; the body being smooth in the Sandy Ray, and the tail remarkably short; which, in addition to its rough skin, and its having the characteristic outline and disposition of the spines to be remarked in the Sandy Ray, will distinguish it from the Homelyn. I give a description of a specimen now before me, that the species may be recognized.

Length $16\frac{1}{2}$ inches.

DESCRIP. (*Form.*) Somewhat rhomboidal; the greatest transverse diameter 9 inches; length from the vent to the tip of the snout 7 inches; body moderately thick; snout and anterior part of the pectorals the same as in the Sandy Ray; mouth $1\frac{1}{2}$ inch; $1\frac{6}{8}$ inch from the snout; the nostrils in a line with the angles of the mouth; the distance from the angles of the mouth to the nostril one-half of that from the nostril to the margin of the pectoral fin: eyes large; spiracles rather small, less than the diameter of the orbit, oval, placed obliquely close behind the eye, their longest diameter pointing upwards and outwards; skin above roughened by minute spines directed backwards, largest on the anterior margins of the pectorals; under surface smooth, except beneath the snout and for a little way along the anterior margin of the pectorals; a semicircle of six or eight spines round the inner margin of the orbits, and a few on the tip of the snout; the four short rows of spines about, or rather anterior to the middle of the back, are less distinctly marked in this specimen than in others I have seen. At some distance below these are two rows of equally large hooked spines, which are continued along the tail; there are four rows of large spines on the tail, all directed backwards; but the ridge or central line of the tail might be said to be comparatively unarmed, as in *R. chagrinia*, there being only a few small blunt tubercles in the specimen before me, and even these were absent in a specimen shown me by my friend Captain Portlock; all the larger spines on the body are radiated at their base somewhat as in the Starry Ray, *R. radiata*: tail considerably longer than the body, measuring in the specimen before me 9 inches, equal to the greatest breadth of the fish, rounded above, flattened beneath; dorsals rather closer to each other than the height of the first dorsal fin; pectorals more abruptly rounded off below than in the Sandy Ray. (*Colour.*) Upper surface of an uniform light yellowish brown, darkest towards the centre; on each

pectoral one large oval spot of a rich chocolate-brown, surrounded by and containing variously-shaped cream-coloured spots.

Dublin bay.

Raia microcellata. As only three specimens have been recorded of this very rare species, two having occurred to Montagu and one to Mr. Couch, I need scarcely apologize for giving a description of a fine specimen now before me, particularly as it offers one or two trifling variations from those already known.

DIMEN. Total length 13 inches; length of tail 7 inches; greatest breadth 9 inches.

DESCRIP. (*Form.*) Rhomboidal, the transverse diameter one-third greater than from the snout to the anus; snout short, triangular, projecting half an inch; the anterior margins of the pectorals waved convex; mouth one inch wide; nostrils large, at an equal distance from the corner of the mouth and from the margins of the pectoral fin: eyes small; spiracles moderate; skin above covered with very minute granular spines directed backwards, largest on the snout and anterior margin of the pectorals; beneath entirely smooth, except at the very tip of the snout: mucous orifices remarkably large; before each eye one large broad spine; at the exterior of its base another smaller; behind each eye two or three spines; a row of twenty-five spines commences a little behind the eyes, and continues to the base of the first dorsal; these spines are neither large or much hooked; there is a smaller one between the two dorsals: tail considerably longer than the body, narrow, depressed; the membranous fin-like border to the tail, noticed by Mr. Couch, particularly striking; the two dorsals are more remote than usual, and the rudiment of caudal is larger; the annexed figure shows these fins of the natural size. (*Colour.*) Upper surface dull brown, with obscure circular whitish spots about the size of a pin; no lines; the sides of the tail elegantly marked with alternate brown and white spots; beneath yellowish white; posterior margin of the pectorals slightly darker.

Dublin bay.

Torpedo emarginata (M'Coy).

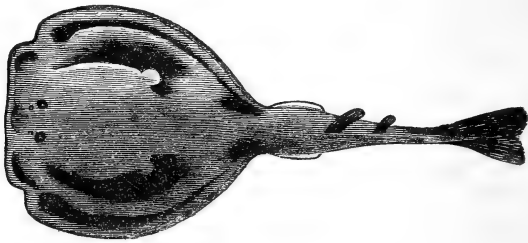
SP. CHAR. Head truncated anteriorly, separated from the pectoral fins by a deep notch on each side; spiracles without appendages or processes; anterior dorsal fin entirely behind the ventrals.

DIMEN. Total length 2 feet 8 inches; greatest breadth 1 foot 2 inches; thickness 5 inches.

DESCRIP. (*Form.*) Head distinct, truncated or terminated by a right line anteriorly, emarginate at the sides; breadth in front 7 inches, slightly rounded at the corners: mouth moderate, teeth minute: eyes small, $1\frac{1}{2}$ inch apart; iris brownish yellow; behind each a large round or somewhat oval spiracle, without any tooth-like process; branchial openings five on each side, crescent-shaped;

skin entirely smooth: about half-way between the spiracles and the posterior terminations of the pectoral fin are situated two large ill-defined tubercles, one on each side of the body; two dorsal fins situated very far back on the tail; anterior dorsal entirely behind the ventrals; height of anterior dorsal 2 inches 5 lines, breadth at base 1 inch 2 lines; length of posterior dorsal 1 inch 3 lines, breadth at base 10 lines; pectoral fins scarcely lobed posteriorly. (*Colour.*) Uniform blackish brown above, greyish white beneath.

Differs from the *T. Narke*, *T. immaculata*, *T. unimaculata*, and *T. Bancroftii*, in being of a uniform brownish black above, not spotted as in those species; from the *T. Galvani* and *T. marmorata* (Riss.) it will be distinguished by the edges of the spiracles being smooth, and entirely wanting the tooth-like processes with which the spiracles of those species are provided; it is likewise much more slender than any of those species. The specific characters are of course peculiar. The specimen was taken in Dublin bay.



XLVII.—*Some further particulars of the Coco de Mer (Lodoicea sechellarum).* By GEORGE CLARKE, Esq.*

THE germ sprouts indifferently, from either side of the cleft between the lobes, turning downwards in shooting, as represented in this section. It suffices for its vegetation that it be placed on the earth; it is not necessary that it be covered, but a shady situation is indispensable. It puts forth only one leaf a year, in general; but there are instances, it is said, in which two are produced; they are, however, exceedingly rare. The leaf at its first appearance is folded together in a most compact manner, so as to resemble a solid piece. This is moreover guarded by a thick downy



* To this gentleman we were indebted for the account given in p. 422 of the Annals. In the 54th volume of the Botanical Magazine, at tab. 2734, will be found a long and interesting account of this Palm, drawn up by Sir Wm. Hooker, from the communications of Mr. Harrison, who has been long resident at the Seychelles.

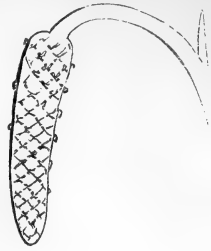
felt, of a fawn colour, which only yields its hold when the leaf unfolds itself. The male flowers are of a most remarkable structure, and still more remarkable for their duration.

The spathe is from 20 to 30 inches long, and the surface reticulated with perfect regularity; the blossoms appear at the angles, and these, by a most wonderful contrivance, continue to bud forth for eight or ten years! Twenty blossoms are provided for each aperture. Here is a section (by fracture) which may convey some idea of this singular structure. The colour of the spathe is deep brown, that of the stamina bright yellow.

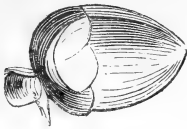
These compartments have somewhat the appearance of diminutive fir-cones at first sight; but if taken out and examined separately, they appear very different.

In their perpendicular position they appear thus; and a section of them in the same direction shows a sheath for each flower, which pushes off its predecessor, as it verges to maturity. Only one catkin is put forth annually, and eight or ten are often observable on the same tree, and all flowering.

There is only one female tree on the island of Mahé that bears; and that has only one drupe, which has been on it eight years, and does not yet give any indications of falling, though it appears just ripe. It was produced by suspending a male spadix on the leaves of the female tree, which stands alone; and it was some months before the effects of the impregnation were observable. To what age the plant might attain, if untouched, it is impossible to say; but there are many that the leaf-marks prove to be nearly 400 years old, and they exhibit no signs of decay. It appears that they thrive best, or rather grow most quickly, in a rich moist soil; but they are found in the driest spots, in the decayed granite and in quartzose sand. They begin to bear at from twenty-five to thirty years old. The outside of the stem is extremely hard and durable; the inside is very soft and spongy. The female blossoms resemble very much those of the common cocoa-nut, and appear to be susceptible of impregnation



when about the size of an egg. It not unfrequently happens that they are but imperfectly impregnated ; in which case they assume a different form from those in which the process is complete, and fall in two or three years.



The perfect fruit.



The abortion.

The weight of an ordinary ripe drupe is from 40 to 50 lbs. I believe it invariably happens, that when four lobes are contained in one husk, which is not uncommon, that they separate in the middle, forming two fruit, only distinguishable from those that grow separately by the flatness of the inner sides. Those, however, that have three lobes are always united.

The number of lobes of the leaves is altogether uncertain, varying from twenty-two to forty-five ; nor do the two sides always contain an equal number.

I have only to add to the foregoing remarks, that the pollen, examined by the microscope, resembles in form a grain of barley, with a longitudinal furrow. It is too minute to present any form to the naked eye.—*Extract from a Letter from Mr. George Clarke of Mahé, which is the largest of the Seychelles group.*

XLVIII.—*Commentary on Mr. G. R. Gray's 'Genera of Birds.'* 8vo. London, 1840. By H. E. STRICKLAND, Esq., M.A., F.G.S., &c.

MR. GRAY'S 'Genera of Birds,' though a work of no external pretensions, is calculated to exercise a very beneficial influence on the science of ornithology. To the unscientific reader it presents only a bare catalogue of names ; but the naturalist no sooner consults it, than he finds in it evidence of much laborious research and sound criticism. The object of this work is to give a classification of all the generic groups of the Class Aves, which have been defined by various authors, and to append to each genus a list of the duplicate names which these authors have given to the same group, either through ignorance of each other's labours, or from the less excusable cause of wishing to introduce their own terms into the science to the exclusion of those given by the original descri-

bers. Few persons would imagine, without seeing Mr. Gray's book, the enormous extent to which this evil has grown, loading the science for ever with a mass of utterly useless synonyms, and compelling the unwilling naturalist too often to desert the works of Nature in order to disentangle the errors of man. Much of this multiplication of synonyms is, indeed, the unavoidable result of the number of labourers employed in the same branch of science, but separated by wide geographic intervals. The machinery for circulating through the civilized world the knowledge which is daily published in detached regions is so imperfect, that it is next to impossible for any individual to gain access to all the works which relate to his particular study. Mr. Gray's office in the British Museum has given him great advantages in this respect, and he has availed himself of them to good purpose. His work appears to me highly creditable to him as a first attempt at bringing into order the heterogeneous materials which lay before him. His book is, indeed, by no means free from defects and inaccuracies, but they are few in comparison with the errors which he has detected in the writings of others. It would not have been possible for any man living to render such a work accurate *at first*. One person will always discover mistakes where another does not, and the greater the number of critics the more accurate the book may ultimately become. Having myself been engaged for a considerable time in preparing a work on the synonyms, specific as well as generic of the class Aves, I have been enabled by comparing Mr. Gray's work with my own MSS. to judge of his general accuracy. In most cases his results have entirely agreed with my own, and where they differed I have been led by further investigation to detect errors, sometimes in my work, and sometimes in his. It appeared desirable to embody these corrections in a detailed commentary on Mr. Gray's book, both for the information of those who possess it, and also to aid Mr. Gray in case he should publish a second edition. A corrected edition of the 'Genera of Birds,' if widely circulated on the Continent as well as at home, would be the most effectual means of introducing an uniform nomenclature into ornithology, of stopping the present wanton and lawless multiplication of synonyms, and of opening the eyes of naturalists to the amount of labour which has already been effected in the same department by others.

The remarks contained in Mr. Gray's preface are very judicious, and deserve to be read and acted upon by all zoological authors. In selecting and forming a permanent nomenclature out of a heap of synonymous terms, Mr. Gray adopts

“the inflexible law of priority.” There is reason to hope that naturalists are daily becoming more convinced of the value and excellence of this law. So long as authors adopt one name in preference to another merely on account of its superior euphony of sound, or applicability of meaning, the nomenclature of science must vary with the individual taste and opinion of each author. But when we adopt priority of publication as our rule, we are guided not by opinion but by fact. The particular date at which any genus or species first receives a name is an irrevocable matter of history; and all naturalists who adopt the *first* name that was given to the object, *must* coincide in their nomenclature. And although the *first* names that were given are not always the *best*, yet surely the establishment of an uniform and permanent language among naturalists of all nations is an object of far greater value than the employment of names which, though more elegant and expressive, want the authority which time alone imparts, and vary with the tastes and caprices of men. The law of priority has also the merit of being the only one which is *just*, as it preserves and honours the terms employed by original discoverers in preference to those introduced by later critics; and it also has the advantage of reminding us of the *date* at which any species was discovered or group defined. In the application of this law Mr. Gray has acted with the strictest impartiality, though in one or two respects he seems to have somewhat departed from its spirit in adhering to its letter. In the first place I entirely agree with the Prince of Musignano, that “in no case do I consider it right to take any of the names of the older authors in preference to those given by Linnæus. We owe this compliment to that great man; and besides it is not fair to assume that our Binomial system of nomenclature was established before his time, because we meet with a few instances capable of being referred to the invaluable principle which he was the first to generalize and render universal.” With regard to *specific* names then, we cannot carry back the law of priority beyond the date of the 12th edition of the ‘*Systema Naturæ*,’ and we ought not to set aside the earliest specific name given to a species *after* that date in favour of one accidentally binomial in form which was given *before* it. Thus, for instance, the *Hirundo chalybea* of Gmelin was termed by Brisson *H. cayanaensis*; but we do not adopt the latter name, because Brisson had evidently no idea of a regular binomial nomenclature like that of Linnæus, and generally employed a *sentence* instead of a *word* to designate a species.

The same principle applies to the priority of generic names

with the exception that we are here enabled to go one step further back, and to extend the benefit of the law to Brisson. An author cannot be cited as the authority for a generic name, unless he uses it in a *generic sense*. Now zoologists had no distinct notion of a *genus* before the time of Linnæus and Brisson; and, therefore, although the *names* used by antecedent authors may often be applied with propriety to modern genera, yet in such cases they acquire a new meaning, and should be quoted on the authority of the first person who used them in this secondary sense. The so-called generic names of Ray, for instance, are only appellations of species derived, in most cases, from his predecessors; and if we apply the rule of priority to them we ought also to quote the names of Aristotle and Pliny as authorities for almost every genus of Linnæus. Thus the names *Puffinus* and *Locustella*, though applied by Ray to certain *species* of birds, were first used *as genera* by Brisson and Gould respectively, and should therefore be quoted on the authority of these authors. Linnæus and Brisson appear to be the earliest writers who ought to be cited as authority for the genera of birds. Brisson's generic definitions are perfectly regular and systematic, and all those of his genera which are *additional* to those of Linnæus, may therefore be quoted on his authority. These Brissonian genera are as follows:—*Gallus*, *Perdix*, *Aquila*, *Asio*, *Coracia**, *Pica*, *Garrulus*, *Nucifraga*, *Promerops*, *Carduelis*, *Coccothraustes*, *Colius*, *Pyrrhula*, *Polytmus*, *Galbula*, *Rupicola*, *Momotus*, *Rhea*, *Casuarus*, *Himantopus*, *Vanellus*, *Arenaria*†, *Glareola*, *Limosa*, *Ciconia*, *Scopus*, *Balearica*, *Cariama*, *Porphyrio*, *Galinula*, *Phalaropus*, *Colymbus*‡, *Fratercula*, *Spheniscus*, *Catarrhactes*, *Puffinus*, *Stercorarius*, *Anser*, *Sula*, *Phalacrocorax* and *Corrira*. It is important to attend to this list, because it has been customary to quote Brisson as an authority for many other genera which he never defined, but only attached their designations to certain species. The names so used by Brisson are in the same predicament with those of Ray, Aldrovandus, or Pliny; they are merely arbitrary or vernacular appellations of species, but do not become generic titles till properly defined as such. On this principle the genus *Buteo*, e. g., should be regarded as founded not by Brisson but by Bechstein, who should therefore be cited as the author of it.

* This name being too near in sound to *Coracias*, Lin., is superseded by Cuvier's name *Fregilus*.

† The name *Arenaria* being used by Linnæus in botany, the genus now stands as *Strepsilas*, Ill.

‡ This genus is now called *Podiceps*, Lath., the name *Colymbus* being given by Linnæus to a different genus.

So also the group of the Kestrels was first defined as a genus by Boié under the name of *Cerchneis*; and this term ought, I conceive, to be retained rather than *Tinnunculus*, which is merely the name by which Brisson designated the common species of Northern Europe. I shall point out other cases of the same kind below.

Before proceeding to details, I wish to make a few further suggestions of improvements which might be introduced with advantage in future editions of this work.

1. In the present work the student is unable to judge what *extent* Mr. Gray assigns to each genus, no definitions being given, and only one species quoted as an example. In his preface, however, Mr. Gray holds out a prospect of publishing the characters to his genera, a plan which I trust he will execute. At any rate he ought to lose no time in publishing the definitions of all the *new* genera contained in this work, it being held by some naturalists that to give a generic name without a definition does not constitute an act of publication; and he is thus exposed to the same kind of petty larceny by which Vieillot anticipated so many of Cuvier's genera. For the same reason Mr. Gray ought to give names at once to all those generic groups which are indicated in the present work without being named.

2. In all cases where the species quoted as the type of a genus remains *unfigured*, a reference should be made to some work in which it is *described*, otherwise the student has no clue to the characters of the genus.

3. A distinction should be made between those genera which are retained exactly as at first defined by their authors, and those which have undergone subsequent restriction. Genera of the former class may remain with merely the name of the author attached, as *Irena*, Horsf. Genera which are now confined within more restricted bounds than when originally defined, may be distinguished by the syllable (*restr.*) after the author's name; thus *Corvus*, L. (*restr.*), *Sphenura*, Licht. (*restr.*), &c.

4. In reciting the synonyms to each genus it would be a great improvement to distinguish those terms which are exactly equal in extent to the adopted genus, from those which are either more or less comprehensive. The neatest way of expressing this seems to be by means of the algebraic signs > *greater than*, = *equal to*, and < *less than*. Thus I would write CRYPSIRHINA, Vieill., 1816, (*restr.*), = *Temia*, Cuv., 1817, = *Phrenothrix*, Horsf., 1821, < *Corvus*, Lath., < *Colius*, Lath., < *Glaucopis*, Tem. Again, CONURUS, Kuhl, 1820, = *Aratinga*, Spix, 1824, > *Psittacara*, Vig., < *Psittacus*, Shaw,

< *Sittace*, Wagl. In these cases all the *equal* or *coextensive* synonyms should be cited first, the *less extensive* ones (if any) second, and the *more extensive* ones last.

5. In some cases Mr. Gray attaches the date of publication to each genus, but it would be an improvement if it were *always* attached both to the adopted name and to its coextensive synonyms, as is done in the above examples. In a work based on the law of priority, it is important that the date of every generic name should be recorded, as furnishing the reason for its adoption.

6. It must be acknowledged that, in following out the law of priority, we are often driven to adopt names which are very barbarous in their sound and ungrammatical in their construction. Many of our modern naturalists have been sadly negligent of their lexicons and grammars, and it is extraordinary how often we see men of no mean attainments in science commit errors in language which would subject a school-boy to an *imposition*, if to nothing worse. I do not, however, think that we are justified in materially altering, much less in cancelling, such names, when they have priority in their favour; but we may, at least, be allowed to make such slight corrections in the orthography of these words as will render them rather more conformable to the rules of language without materially changing their syllabic structure. I shall take occasion hereafter to point out numerous cases in which the orthography of the *adopted* generic names appears capable of improvement. I have not attempted to apply these corrections to the *synonyms*, which had far better remain "with all their imperfections on their head."

COMMENTARY.

Page 1. *Gypætos*, "Ray," was first defined as a genus by Storr, and should therefore bear his name as the authority.

As I understand that Mr. Gray intends to remodel the genera of the subfamily *Vulturinae*, I will say no more than to recommend that the name *Vultur*, L., should be retained for the group which contains *V. fulvus*, Gm., and the name *Ægyptius*, Sav., for that which contains *V. cinereus*, Gm. (*Ægyptius niger*, Gray). We have the authority of Bonaparte for this arrangement, which is far better than to transfer the term *Vultur* to the latter group. It is well remarked by the Rev. F. W. Hope, in reference to two of Latreille's genera, the names of which were afterwards transposed by Laporte, that "such changing of types creates great confusion and should never be attempted."—(Mag. Nat. Hist. n. s. vol. iii. p. 20.)

P. 2. Add *Polyborus*, Gould, to the synonyms of *Craxirex*.

P. 3. Mr. Gray follows Lesson in making *Physeta*, Vieill., a synonym of *Herpetotheres*, but Lesson gives no reason for this union.

I am not aware that the *Falco sufflator*, L., the type of *Physeta*, Vieill., has been rediscovered since the time of Linnæus, who relates that it *inflates the head with air*. Perhaps some species of Owl, erecting the feathers when angry, has given rise to this statement.

The name *Hæmatornis*, Vig., should be retained, instead of *Spi-lornis*, Gray, because the name *Hæmatornis*, Sw., though prior to Vigors's name, should be changed to *Ixos*, Tem. (restr.). *Vide infra*.

Cuvier in his 'Règ. An.' admits *Circaëtus* as a distinct genus, and does *not* include it under *Haliaëtus*.

To the *Aquilinæ* add the following genus: HALIASTUR, Selby, 1840, = *Haliaëtus*, Swains., < *Falco*, L.

H. ponticerianus, (L.) Selby.—Briss. Orn. vol. i. pl. 35.

This name was first given by Mr. Selby in his 'Catalogue of the Generic and Subgeneric Types of Birds.' 8vo. Newcastle, 1840.

The *Falco subbuteo* was first *made into a genus* by Boié under the name of *Hypotriorchis*, which name ought not to be superseded by Ray's specific name *Dendrofalco*. I must, however, remark, that *Falco subbuteo* and *vespertinus* seem not to deserve generic separation from *Falco* proper. Even *Hierofalco* is reunited to *Falco* by Bonaparte.

The Kestrels were first defined *as a genus* by Boié under the name of *Cerchneis*, which name, therefore, ought to be retained.

Ieracidea, Gould, ought to be written *Hieracidea*, the word *iépaξ* being aspirated.

P. 4. *Gampsonyx*, Vig., should be placed next *Elanus*, Sav., from which it is chiefly distinguished by the shorter wings.

For *Aviceda*, Sw., write *Avicida* (after the analogy of *regicida*, &c.). I have not seen this genus, but from the toothed bill, I should prefer placing it among the *Falconinæ*.

Is it certain that the name *Dædalion*, Sav., is prior to *Astur*, Bechst.? The latter name has been so long current, that I should regret if the laws of priority compel its removal.

P. 5. The genus *Nisus* was defined by Lacepède before 1800, but the name *Accipiter*, "Ray," seems to have been first used *generically* by the late Mr. Vigors in 1824; therefore, according to the principle before explained, *Nisus* should have the preference. And even if *Accipiter* were retained, the specific name *nisus*, Lin., should not be changed for a word used prior to Linnæus's system of nomenclature. But in adopting the word *Nisus* as a genus, we require a new specific name, and *fringillarius*, Vig., seems to be prior as such to *communis*, Cuv.

Cuvier in his 'Règ. An.' includes *Ciccaba*, Wagl., under *Noctua* and not under *Surnia*.

To the synonyms of *Athene*, Boié, add *Carine*, Kaup. (Thierreich, vol. ii. Darmstadt, 1836), a work which seems not to have fallen under Mr. Gray's observation, and which contains a few additional genera which will be pointed out in their places.

P. 6. *Ketupu* should be written *Ketupa*. It is better not to introduce barbarous names into science; but when done, they should at least have a Latin termination given them.

Cuvier defines his genus *Ulula* as having a large opening to the

ear like *Otus*, and cites two species, *U. lapponica* and *U. nebulosa*. But it appears that the *U. lapponica* has *not* a large ear-cavity, but agrees in its structure with the genus *Syrnium*, so that the *nebulosa* only can be quoted as a type of *Ulula*, Cuv. This error of Cuvier's was pointed out by Bonaparte in his excellent but little-known 'Osservazioni sulla 2^{da} edizione del Regno Animale del Barone Cuvier,' 8vo, Bologna, 1830, p. 43. Bonaparte retains the specific name *cinereum*, Gm., as being prior to *lapponicum*, Retz.

The specific name *Nyctale tengmalmi* (Gm.)* should be used as being prior to *dasyptus*, Bechst.

P. 8. Does not *Collocalia*, Gray, belong to the *Hirundininae* rather than the *Cypselinae*?

P. 9. The subfamily *Coraciinae* ought, I conceive, to be included in the *Halcyonidae* (*Alcedinidae*, mihi,) rather than among the *Todidae*. The structure of their feet, their habits, and the cœrulean tints of their plumage, show great affinity, first to the Bee-eaters and through them to the Kingfishers. (See my 'Map of the *Alcedinidae*,' Ann. Nat. Hist. vol. vi. pl. 8.) They may, however, lead towards the *Todidae* in the other direction, as there shown.

The genus *Corydon*, Less., 1828, though afterwards united by Lesson to *Eurylaimus*, forms a very distinct generic type, and should take its place as follows:—

CORYDON, Less., 1828, < *Coracias*, Raff., < *Eurylaimus*, Tem.

C. sumatranus (Raff.) n. *E. corydon*, Tem. Pl. Col. 297, *C. temminckii*, Less.

The *Momotinae* are evidently only the American group of the Bee-eaters, and might, I think, be included with them as a mere subfamily, *Meropinae*, of the *Halcyonidae*.

The *Prionites mexicanus*, Swains., is not the same as *Crypticus platyrhynchus*, but is a true *Momotus*, figured by Jardine and Selby (Ill. Orn. ser. 1. pl. 25.), where it is erroneously named *M. martii*. The true *martii* of Spix is said by Bonaparte to be the same as *Crypticus platyrhynchus*, which in that case should be called *C. martii* (Spix).

P. 10. *Calurus resplendens* was named *paradiseus* by Bonaparte in 1826. (See Proc. Zool. Soc. part v. p. 101.)

There seems to be no sufficient ground for including the *Tamatianae* among the *Halcyonidae*. This group possesses structural characters which entitle it to rank as a distinct family under the name of *Capitonidae*.

Mr. Gray transposes the names *Tamatia* and *Capito* as used by Mr. Swainson, a step which would certainly cause confusion, but which may be rectified as follows. It should first be observed, that when two authors give separate names to *precisely the same* group, the later name should be cancelled *in toto*, and not allowed to share

* I have found great convenience in *always* writing *specific* names with a small initial letter, even when they are derived from persons or places. The eye thus at once distinguishes *specific* from *generic* names, and avoids the confusion caused by *specific* names commencing occasionally with a capital letter like *genera*.

in any subsequent partition of the group which may take place. This is the case with *Capito*, Vieill., 1816, and *Tamatia*, Cuv., 1817, which latter name ought therefore to be cancelled. Now this original group of Vieillot requires to be divided into *three* genera (not two, as is done by Swainson and Gray). Two of these genera have already had names given them, viz. 1. *Nyctactes*, Gloger (= *Tamatia*, Sw., < *Bucco*, Gm., < *Capito*, Vieill., < *Tamatia*, Cuv.); type, *N. tamatia*, (Gm.). 2. *Cyphos*, Spix. (< *Bucco*, Gm., < *Tamatia*, Gray); types, *C. macrorhynchus* (Gm.) and *C. macrodactylus*, Spix. The remaining genus may therefore stand as *Capito*, Vieill. (restr.) (= *Capito*, Sw., < *Alcedo*, Gm., < *Bucco*, Licht., < *Tamatia*, Gray); types, *C. chacuru*, Vieill. (*Bucco strigilatus*, Licht., *Capito melanotis*, Tem., *C. leucotis*, Sw.) and *C. maculatus* (Gm.), (*Bucco somnolentus*, Licht.).

Lypornix torquatus (Hahn) is the *Bucco fuscus*, Gm.; and the latter specific name therefore has the priority.

P. 11. Three, if not four species are confounded under the name of *Alcedo rudis*, Lin. The one which has the best right to the name is the European one (Gould, 'Birds of Europe,' pl. 62), because it is doubtless identical with the Egyptian bird called *A. rudis* by Hasselquist, from whom Linnæus adopted the name. It seems only to have been figured by Gould, unless Edwards, 'Birds,' pl. 9. (from Persia) be this species. The *Ispida bicincta*, Swains. W. Afr. vol. ii. p. 95, forms a second species, and the *Ispida ex albo et nigro varia*, Briss. (Buff. Pl. Enl. 716.) a third. This last never having received a specific name, I recommend that it be called *varia*. It seems to be identical with the Indian species, but of this I am not certain, never having examined a Cape specimen. The bird in Buff. Pl. Enl. 62, said to be only 8 inches long, must be the young either of *Ceryle varia* or of *C. bicincta*.

To the synonyms of *Jacamaralcyon tridactyla*, add *Galbula ceycoides*, Jard., and *G. armata*, Sw.

P. 12. It is doubtful whether *Neomorpha*, Gould, belongs to the *Upupidæ*. Gould says, "lingua gracilis ad apicem setosa." (Proc. Z. S. pt. iv. p. 144.) Taking this in connexion with its *habitat*, I conclude *Neomorpha* to be a Melliphagide. I may here remark, that Mr. Gray seems in many cases not to attach sufficient value to *geographical distribution*, a point often of the utmost importance in guiding us to the true affinities of groups as distinguished from their analogies.

The specific name *acutirostris*, Gould, seems to me quite sufficiently applicable to the *Neomorpha*, to justify its adoption. It is safer not to set the example of introducing *improved names* where they can possibly be dispensed with.

The peculiar structure of the plumage in *Seleucides*, Less., and *Ptiloris*, Sw., joined with their *habitats*, the one in New Guinea, and the other in the neighbouring continent of Australia, seems clearly to refer these genera to the *Paradisæadæ* and not to the *Upupidæ*. The same remark probably applies to *Craspedophora*.

Drepanis, Tem. This name should be cancelled, being merely

a synonym of *Melithreptus*, Vieill. The latter term (restricted) should be retained for this group, as is done by Cuvier, Lesson, Swainson, and Vieillot himself, who figures *M. vestiarius* as the type in his 'Galérie des Oiseaux.'

Ptiloturus, Sw., should be written *Ptilurus* (from πτίλον and οὐρά). *Merops*, L., may be added to its synonyms.

P. 13. The earliest specific name of *Eulampis aurata*, Boié, seems to be *jugularis*, Lin.

The specific name *Calothorax lucifer* (Sw.) is prior to *C. cyanopogon*, Less., being first published in 1827.

P. 14. *Phathornis* should be written *Phaëthornis*.

The genus *Cynanthus* was founded by Swainson in 1827 (Zool. Journ. vol. iii. p. 357); and as one of his characters is "Cauda longissima, forficata," the name (restricted) should be adopted in place of *Lesbia*, Less.

Heliothyrs should be written *Heliothrix* (from ἥλιος and θρίξ).

The name *Mellisuga*, Briss., must be regarded as synonymous with *Trochilus*, Lin., and should therefore be cancelled, and the name *Calliphlox*, Boié, adopted.

Mr. Gray gives a new name, *Meliornis*, to the genus *Meliphaga*, Lewin, as restricted by Vigers, because he conceives that this is not the type of the original genus *Meliphaga* as defined by Lewin. Now although an author, in restricting an existing genus, ought always to retain the original name for that part of the old genus which was considered as typical by its author, yet where this rule has been departed from I do not think we are bound to remove the name so restricted, and attach it to another part of the group, which, though more typical, has never borne it exclusively. Such transposition of names produces sad confusion. In the case before us, Mr. Vigers in 1826 carefully restricted and defined the genus *Meliphaga* of Lewin, including in it several of Lewin's species, and this arrangement has been followed by Lesson, Swainson, Gould, &c. The priority of the *restricted genus* rests with the lamented Mr. Vigers, and it should therefore retain the name which he gave to it.

Prothemadera cincinnata, Lath., was named *Merops novæ seelandiæ* (not *novæ hollandiæ*) by Gmelin; and that name is therefore prior to *cincinnata*.

For *Philemon*, Vieill., read *Philedon*, Comm. (from φιλέω and ἡδονή). Cuvier adopted Commerson's name, but Vieillot (probably ignorant of its derivation) changed it into the unmeaning term *Philemon*.

I very much doubt whether *Phyllornis* (*Chloropsis*, Jard.) possesses a feathered tongue like the *Meliphagidæ*. Its general structure points much more to the short-legged *Turdidæ*, where Mr. Swainson places it.

For *Zanthomyza* write *Xanthomyza* (from ξανθός and μυζάω).

P. 16. For *Plectoramphus* write *Plectorhamphus*. (Naturalists seem too often to forget that the initial ρ in Greek being aspirated, all words of Greek derivation which commence with *r* must be followed by *h*, which they retain in composition.)

The *Myzantha garrula* (Lath.), Vig., seems to be sufficiently distinct in structure from *Manorhina*, to form the type of a genus which will stand as MYZANTHA, Vig. (*restr.*), < *Merops*, Lath., < *Gracula*, Lath., < *Manorhina*, Wagl.; type, *M. garrula* (Lath.), Vig. (*M. cucullatus*, Lath., *G. melanocephala*, Lath., *Manorhina melanocephala*, Wagl.).

Psophodes seems to have much more affinity to the *Crateropodinae* than to the *Manorhininae*.

To the synonyms of *Eidopsarus* add < *Sturnus*, Wagl. The *E. bicinctus*, Sw., is the *Sturnus virescens*, Wagl., which latter specific name has the priority.

I have shown above that the name *Melithreptus* ought to supersede *Drepanis*; therefore the name *Hæmatops*, Gould, may be reinstated.

Mr. Gray seems to be justified in cancelling the name *Opetiorhynchus*, Tem., because it is a mere synonym of *Furnarius*, Vieill.

P. 17. Ought not the name *Philydor*, Spix, 1824, to supersede *Dendroma*, Swains., 1837? I possess specimens of three species of *Philydor*, Spix, in all which the tip of the bill is bent down as in *Dendroma*, Sw., not straight as in *Anabates*, Tem. (*restr.*).

The genus *Oxyrhynchus*, Tem., is a difficult group to classify, but its structure and style of colouring show that it has no affinity to the *Certhiadae*. I am most disposed to place it in or near the *Icterinae*.

The name *Oxyrhynchus* was given by Leach to a genus of fish, in 1818. (See Tuckey's Congo, p. 410.) Ichthyologists must decide whether that genus can stand; but if so, of course a new name must be found for the bird before us, which might be called *Oxyrhamphus*.

According to my observations, the original *Xenops genibarbis* of Illiger (Prodromus, p. 213) agrees with *Neops ruficauda*, Vieill., but is neither the *X. genibarbis*, Tem., nor the *X. genibarbis*, Sw. Temminck's bird should therefore be called *X. hoffmanseggii*, Cuv.; and Swainson's, which he afterwards named *X. affinis*, is the *X. rutilus*, Licht., 1823.

P. 18. Mr. Gray is quite right in making *Gracula cayanensis*, Gm., the type of *Dendrocolaptes*, Herm. (*restr.*), because it agrees with Illiger's definition of that genus; but should not the genus *Dendrocops*, Sw., be united with it? Illiger's character, "rostrum rectum, culmine ad apicem deflexo," applies equally to *Dendrocops*, Sw. *Dendrocolaptes*, as restricted by Swainson, does not agree with Illiger's character, but is a distinct form, which may be included in *Picolaptes*, Less.

For *Ziphorhynchus* and *Zenophasia* write *Xiphorhynchus* and *Xenophasia*.

Climacteris and *Tichodroma* belong to the *Sittinae* rather than to the *Certhianae*, their tails not being scansorial.

P. 19. It appears to me, judging from the *totality* of its characters, combined with its *habitat*, that *Orthonyx* is merely a scansorial form of the *Crateropodinae*, allied to *Psophodes* and *Dasyornis*. I would also place *Menura* in the same region of the Natural System.

Is not the name *Orthonyx temminckii*, Vig., 1826, prior to *O. spinicauda*, Tem.?

I should have rejoiced had the stern laws of priority allowed the appropriate name, *Platyurus*, Swains., to be retained instead of a name so absurdly constructed as *Merulaxis*, Less. Few would discover, without being told, that this word is intended as a compound of *Merula* and *Synallaxis*.

Judging from the description, there seems much doubt as to whether *Sylvia magellanica*, Lath., is the same as *Scytalopus fuscus*, Gould.

For *Microura* write *Micrura*; (*ov* in Greek is always made *u* in Latin).

For *Ramphocænus* write *Rhamphocænus*.

P. 20. *Cyanotis*, Sw., ought certainly, I think, to come next *Regulus*.

For *Cysticola* write *Cisticola* (*Cistus* and *colo*).

Hemipteryx, Sw., should be merged into *Cisticola*, Less. On comparing specimens of *Cisticola schænicola* with *Hemipteryx textrix*, I find that the form of the wings and feet exactly agrees, and the only structural difference is, that the tail of the former is slightly more developed. The wings of *Cisticola* are quite different from those of *Drymoica*, Sw., though Mr. Swainson unites *C. schænicola* under the latter genus.

For *Cincloramphus* write *Cinclorhamphus*.

To the *Malurinae* may be added the following well-marked genus, which I believe has never yet been named:—

SPHENÆACUS, Strickland, 1841 (*σφῆν*, cuneus, and *οἶαξ*, gubernaculum, rectrix), < *Motacilla*, Gm., < *Malurus*, Sw., < *Sphenura*, Licht. Type, *S. africanus* (Gm.), mihi. Levaill. Ois. Af. pl. 112. f. 2. *Sphenura tibicen*, Licht.

The differential characters of the genus are,—Beak much compressed, elevated at the base; culmen nearly straight, slightly curved down at the tip; gonys ascending in nearly the same degree. Tail long, very cuneate; rectrices 12, narrow, pointed, with the webs subdecomposed.

I cannot adopt the name *Locustella avicula*, Ray, instead of *L. Rayi*, Gould. In the first place Ray does not use the word *avicula* as a specific name, and secondly it has been shown above that we ought not to carry the law of priority further back than Linnæus. The authority of the genus *Locustella* rests with Gould, though he very judiciously selected Ray's word *Locustella* for it,

P. 21. I at first thought that the specific name of *Acrocephalus arundinaceus* (L.) would interfere with that of the Reed-Wren (*Motacilla arundinacea*, Gm.); but as there seems to be no doubt that the latter bird is the *Motacilla salicaria* of Linnæus, it will be called *Acrocephalus salicarius* (L.), and the former name may stand.

The name *Regulus*, "Ray," was first used generically by Cuvier.

The earliest specific name of the Wood-Wren is *sibilatrix*, so

named by Bechstein before 1796, when Montagu (not Latham) named it *Sylvia sylvicola*. (See Lin. Trans. vol. iv.) It will therefore stand as *Phyllopnuste sibilatrix* (Bechst.), as Bonaparte has it.

The name *Curruca*, "Briss.," was first used *generically* by Bechstein.

The name *Luscinia*, "Briss.," seems to have been first used *generically* by Bonaparte in 1838, and should therefore give way to *Philomela*, Selby, 1833, unless *Daulias*, Boié, be prior to the latter name.

The type intended by Mr. Gray to illustrate his genus is the English Nightingale, *Philomela luscinia*, Selby (*Luscinia philomela*, Bon.), and not the Greater Nightingale, *Philomela major* (Briss.), mihi.

The *Turdus mindanensis*, Gm., can hardly be the same as *Copsychus saularis*, for Latham (Syn. v. iii. p. 69) describes the breast of *T. mindanensis* as white, and says nothing of white on the tail.

If the true *Copsychus saularis* (Lin.) of India, with four lateral pairs of rectrices white, (*Gryllivora intermedia*, Sw.) should prove really distinct from the Java bird with three lateral pair of rectrices white, (*G. brevirostris*, Sw.) then the synonyms *Turdus amœnus*, Horsf., and *Lanius musicus*, Raff., must be transferred to the latter species, which will then stand as *Copsychus amœnus* (Horsf.).

Ruticilla, "Ray," was first used *generically* by Bonaparte in 1838, and should therefore yield to *Phœnicura*, Sw., 1831.

Cyanecula may stand; but it is Brehm's genus, not Brisson's.

The name *Calliope* was given to a genus of Mammalia by Mr. Ogilby, in December 1836. I am not aware, however, whether this was prior to Mr. Gould's adoption of the name in Ornithology. If *Calliope*, Gould, be retained, the bird should be called *C. camtschatkensis* (Gm.).

P. 22. The earliest *generic* name for the Redbreast is *Erythacus*, Cuv., 1802. The name *Rubecula* was first used as such by Mr. Blyth, at a very recent date.

I should prefer placing *Aedon*, Boié (not *Ædon*) among the *Sylvianæ* rather than the *Vitiflorinæ*. The habits of *A. galactotes*, which I have seen alive in the Morea, are strictly arboreal, and it has a very musical song.

The name *Vitiflora*, though only introduced as a genus by Bonaparte in 1838, may be retained, as Vieillot's name *Ænanthe* was preoccupied in Botany by Linnæus.

The name *Rubetra*, now first introduced as a genus by Mr. Gray, ought not to supersede the old genus *Saxicola*, Bechst., as restricted by Bonaparte.

It is hardly necessary to change the name *Seiurus*, Sw. (N.B. It should be written *Siurus*.) This word seems to be quite sufficiently distinct in sound from *Seisura*, Vig. (which ought to be spelled *Sisura*), not to be confounded with it.

Should not *Trichas* be placed among the *Sylvicolinæ*?

P. 23. *Iora scapularis* ought to bear the name of *I. tiphia* (Lin.).

For *Megistura* write *Mecistura* (from *μηκιστος*). This genus should be placed next to *Parus*.

In the last line *poicilotus* should be written *pæcilotus*.

P. 24. Oppel published his genus *Tanypus* in the 'Mem. Ac. Munich.' in 1812, and his name ought therefore to supersede *Grallina*, Vieill. Meigen used the name *Tanypus* for a dipterous genus, at a later period.

P. 25. *Dasycephala cinerea* is the *Muscicapa cinerea*, Gm., accurately described and figured by Brisson, Orn. Sup. p. 52. pl. 3. f. 3.

The *Formicivora nigricollis* of Swainson is the *Motacilla grisea*, Gm., and *Myiothera superciliaris*, Licht.

Campylorhynchus appears to me to belong to the *Troglodytinæ*, a group so largely developed in South America.

The word *Goldana* seems to be arbitrarily invented without any derivation. The practice of coining *nonsense names*, such as *Viralva*, *Dafila*, *Assimineæ*, *Azeca*, &c., originated with Dr. Leach, and has fortunately not been introduced to any great extent, at least among the higher classes of animals. It is, I think, very objectionable, being contrary to the genius of all languages, and leading the etymologist to waste his time in pursuing a phantom. Many of the names given by the French school are sufficiently absurd, yet they generally exhibit an attempt at etymology, and are therefore far more rational than these nonsense names. Every generic name when first proposed ought to be accompanied with an explanation of its etymology.

Mr. Gray changes the name *Grallaria rex* (Gm.) to *G. varia* (Bodd.), on the ground of priority. It becomes a question, however, whether the Latin names given by Gmelin to Buffon's species, may not be held to have acquired a prescriptive right from the length of time that they have been used in the science. There is no doubt but that Boddaert's names for Buffon's birds, as well as Scopoli's names for Sonnerat's, were prior by some years to Gmelin's 'Systema;' but they were published in works of such confined sale, that they never became current. To go back to these names *now* would be to alter the nomenclature of several hundred species after it has been established half a century. All this difficulty and confusion arises from the practice which has prevailed in France from the days of Buffon, and which Latham unfortunately followed, of describing new species by a vernacular name unaccompanied by a scientific one. The result is, a race among systematists to be the first to give Latin names to such species, the original describer loses the credit of having his name recorded, and the species themselves are loaded with a heap of nearly contemporaneous synonyms.

[To be continued.]

XLIX.—Report of the Results of Researches in Physiological Botany made in the year 1839. By F. J. MEYEN, M.D., Professor of Botany in the University of Berlin*.

[Continued from p. 336.]

I HAVE given a special description of the development of structure in the leaves of *Ficus elastica*†, and drew attention to some phænomena visible in this and in similar plants. I showed the development of the cuticular glands and their stomata, and found that the whole respiratory system, viz. the intercellular passages, with the more or less regular air-cells and respiratory cavities in the substance of the leaf, are first developed when the stomata make their appearance, and that as these are more fully developed the glandular hairs (which at an early stage are seen on the whole surface of the leaves of *Ficus elastica*) die off. All these subjects are fully explained by a series of drawings. The large masses of crystals which one finds in the large cells, chiefly under the epidermis of the upper surface of the leaves of *Ficus elastica*, are formed in a most peculiar manner on the surface of a club-shaped mass of gum, which is developed in the epidermal end of those large cells, and which grows downwards into the centre of the cell. These bodies, which I call for the sake of distinction "Gum-clubs" (gummikeulen), are of very different forms in the different species of *Ficus*; in some they are found only just under the upper surface, in others on the lower surface, and in some, indeed, they are found exclusively in that position. The delineations give the most exact description of the form, development, &c. of these formations. The species of the genus *Ficus* have generally firm and shining leaves, and the epidermis is then generally composed of several layers of cells; they are, however, all formed out of the outer layer which covers the leaf at the time when the formation of the cuticular glands and stomata commences; in one species a simple division of these cells takes place, in others the division is repeated, but one soon sees that all these layers belong together and form the true epidermis, on which account I should propose in such cases the name epidermal layer. It is thus explicable why the epidermal layer on the leaves of some species of *Ficus* have only two layers of cells, and that the layer on the lower surface, as, for instance, in *Ficus bengalensis*,

* Translated from the German, under the direction of the Author, and communicated by Henry Croft, Esq.

† Meyen's Beiträge zur Bildungsgeschichte verschiedener Pflanzentheile. —Müller, Archiv für Anatomie und Physiologie, &c., 1839, 255. mit 3 Quarttafeln.

Ficus pyriformis, consists of a single stratum of cells. We see by this that the type of formation remains the same in all the species of a genus, and that the modifications exhibited by different species in their structure are only to be explained by the more or less advanced degree of development; the same is seen in the hairs and glands on the leaves of the various species of *Ficus*; in some they remain during the whole life of the plants; in others, on the contrary, they fall off earlier or later.

At the same time I brought forward a series of examples, to show that in different plants and in different parts, cellular formations entirely different may be developed. The cell formation, on occasion of the development of the spores out of the original spore (motherspore), will be specially mentioned hereafter, as also the formation of the large cells by the appearance of transverse partitions in the embryo-sac of *Viscum album*; but besides these I mentioned the following cases:—During the formation of both cells of the cuticular glands, a longitudinal partition passes through the middle of the mucous nucleus, which is seen in the middle of the primitive cell of the future gland, and after the production of both cells a nucleus is formed in the middle of each of them. During the formation of the glands on the young leaves of *Ficus elastica*, I observed the radial arrangement of the cells lying near the primitive cell of the glands (mothercell); moreover, the further changes up to the perfect development of the gland with its stoma, the cavity belonging to it, &c. &c., were observed and delineated. In the club-formed and glandular hairs with which the young leaves of *Ficus* are covered, I observed that the formation of cells, by means of partitions, was preceded by separation or dissolution of the growing masses in the interior; but in some cases I saw that a partition passed through such a mass, and that sometimes cells were formed in the interior of the hair without the presence of such masses. In the tubes of *Mucor mucedo* I saw spiral formations as in the *Spirogyræ*, but in the case of *Mucor* they are colourless and extremely tender, and moreover not always present. Sometimes a portion of these spiral deposits separates from the sides and forms a bladder, which, at first, lies loose in the cavity of the tube, but afterwards attaches itself to the side, and partly causes its absorption, so that at last the new cell appears as a perfectly independent one connecting the neighbouring ends of the tubes.

Moreover, observations were made on the development of the *Ceramium diaphanum*, which are perhaps not altogether devoid of interest, but of which an extract cannot well be

given. Finally, the curious increase by continued regular division was explained in the case of that small Alga which I have denominated *Merismopedia punctata*, a plant which Ehrenberg has erroneously reckoned among animals. The regular position of the small ellipsoidal cells of this plant in fours instantly strikes the observer, and the propagation of these takes place by their regular division, which by observing different individuals may soon be seen in all its different stages. The new cells group themselves always in fours, and are surrounded by a tender gum-like substance.

In the Botanical Society of London* Mr. Daniel Cooper made known some experiments he had made to see whether coloured fluids entered into plants which were watered with them; the experiments were made without the author's being aware of what had been done previously. Three pots with large beans were taken, two were filled with mould and one with common sand, and all were watered with the same quantity of fluid, but the water which was used for the pot filled with sand was strongly coloured with madder. The result was that the coloured fluid did not pass into the plants, which were not at all changed by the operation. Mr. Cooper had placed one of the pots with mould in a dark place; he brought the grown-up plant into the light, and saw that the leaves first became lax and then died; and the same was the case with the other pot, which had been allowed to stand in the open air and was then brought into the dark; in this case also death finally ensued.

At the same time Mr. Cooper made known an observation of Mr. Wilkinson, who had observed that a potatoe which had fallen into a well twelve feet or more deep, grew out of it in order to reach the light. According to other observations, the length of a potatoe stalk grown in a cellar has been found to be twenty feet, on attaining which length it reached the window.

PHENOMENA OF GENERATION IN PLANTS.

1. *In the Phanerogamic Plants.*

In the former Report I could only give a very imperfect account of M. Wydler's† research on the formation of the embryo in the genus *Scrophularia*, for up to that time the treatise was unpublished. M. W. made his observations on

* Proceedings of the Bot. Society of London, &c. With Plates. London, 1839.

† Recherches sur la Formation de l'Ovule et de l'Embryon des Scrofulaires.—Bibliothèque Universelle de Genève, Oct. 1838.

Scrophularia nodosa, aquatica, betonicæfolia, peregrina, and vernalis; he first gives his observations on the formation of the placenta and of the ovulum, which agree with the ideas at present held on the subject. Until the formation of the integument the ovulum is straight, but it afterwards becomes bent. In *Scro. betonicæfolia* M. Wydler remarked that the nucleus as it protruded from its integument became hollow, and the cavity became covered with a membrane which represented the embryo-sac; but he could not distinguish whether this membrane was a new product, nor whether the cavity of the nucleus extended as far as the point; sometimes it could be distinctly seen that the end of the nucleus was closed. The description of the development of the stigma of the *Scrophularineæ* is also very clear and accurate; he states that the conducting tissue of the style is nothing more than the inner and modified epidermis of the involute fruit-leaf. M. Wydler observed the fructification to take place by means of a pollen-tube which entered into the micropyle; he also saw two or even four pollen-tubes enter at the same time, and correctly derives the appearance of several embryos from this circumstance, but adds that out of four young embryos only one comes to maturity. In regard to the act of fertilization, M. W. is evidently a follower of the new theory; but he admits that he has not been able to observe the action of the pollen-tube when it enters into the ovulum; but on this the whole hypothesis depends.

It seemed to M. W. that the embryo-sac was open at its end and communicated by a straight canal with the micropyle, for he often observed that the pollen-tube entered into the embryo-sac without this latter being indented. In the action of the seeds the presence of spiral fibres in the interior of the cells was observed; in a young state the cells contained grains of fecula, which vanished as the seeds became ripe, and here and there drops of oil made their appearance, and fibres were formed on the inner walls of the cells.

M. Wydler draws a number of conclusions from the above observation, in which I not only do not agree, but against which I can bring forward important facts. Concerning the hypothesis that there are not two sexes in plants, and that the anthers may be compared to the ovarium, we have spoken at full in the former Report and elsewhere; and M. W.'s observations on the changes which take place in the pollen-tube after its entrance into the nucleus are so imperfect, that we can draw no conclusion from them. M. Wydler has not been able to distinguish the pollen-tube from the suspensor of the embryo; he speaks of the formation of cells in the former, but he evi-

dently means the suspensor of the embryo. All that I have said in the 3rd volume of my 'Vegetable Physiology' against Dr. Schleiden's theory of fertilization, applies in an equal degree to that of M. W., and I therefore refer my readers to the former Report, &c. &c.

Since then MM. Mirbel and Spach* have also opposed the theory of Schleiden; they have made observations on the development of the embryo in *Zea Mays*, and have confirmed the results thus obtained in many other grasses, as in *Euchlæna mexicana*, *Coix Lacryma*, *Tripsacum hermaphroditum*, *Sorghum vulgare*, &c. &c.

MM. Mirbel and Spach observed the complete development of the ovulum and the ovarium, and have given full descriptions accompanied by figures; they consider the formation of the above-mentioned cavity as the first appearance of the embryo-sac in the end of the nucleus, and call the gum contained therein "amorphous cambium." Finally, the transparency of this gum disappears, and in the cavity of the nucleus there is seen a proportionately large tube, egg-shaped and transparent; this was called "utricule primordiale;" at the upper end (chalaza end) it is furnished with a slender elongation, on which small cells are fastened in the form of a compound raceme; at the lower end it terminates in a thread-shaped tubular appendage, which extends into the endostomium, and may be compared to the suspensor in other plants. It is shown that this primordial or primitive tube is not produced by a depression of the embryo-sac, for the *Gramineæ* have no embryo-sac at all.

Soon after the appearance of the primitive tube they remarked in it the formation of a "cambium globulo-cellulaire," which consisted of globules, in each of which there is a central cavity. This cambium forms finally a mass of cellular tissue, which fills the cavity of the tube and the supporter, which latter becomes larger and longer. This primitive tube being filled with cellular tissue is the young embryo, which, as the authors say, no one will doubt; the upper end thickens, spreads itself out like a blunt-headed lance and becomes the hypoblast of Richard, while the lower end exhibits for some time the lax thread or supporter. These gentlemen have convinced themselves long since that the formation of the primitive tube takes place before the action of the pollen, and that it is quite independent, that it is produced *in* the nucleus and does not descend into it. Schleiden evidently took this

* Notes pour servir à l'Histoire de l'Embryogénie Végétale.—Compt. Rend., Mars, 1839; Annales des Sc. Nat. 1839, I.

tube for the end of the pollen-tube which had penetrated into the nucleus.

The raceme of small cells which crowns the primordial tube at the upper end has been overlooked by Schleiden, and MM. Mirbel and Spach state them to be abortive primordial tubes.

The results of the observations are too evident to require any very full explanation. According to them, the fertilization of *Zea Mays* takes place neither according to the new nor the old theory: the observations are quite unfavourable to the new view; for the tube which produces, or is changed into the embryo, does not come into the nucleus from without, but is formed in it and at a distance from the pollen. How the fertilization takes place, MM. Mirbel and Spach show they are quite ignorant. The observations of these gentlemen were so very different from my own former ones, that I was obliged to convince myself of their correctness*. I examined the female flowers of the *Zea Mays*, and not only found the above discoveries perfectly correct, but was fortunate enough to be able to add some new observations. I saw that the extremity of the primitive tube was always closed and never in communication with the pollen-tube; the primitive tube becomes embryo, and out of the ovoid cells at the lower (chalaza) end is produced the scutellum, which grows more or less over the whole embryo in the form of a folding leaf; out of the small lower cleft of this scutellum there hangs the radicular end of the embryo, and exhibits the half lifeless string of cells which formed the supporter at the end of the primitive tube. I have often succeeded in extricating the little embryo from the imperfectly formed scutellum.

Afterwards M. Mirbel† acknowledged that his discovery of the primitive tube, out of which the embryo was formed, was erroneous; he convinced himself that this utriculus is the true embryo-sac in which the embryo and the albuminous body are formed; and according to this also the error into which I have fallen must be corrected; it was caused by my trusting more to these observations than to my own, which had been made previously.

[To be continued.]

* Meyen, Noch einige Worte uber den Befruchtungsakt und die Polyembryonie bei den höheren Pflanzen. 2 Steintafeln. Quarto. Berlin, 1840. p. 21.

† Rectification d'une erreur commise dans les "Notes pour servir à l'Histoire de l'Embryogénie Végétale."—Annales des Sci. Nat., Avril, 1839. Part. Bot. i. p. 381.

L.—*Notices of British Fungi*. By the Rev. M. J. BERKELEY, M.A., F.L.S.

[With Five Plates.]

[Continued from p. 365.]

HENDERSONIA.*

Perithecia intus strato prolifero sporas longas septatas edente vestita.

208. *Hendersonia elegans*. On culms of the common reed. Tansor, Norths. April, 1838. Forming little dark brown spots, in the centre of which is seated a single shining perithecium, the upper part of which causes a little projection above the surface. Perithecia lined with a gelatinous stratum, which gives rise to long broadly fusiform pedunculate colourless spores, with from 6—8 dissepiments. Articulations sometimes swollen, often quite even; each of the central ones containing a single large globose nucleus, with occasionally a few granules. Some of the spores are abortive.

This most interesting and well-characterized genus I have named after my friend Mr. J. Henderson, who has made many additions to the list of British Fungi, and who is a most indefatigable and accurate botanist. It is allied to the genus *Diplodia*, but is well distinguished by the more highly developed spores, which are colourless and pellucid.

TAB. XI. fig. 9. *a*, culm of reed with *H. elegans*, nat. size; *b*, a small portion of a horizontal section magnified; *c*, spores; *d*, nucleus; *e*, abortive spores, highly magnified.

209. *Geaster fimbriatus*, Fr. Syst. Myc. vol. iii. p. 16. Norfolk. Rev. R. B. Francis, whose plant was supposed at the time of the publication of the English Flora to be *G. rufescens*, a much more common species. A single specimen has also been found by Mr. Churchill Babington at Clifton, near Nottingham.

210. *Lycoperdon saccatum*, Schum., Fr. Syst. Myc. vol. iii. p. 35. In a boggy meadow at Hayes, Kent. Miss Read, from whom I have an admirable drawing.

*211. *Elaphomyces granulatus*, Fr. Syst. Myc. vol. iii. p. 58. *E. asperulus*, Vitt. Mon. Tub. p. 69. t. 4. fig. 6. Vittadini has shown that this genus belongs to the same group as *Tuber*. I find the structure of the fruit in both our species to agree, except that in the present the sporidia are much larger. The central substance when young is tender and juicy, and consists

* Other species of this genus are included in Corda's *Sporocadus* = *Diplodia* + *Hendersonia*, &c.

The name *Sporocadus*, though appropriate to true *Diplodiæ*, cannot be used for the species now separated under the name of *Hendersonia*.

of filaments spotted with fertile patches. The filaments of the interstices are loose and but little complicated, whereas those of the fructifying spots are more closely packed, short and branched, their tips swelling and gradually giving rise to large globose utricles, which contain about four sporidia, and very much resembling those of *Anthoceros*, as represented by Mohl. Each sporidium has two membranes, and in the centre is a globose nucleus. While in the utricles the sporidia are far less coloured than after their escape. They appear to me to be perfected, when free, by the imbibition of the surrounding nutriment. The same I believe takes place in *Bovista* and *Lycopodon*, and in many of the dark-coloured *Hypomyces*.

PLATE. XI. fig. 10. *a*, a filament from fertile patches which produce the utricles; *b*, a portion of one of the patches at a later stage of growth with utricles and sporidia; the sporidia in the utricles are still nearly colourless; *c*, a single sporidium of *E. muricatus*; *d*, ditto of *E. granulatus*. All highly magnified.

*212. *E. muricatus*, Fr. Syst. Myc. vol. iii. p. 59. *E. variegatus*, Vitt. l. c. p. 68. t. 4. fig. 4. Found with the last. This differs not only in the more muricated surface, but essentially in the substance of the coriaceous covering, being variegated with brown dots, and in the smaller size of the sporidia.

*213. *Physarum hyalinum*, Pers., Fr. Syst. Myc. vol. iii. p. 139. Lambley, Notts.

214. *P. utriculare*, Chev., Fr. l. c. On wood. King's Cliffe.

215. *P. lilacinum*, Fr. Syst. Myc. vol. iii. p. 140. The only specimen I have seen of this elegant species was found by my pupil Mr. Charles Wing, on the smooth bark of a fallen oak twig in Westhay Wood, King's Cliffe, Nov. 1838.

216. *P. atrum*, Fr. Syst. Myc. vol. iii. p. 147. On fallen oak branches, King's Cliffe. And a much smaller variety on cabbage stalks.

217. *Stemonitis pulchella*, Bab., Abst. Linn. Trans. 1839. Minutissima, hypothallo notabili fusco; peridiis sparsis evanidis; stipite breviusculo, deorsum incrassato, apicem non attingente; capillitio purpurascete ovato-oblongo vix ventricososo; sporidiis purpureo-fuscis. On *Pteris aquilina*, Barden Hill, Leic. Mr. Churchill Babington, Sept. 1837.

Extremely minute, not 1 line high, scattered with a transparent horn-brown hypothallus; peridium extremely evanescent; stem vanishing a little below the apex, giving off filaments on every side; the free part rather short, smooth, dark, slightly incrassated below; capillitium ovato-oblong, purplish brown; sporidia purple brown.

TAB. XII. fig. 11. *a*, *S. pulchella*, nat size; *b*, a single plant, magnified;

c, a portion of the capillitium with sporidia; *d*, appearance of the sporidia when dry. The two last highly magnified.

218. *Trichia Neesiana*, Corda, fasc. 2. f. 288. Apethorpe, Norths. My plant is certainly that of Corda, which is distinguished by the echinulate elaters; and it is also exactly the same as specimens from Mougeot in Sir W. J. Hooker's Herbarium, marked *Trichia rubiformis*, Fr. Whether Fries's plant is really distinct, I am unable to say. Corda figures it as having smooth elaters.

219. *Onygena piligena*, Fr. Syst. Myc. vol. iii. p. 208. On a piece of old flannel amongst larch trees in heathy ground. Sherwood Forest, Notts.

220. *Perisporium Arundinis*, Desm. ! exs. n. 329. On leaves of reeds and their sheaths. Tansor, Norths. Spring.

221. *Isaria puberula*, n. s. Minuta, puberula, rubella; stipite recto; ramulis paucis simplicibus; apicibus clavatis. On decayed flowers of dahlia. Apethorpe, Norths.

About 1 line high; stem straight, slender, with generally three short obtuse branchlets given off from the same point; occasionally the stem is forked, but in this case I have not seen the second division branched. The whole plant is of a reddish-gray hue, and is mealy, with little granules and flocci.

TAB. XII. fig. 12. *a*, *I. puberula*, nat. size; *b*, ditto, magnified.

222. *Cephalotrichum curtum*, n. s. Sparsum; capitulis subglobois, æneo-fuscis; stipite brevi 1—2 septato fusco; floccis apicalibus, ramosis scabriusculis; sporis globosis. On leaves of Carices, both on the upper and under side, with *Torula graminis*, on the margin of a pond. Collyweston, Norths.

Extremely minute. Stem short, brown, even, with 1—2 septa, very slightly thickened at the base; heads globose or sometimes broadly ovate, bronzy-brown; threads springing in a little tuft from the top of the stem, forked or ternate, with one or two short acute branchlets, slightly scabrous. Spores globose, with a small globose nucleus, smooth. Distinguished from *C. macrocephalum* by its smooth spores, articulated stem, and scattered habit, in which two latter points it differs also from *C. rigescens*. *C. flavo-virens* does not properly belong to the genus.

TAB. XII. fig. 13. *a*, *C. curtum*, nat. size; *b*, a single plant magnified; *c*, ditto, more highly magnified, the greater part of the sporidia having been washed away; *d*, portion of one of the threads; *e*, sporidia with their nuclei.

223. *Stilbum aurantiacum*, Bab. in Abstr. of Linn. Soc. Trans. 1839. Subfasciculatum, aurantiacum; stipite glabro infra obscuriore; capitulo subclavato; sporidiis oblongis, ob-

tusis, subtruncatis. On an elm twig. Grace Dieu, Leic. Mr. Churchill Babington. Very near to the foreign *S. lateritium* and *S. cinnabarinum*, with which it forms a distinct group. It is less fasciculate than either, and is of a brighter colour. Receptacle composed of subdichotomous filaments, crowned with abortive sporidia, which are about one-third shorter than those which are perfect. Perfect sporidia oblong, obtuse, almost truncate.

TAB. XII. fig. 14. *a*, *S. aurantiacum*, nat. size; *b*, ditto, magnified; *c*, filaments of the receptacle which arise from the stem, with abortive spores; *d*, sporidia, both highly magnified.

224. *Phycomyces nitens*, Kze., Myc. heft 2. p. 113. t. 2. f. 9. *Byssus olivaceus*, Winch, Fl. Northumb. p. 121. in Trans. of Newcastle Nat. Hist. Soc. 1831. On the walls of an oil-cellar. Newcastle. Mr. Winch. I have been enabled to determine the above synonym by the assistance of Dr. Johnston, in whose collection, which has been kindly submitted to my inspection, there is a specimen.

225. *Mucor succosus*, n. s. Minutissimus; hyphasmate spongioso; sporangiis minutissimis globosis flavis, dein olivaceis; columellâ minutâ. On the cut surface of stumps of *Aucuba Japonica*, which had been killed by frost. May, 1838. Apethorpe, Norths. Forming small pulvinate orange-ochre spongy masses, which, while there is an abundance of nutriment, do not fructify; but when gathered, produce a forest of exceedingly minute globose yellow sporangia, not indeed visible to the naked eye, which at length become olive. Columella very small, and little more than a slight swelling of the top of the stem.

TAB. XII. fig. 15. *a*, *M. succosus*, slightly magnified; *b*, threads from the barren plant; *c*, *d*, fertile flocci; *e*, sporidia; *f*, granules and an abortive sporangium from the barren plant, more or less highly magnified.

226. *Sporocybe nigrella*, n. s. Minutissima, nigra, stipite simplice, tenuissimo, articulato; sporidiis globosis glabris. On dead leaves of grass. King's Cliffe, Leicestershire. Mr. Churchill Babington. Extremely minute, not one-fourth of a line high, dark black. Stem slender, with 4—5 articulations; heads globose; sporidia globose, smooth, with a globose nucleus. The whole plant is dark, so that it requires a good light to see the articulations of the stem, which are, however, very evident. It is very near to *Periconia atra*, Corda; but the stem of that species is figured as closely annulated, a structure quite at variance with that of the present species; and the sporidia appear to be less transparent. I suspect that under a very superior microscope they would appear very minutely scabrous, but I am not certain whether this is the case; and

perhaps it may be the same with *Cephalotrichum curtum*; but under a magnifier of 600 diameters I cannot see this clearly enough to make it part of the specific character.

TAB. XIII. fig. 16. *a*, *S. nigrella*, nat. size; *b*, *c*, single plants; *d*, sporidia, highly magnified.

*227. *Sporocybe alternata*. *Aspergillus alternatus*, Berk., Ann. of Nat. Hist., vol. i. p. 262. This species, on more mature reflection, certainly belongs to the genus *Sporocybe*, as the sporidia are not arranged in moniliform threads.

228. *Sporocybe lobulata*, n. s. Atra, filis proliferè ramosis; ramulis subalternis attenuatis; apicibus 4—5 lobulatis; sporidiis ellipticis, echinatis lævigatisque, binucleatis. On a coarse linen cloth on a heap of rubbish. King's Cliffe.

From the articulated creeping mycelium spring slender very minutely scabrous threads, branched proliferously; ramuli often alternate, attenuated, their apices swelling into a pyriform 4—5-lobed receptacle, from which spring elliptic sporidia, some of which are echinulate, others smooth with two nuclei.

Nearly allied to the last, but it is at once distinguished by the lobed tips of the branchlets. It appears also to have a great resemblance to *Stachybotrys atra*, Corda, but the lobes are not so distinct; neither are they mammillate, and the sporidia have no true septum. There is a species of *Periconia* (= *Sporocybe*, Fr.), figured by Corda, with a lobed receptacle, but very different in other respects.

TAB. XIII. fig. 17. *a*, Portion of *S. lobulata*; *b*, a portion of one of the threads; *c*, one of the lobed tips; *d*, sporidia: all highly magnified.

229. *Helicosporium vegetum*, Nees. Syst. p. 68. f. 69. On decayed oak branches. Morehay Lawn, in Rockingham Forest, Norths.

*230. *Helminthosporium Tiliæ*, Fr. Syst. Myc. vol. 3. p. 361. Dr. Greville's figure does not give a good notion of this plant, which is certainly an *Helminthosporium*. Besides the filiform and clavate flocci, there are distinct oblong biseptate sporidia, supported by a minute peduncle.

TAB. XIII. fig. 18. *a*, flocci; *b*, sporidia: highly magnified.

231. *H. folliculatum*, Corda, Ic. fasc. 1. t. 3. fig. 180. On stems of umbelliferous plants and cabbage-stalks. King's Cliffe.

232. *H. obovatum*, n. s. Floccis subulatis, multi-articulatis, subæqualibus; sporidiis obovatis, fuscis, biseptatis. On old planks exposed to wet.

Forming a short dense velvety-black stratum; flocci very slightly attenuated, subulate, either nearly straight or slightly flexuous. Sporidia broadly obovate, with two dissepiments,

which divide them into three very unequal articulations. This species is clearly new, differing from all in the very remarkable form of its sporidia.

TAB. XIII. fig. 19. *a*, *H. obovatum*, nat. size; *b*, flocci and sporidia; *c*, a single sporidium, very highly magnified.

233. *H. delicatulum*, n. s. Tenuissimum; filis subulatis multi-articulatis; sporidiis oblongis, obtusis, 4—5-septatis, pellucidis; articulis interdum septo verticali instructis. On stems of umbelliferæ. King's Cliffe.

Forming very delicate soft patches of scattered filaments, presenting to the naked eye a cloudy black spot. Flocci very slender, subulate, multi-articulate, brown, paler at the tips. Sporidia nearly colourless, oblong, with the apices very obtuse, consisting of about five swollen articulations, one or two of which have occasionally a vertical dissepiment.

TAB. XIII. fig. 20. *a*, *H. delicatulum*, nat. size; *b*, flocci and sporidia; *c*, a portion of one of the flocci; *d*, sporidia. All more or less highly magnified.

*234. *Dematium hispidulum*, Fr. Syst. Myc. vol. iii. p. 366. *Sporodum conopleoides*, Corda, fasc. iii. tab. 1. fig. 22. On dead grasses. Common. An excellent figure of this plant is given by Corda under the name quoted above, but he does not refer to *Dematium hispidulum*. From the middle of the flocci spring one or two obovate joints, which support two or three rows of sporidia, of which those at the apices are the largest. We have, therefore, something like the structure of *Penicillium*, but the plant belongs to a different series, and the genus of Corda is probably a good one. It is quite certain that Fries's genus *Dematium*, as it at present stands, cannot be retained, but it is well to be cautious about making new genera, where the affinities are obscure, and till all the species, or at least the greater part of them, have been correctly observed.

235. *Macrosporium concinnum*, n. s. *Helminthosporium striæforme*, Corda, fasc. 1. p. 13. Maculis pulverulento-velutinis, nigris; floccis flexuosis, articulatis, fuscis; sporidiis obovatis, pedicellatis, demum oblongis. On the decorticated twigs of an old hamper made of some species of ozier. Ape-
thorpe, Sept. 1840.

Spots elongated black. Flocci minute waved, brown below, pellucid above, often with the rudiment of a branch at the apex. Sporidia obovate, with about three principal dissepiments, which are divided vertically or obliquely; furnished with a very short pellucid peduncle. This peduncle at length vanishes, and they lose their obovate form and become oblong.

TAB. XII. fig. 21. *a*, *M. concinnum*, nat. size; *b*, flocci and sporidia; *c*, a sporidium germinating; *d*, sporidia in various stages of growth. All more or less magnified.

*236. *Arthrinium Puccinioides*, Kz., Myc. heft 2. p. 103. *Torula Eriophori*, Berk. Eng. Fl. vol. v. part 2. p. 309. An inspection of my plant with higher magnifying powers than I possessed at the time of the publication of the concluding volume of the 'English Flora,' shows that it is certainly that cited above, and exactly agreeing with Desmazières' published specimens. In neither are the sporidia very distinctly angular, and by no means in so high a degree as Corda represents them. They are nearly of the shape of two cones placed base to base, which gives them an angular outline. I find them as Corda does, attached in whorls, at the dissepiments.

237. *Aspergillus aurantiacus*, n. s. *Nematogonum aurantiacum*, Desm. ! Ann. d. Sc. Nat. n. s. vol. ii. tab. 2. fig. 1. On elm bark. Apethorpe, Norths. Having found this very curious production in every stage of growth, I am enabled to state that it is certainly a true *Aspergillus*, very nearly allied to *A. aureus*. When in perfection the threads are simple, and the sporidia attached in moniliform rows to a larger one at their base. It has, however, a great tendency to become proliferous, especially when it has been beaten down by the weather; in which case new threads proceed from the swollen receptacles, forming a more or less intricate mass. In one instance I saw a few short spicules on one of the receptacles, marking, I suppose, the situation of the chains of sporidia.

TAB. XIII. fig. 22. *A. aurantiacus*, highly magnified.

*238. *Botrytis lateritia*, Fr. Syst. Myc. vol. iii. p. 402. In an early stage of growth the sporidia are contained in a large globose sporangium; it accords therefore with *Stachylidium* rather than *Botrytis*. *Botrytis allochroa* is probably the same thing, as is also apparently *Acrostalagmus parasitans*, Corda.

239. *Botrytis destructor*, n. s. Grisea, sparso-effusa; floccis vix septatis erectis, ramis alternis, ultimis furcatis, uncinatis et divaricatis; sporidiis obovatis basi valde attenuatâ. On the leaves of various species of *Allium*. Spring. Very common and destructive in some years, preventing the plants which are attacked from coming to perfection. The individual threads are distinct, but form large patches on the leaves, or even entirely cover them. Flocci erect, not septate, branched alternately; ultimate ramuli forked and uncinata, or divaricate. Sporidia seated on the tips of the ultimate ramuli. Nearly allied to *B. parasitica*, of which there are many forms or allied species, but distinguished easily from all by the peculiar shape of the sporidia.

TAB. XIII. fig. 23. *a*, a plant of *B. destructor*; *c*, portions of ditto; *b*, spores. All more or less magnified.

*240. *B. terrestris*, Pers., Myc. Eur. 1. p. 38. *Stachylidium terrestre*, Fr. Syst. Myc. vol. iii. p. 391. The sporidia are seated singly on the tips of the ramuli, the plant therefore is not a true *Stachylidium*.

Tab. XIV. fig. 24. *B. terrestris*, highly magnified.

241. *Penicillium subtile*, n. s. Minutissimum, niveum; hyphasmate serpente, tenuissimo; floccis fertilibus erectis, simplicibus vel ternatis; catenis sporidiorum lato-ellipticorum paucis. Clothing the inside of an old willow. Tansor, Norths. Spring.

Extremely minute and delicate, presenting to the naked eye nothing more than a white mealy bloom. Hyphasma creeping; fertile threads mostly simple but sometimes ternate, giving off a few chains of rather large broadly elliptic sporidia, each furnished at either end with a little apiculus.

Very distinct in the form and size of the sporidia from any with which it might be confounded.

Tab. XIV. fig. 25. *a*, threads of *P. subtile*; *b*, two sporidia. Both more or less highly magnified.

242. *Dactylium obovatum*, n. s. Candidum, pulvinulatum; floccis tenuissimis simplicibus; sporidiis obovatis apicalibus subbinis obovatis uniseptatis. On twigs of willow in a damp place. King's Cliffe. Forming minute white tufts springing up about the ostiola of some *Sphæria*. Flocci erect, simple, not articulated, at least as far as I have observed, bearing at their apices one or two broadly obovate uniseptate shortly pedicellate sporidia.

This differs from *Dactylium roseum* (*Trichothecium roseum*, Auct.) in its sporidia not being constricted, and the absence of any tint of rose-colour.

Trichothecium roseum is certainly a *Dactylium*. Nothing can be more unnatural than to make it a *Puccinia*, as Corda has done; with which genus it has scarcely any affinity.

Tab. XIV. fig. 26. *a*, tuft of *D. obovatum*, magnified; *b*, flocci and sporidia; *c*, sporidia. Both more or less highly magnified.

243. *Dactylium sphaerocephalum*, n. s. Album; hyphasmate tenui, decumbente; floccis fertilibus erectis, supra plus minus ternatis; capitulis subglobosis 10—12 sporis; sporidiis oblongis brevissimè pedicellatis 3-septatis. On dead twigs of ivy. Lambley, Notts.

Forming a thin white stratum, with the heads visible to the naked eye. Hyphasma decumbent, branched, articulated; fertile flocci erect, articulated, naked below, above branched in a more or less ternate manner; branchlets slightly swollen

at the base, attenuated above. Sporidia forming subglobose heads attached by very short peduncles, oblongo-elliptic, tri-septate.

A most elegant species, to which the figure does not do justice. It is white in every stage of growth, by which it is distinguished, and by the large heads of distinctly septate sporidia.

TAB. XIV. fig. 27. *a*, *Dactylium sphærocephalum*, nat. size; *b*, tuft of ditto, magnified; *c*, a sporidium highly magnified.

*244. *Oidium leucoconium*, Desm. ! Fr. Syst. Myc. vol. iii. p. 432. This species, *O. erysiphoides* and *O. monilioides*, are, I have no doubt, the early stages of various species of *Erysiphe*.

245. *Fusisporium udum*, n. s. Late effusum, tremellinum; sordidè aurantiacum; floccis hyphasmatis decumbentibus, parcè ramosis; sporidiis longis, curvulis, 3—5 septatis, utrinque acutis. On trees in spring. King's Cliffe.

Forming a broad tremelloid mass wet with the overflowing sap, composed of slightly branched decumbent filaments, some of which are closely septate, others contain a series of globose nuclei, while others are quite simple. Sporidia 3—5 septate elongated curved, acute at either end, the contents of the articulations orange. In age the septa are absorbed, and there is a row of irregular nuclei.

TAB. XIV. fig. 28. *a*, flocci and sporidia, magnified; *b*, sporidia, highly magnified.

246. *F. Betæ*, Desm. ! exs. n. 305. Ann. d. Sc. Nat. vol. xix. tab. 18. On beet root. Apethorpe.

247. *F. Georginæ*, Kl. ! exs. n. 186. On roots of dahlia. Apethorpe.

248. *F. album*, Desm. ! n. 929. On dry but green leaves of the oak. Milton, Norths. Moug. and Nest. n. 894. is this species, and not the true *F. griseum* of Greville.

249. *Fusarium lateritium*, Nees, Fr. Syst. Myc. vol. iii. p. 470. On *Sophora Japonica*. Milton. Mr. Henderson. On willow, King's Cliffe. On lime, Burleigh, Norths.

*250. *Melanconium bicolor*, Nees, Fr. Syst. Myc. vol. iii. p. 488. *Didymosporium elevatum* is certainly only a form of this species. In Fries's specimens in Scler. Succ. the sporidia are not didymous, neither are they in Dr. Greville's plant. More modern microscopes show clearly that the supposed septum arose from an optical deception caused by the presence of the nucleus. The plant again of Carmichael, referred to *M. sphæroideum*, Lk., is a form of the same species.

251. *M. sphærospermum*, Lk., Fr. Syst. Myc. vol. iii. p. 489.

On reeds. Tansor, Norths. At present I have found only a very few specimens.

252. *Torula Plantaginis*, Corda, Ic. fasc. 3. tab. 1. f. 14. On leaves of Plantains. Stibbington, Hunts., 1828. I find exactly the same barren creeping threads of a perfectly distinct structure from the torulose threads as Corda. I suspect that further observations will show that this fungus has distinct sporidia. At present, however, it must remain in the genus *Torula*.

253. *Puccinia Galiorum*, Lk., Sp. vol. ii. p. 76. Dr. Johnston finds a beautiful variety on *Asperula odorata*.

254. *Æcidium Pedicularis*, Loboschutz. *Cœoma Pediculariatum*, Lk., Sp. vol. ii. p. 47. Near Berwick. Dr. Johnston, Sept. 1839. Only a very few specimens of this interesting species occurred.

255. *Æ. Asperifolii*, Pers. Syn. p. 208. On *Boraginæ*. Berwicks., Dr. Johnston.

256. *Uredo hypodytes*, Schlecht., Kl. exs. 83. Spittal Links. Berwicks., Dr. Johnston, who informs me that he has in vain looked for specimens this year, though it was very abundant when he first met with it.

LI.—*Notes on British Char*, *Salmo Umbla*, Linn., *S. Salvelinus*, Don. By WM. THOMPSON, Vice-Pres. Nat. Hist. Society of Belfast.

HAVING within the last few years, through the kindness of friends and correspondents, been favoured with specimens of Char from various localities in the British Islands, I shall here give some notes made upon them.

It may first be mentioned, that so late as the years 1835 and 1836, when the excellent volumes of Mr. Jenyns and Mr. Yarrell appeared, neither author had seen any Char from Ireland* or Scotland, and the original observations contained in their respective works were necessarily limited to examples of the fish from the lakes of England and Wales. In the Edinburgh Philosophical Journal for January 1835 (vol. xviii. p. 58), Sir Wm. Jardine noticed the *Salmo alpinus* as taken by his party in Sutherlandshire.

* When I supplied Mr. Yarrell with the published localities in Ireland for the Char, as noticed in his work, I had not seen any native examples of the species. In the Supplement to his 'British Fishes' (1839, p. 27), this author has offered a few remarks on Char sent him by Lord Cole from Loughs Eask and Melvin in Ireland—these are considered to be examples of the *S. Umbla*, Linn., and *S. Salvelinus*, Don.

The chief object of my inquiry was to learn whether, in the lakes of Ireland and of those in Scotland* from which I could procure specimens, the *S. Salvelinus*, Don, was to be found; and at the same time to ascertain, at least for my own satisfaction, whether its characters have sufficient permanency to entitle it to rank as a distinct species. As they are merely crude unfinished notes that are to follow, I shall here give the result of the investigation, that the reader may be in possession of it without entering into the details. In a fresh state I have had the opportunity of examining Char from three localities—Windermere (England), Lough Melvin (Ireland), and Loch Grannoch (Scotland); and either in spirits or preserved dry, from nine other lakes in Ireland and Scotland. The examination of these examples leads me to believe that the *S. Umbra*, Linn., and *S. Salvelinus*, Don, are but one species; one however that, like the *Salmo Fario*, is subject to extraordinary variety. In one lake the male fish can at a glance be distinguished from the female either by colour or by the many characters which are comprised under “form.” In another, so similar are the sexes in every external character, that without the aid of dissection they cannot be determined. In size we find the species ordinarily attain twice the length and several times the weight † in one lake that it does in another, although the area of their waters is of similar extent; indeed, in some of the largest lakes, this fish will be found not to attain near the size it does in some others which are but as pools in comparison—there are, however, various influences which account satisfactorily for such differences. In the form of the body again we find the species, and when in equally high condition, to be in one lake herring-like, and in another approximating the roundness of the Eel. So manifold are the differences presented by the Char now before me from various localities, that it would be tedious and perhaps useless to point them out in every case, and consequently this will only be attempted when they are remarkably striking, or particularly demand attention.

Oct. 25, 1836.—Through the kind attention of Captain Fayrer, R.N., I today received two specimens of Char from Loch Grannoch, Kircudbrightshire. On comparing them critically with the detailed descriptions of our British Char given by Yarrell and Jenyns, they were found to be both their

* The fine work of Sir Wm. Jardine on the Scottish *Salmonidæ* was not at the time announced.

† That the quantity of ova produced will vary accordingly, is illustrated by the difference between the number found in the Loch Grannoch and the Lough Melvin fish.

species, and likewise the *S. alpinus* and *S. Salvelinus* of Donovan's British Fishes*. On thus finding that a small loch produced the two supposed species, and that the examples were of different sexes, I endeavoured to procure a number of individuals for the purpose of ascertaining if the difference were sexual; but this fish is taken during so short a period, that in this object I was disappointed for that year. In a letter upon the subject from James Stewart, Esq., of Cairnsmere, Newtown-Stewart (Wigtonshire), to Capt. Fayer, dated Nov. 1, 1836, it was observed—"I lost no time in despatching my men early yesterday morning to Loch Grannoch, though I must confess with very slight hopes of success in the object of their pursuit. The Char are never found in our lakes before about the 13th October, and in ten days again they disappear—the whole produce of the day's exertions amounted only to four very small fish." These were not considered worth sending forward. The object of the inquiry being made known to this gentleman, he at the same time remarked—"If my evidence is worth anything, I can give it with great confidence as to the Red Char [*S. Salvelinus*, Don.] being the male, and the Gray the female [*S. alpinus*, Don.] of the same species. I have noticed them frequently, when taken out of the water, eject the milt and roe, and never saw the former from a gray, or the latter from a red fish." I subsequently availed myself of Mr. Stewart's kindness in offering to procure specimens. On the 17th of October, 1838, "a dozen of the red and the same number of the gray fish," caught late that day in Loch Grannoch, were sent me by this gentleman, and being packed with great care, reached Belfast in excellent condition for examination on the morning of the 20th—the following observations were then made upon them.

These two dozen specimens—of the full size produced in this lake—are all from 7 to 8 inches in length, and the females generally somewhat shorter than the males. The difference in form between the sexes (as proved by dissection), both generally and particularly, is very great. The dorsal and ventral profile of the male fish are alike, the slope being similar from head to tail above and below: the female has the dorsal line much straighter, and the ventral much more convex than the male—a difference to be expected at the spawning season, and which would be less conspicuous at other times. The lower jaw of some of the males is slightly turned

* At the Meeting of the British Association held at Newcastle in 1838, the two examples from Loch Grannoch were shown to my friends Mr. Yarell and Mr. Jenyns, both of whom looked upon them as representing their two species.

up and hooked; the head in this sex is very much larger in every part than in the female, and the size of the fins is much greater.

The males, though differing in intensity of colour, may be described as lilac-black or dusky, relieved by a lilac tinge on the uppermost third of the body, viewed lengthwise, from the dorsal ridge, becoming however gradually paler from this part; the middle of the sides is lilac-gray, beautifully and somewhat closely marked with round scarlet spots about a line in diameter; the lowest portion of the sides is of a salmon-coloured scarlet without spots. The head and the dorsal fin are dusky, with a lilac tinge; the pectorals dusky above, tinged with scarlet beneath where they rest upon the part of the body which is of this colour; the ventrals are bright scarlet, with occasionally a dusky longitudinal band inside the margin, which is white; the anal fin dusky, tinged with scarlet—in all; the ventrals and the anal fin have a white margin, and some have the lower lobe of the caudal fin likewise of this colour: two or three individuals have a tinge of red on the caudal fin. Donovan's *description* of the colour of *S. Salvelinus* agrees admirably with the present specimens.

The females in *colour* somewhat resemble Donovan's *S. alpinus*: the uppermost third of the body, viewed lengthwise, from the dorsal ridge, is dusky, relieved by lilac, becoming gradually paler downwards, so that the middle of the sides presents a dull lilac—this part is adorned with numerous round spots of similar size to those in the male, but less bright in colour; some however are scarlet, but they are chiefly either pink, or of a dull chalky pinkish hue, as represented in Donovan's *S. alpinus*; the lowest portion of the sides is of a silvery lilac, without spots. The fins are all dusky, with a tinge of lilac; the margin of the ventrals, of the anal, and occasionally of the caudal fin, is white, as in the males—there is no regular spotting on the dorsal fins, as represented in Donovan's figures of his two species. The dorsal fins of the males are nearly all blackish, occasionally towards the tip transparent, which those of the females generally are, and in one or two individuals of the latter sex an approximation to spots may be faintly traced. One only of the males and a few of the females exhibit transverse markings along the sides like the "Par," but not so conspicuously. On *dissection*, the milt (of the ordinary white colour) and roe (of an amber* hue)

* This is the general colour; some are of a very pale yellow; the ova of both colours are of similar size.

are found to be just ready for exclusion: a small portion of both has been indeed shed by a few individuals. A specimen $7\frac{1}{2}$ inches in length weighs with the ova $2\frac{1}{4}$ oz., the ova separately $\frac{1}{2}$ an oz. and $1\frac{1}{2}$ drachm. On accurately reckoning these ova, which are 2 lines or $\frac{1}{6}$ th of an inch in diameter, they amount in number to 482—this I should say, or 500 for round numbers, is the average produce of the species in this lake. The example was selected out of seven females as of average size, and the ova as of average quantity. The air-bladder is in both sexes of a beautiful reddish lilac colour, like the inside of some species of North American *Unio*, as *U. pyramidatus*, Lea, &c. The stomach and intestines of the greater number (13 were cut up) were empty, but a few contained the remains of food which could not be satisfactorily determined—it consisted either of minute aquatic insects or entomostracous crustacea, more probably the latter. When boiled, the flesh of the male was of a rich salmon colour, that of the female a very little paler in hue.

Nov. 16, 1838.—To the kind attention of Viscount Cole I am indebted for twelve Char from Lough Melvin (partly in the county Fermanagh), sent immediately after capture. In the accompanying note, dated Florence Court, 15th November, His Lordship remarked—“I can procure you any number you wish, as the people are now taking them in cart-loads. The flesh of such as I send is white and soft, and different from what that of Char is in any other lough.”

These specimens, which are in a fresh state and excellent condition for examination, are all from 10 to 12 inches in length, and differ greatly from those of Loch Grannoch, in presenting little or no beauty of appearance. The upper half of the body, in both sexes, is of a dull blackish lead colour, unrelieved by spotting in any but three or four individuals, which exhibit a considerable number of minute spots which are merely of a paler shade than the surrounding parts, and consequently inconspicuous; for more than half the space between the lateral line and ventral profile they are dull lead colour, without any spots except in the individuals just noticed; the lower portion of the sides varies in individuals from a pale to a rich salmon colour, which latter is seen in only one or two examples. The dorsal fins are of a uniform gray and transparent; in some, when closely examined, there appear roundish spots of a paler colour; pectorals dusky gray, darker towards the tips, except at the lower portion, which, partaking of the colour of the part of the body in which it rests, is of a pale pinkish white; ventrals in the brighter-coloured individuals with a white marginal line; in the duller-coloured examples

this does not appear, but all have the two or three first rays and their connecting membrane dusky, and the remainder red, and of a deeper hue than on any part of the body: anal fin partaking at its base of the colour of the part of the body to which it is attached, dusky towards the tip; white margin to the first ray in some of the brighter-coloured specimens only: caudal fin gray, of different shades in all; in the brightest individual varied with red, which appears at the base of the lower lobe.

The males are generally more gracefully formed than the females, and most of them rather brighter in colour, but there is no external character so strikingly different as to lead to a certain knowledge of the sex; some of the largest finned are females—in the Loch Grannoch Char the males had much the larger fins, and the sex was as unerringly distinguished by the colour as by the form, the accuracy of the distinction in both cases being established by dissection. Both sexes of the Lough Melvin fish represent the Welsh Char.

The colour of the flesh when boiled was rather pale, between the “sienna yellow” and “flesh-red” of Syme’s Nomenclature of Colours; no difference of colour in that of the sexes. The milt and roe were in these specimens ready for exclusion. The ova severally reckoned from a fish 11 inches in length, and which had not shed any, were 959 in number, and of a pale yellowish colour—the ova generally, though equally mature, were lighter coloured than in the Loch Grannoch Char; they were of the same size, 2 lines in diameter.

The remains of food were found in only one out of the twelve specimens, and appeared to be a portion of the case of a cad-dis-worm. The vertebræ, as reckoned in two specimens, male and female, were 60 in number*.

Lord Cole informs me that this fish is called “Freshwater Herring” at Lough Melvin, though in the same part of the country the term “Char” is applied to the more ordinary state of the species as taken in other lakes. Its differing from the so-called Char, in being an insipid bad fish for the table, and pale in the flesh, is the chief reason of its being considered distinct from it. It will, however, be seen in the following pages, that the term “Freshwater Herring” is applied to the Char of several of the lakes in Connaught, and from one of which an example before me is identical with the fish of the English lakes. Examples of the Lough Melvin

* The vertebræ reckoned in a male and female of the Loch Grannoch fish were in the former 60, and in the latter 62 or 63—this must be considered an accidental variation.

Char, taken at the same time as those just noticed, were sent by Lord Cole to Mr. Yarrell, and in the Supplement to this author's 'History of British Fishes' (p. 27) are noticed as identical with the Welsh species.

London, May 1840.—During the latter half of this month I had the opportunity of seeing quantities of Char from Windermere exposed for sale at Mr. Groves's, the well-known fishmonger in Bond Street. On examination they differed much from each other in size of fins: their colour was precisely that of the Lough Melvin fish; and, like it too, the flesh of specimens I bought in the last week of the month was pale-coloured and soft—they were now in such bad condition that Mr. Groves ceased to purchase them*.

So far, the examples of Char treated of were examined when fresh. The following, after being preserved in spirits or in a dry state, have been received from the under-mentioned Scottish lakes:

L. INCH—which is one of the localities for Char noticed by Pennant. Hence two fine specimens, about 14 inches in length, were kindly sent me, in May 1837, by Professor Allen Thomson of Aberdeen. They would be called the "Northern Char." The stomach of one of these was crammed with food, consisting of insect larvæ, entomostracous crustacea, a small *Notonecta* or Boat-fly, bivalve shells of the genus *Pisidium*, and minute gravel. Its cæca were 38 in number.

L. CORR and L. KILLIN, INVERNESS-SHIRE. From these lakes examples of Char were brought me by my relative Robert Langtry, Esq., of Fortwilliam, near Belfast, on his return from Aberarder, after the sporting season of 1838. The Loch Corr specimen—a "Northern Char"—is in beauty of colour, and elegance combined with strength of form, the finest example I have seen; it is of a fine deep gray on the upper parts, becoming lighter towards and below the lateral line, about which it is adorned with white spots; on the lower portion of the sides it is silvery, and beneath of the most brilliant red. This specimen is 16 inches in length, and, with another of similar size, was taken by my friend when angling with an artificial fly, on the 25th of September. The other, which was eaten, was excellent and high-flavoured, the flesh

* When at the inn at Waterhead, at the northern extremity of Coniston Water, during a tour to the English lakes in June 1835, a number of Char from this lake were kept alive by our host in a capacious wooden box or trough, into which a constant stream of water poured. They were fine examples of the species, about a foot in length. Here I was informed that a supply of this delicate fish was always kept up, that the "curious" visitor might gratify his taste at any season by having fresh Char set before him at the rate of ten shillings for the dozen of fish.

firm and red. Loch Corr is described to me as a deep mountain-lake or basin, less than a mile in length, with rocks rising precipitously above it at one part; at another it is shallow and sandy, and here this fish is taken in some quantity when spawning. A beautifully clear river issues from the lake. About fifteen miles from Loch Corr is Loch Killin, situated in the pastoral vale of Stratherrick. Three specimens of Char have thence been brought me. They are remarkably different from the L. Corr example, are of a clumsy form, have very large fins like the Welsh fish, and are very dull in colour—of a blackish leaden hue throughout the greater part of the sides, the lower portion of which is of a dull yellow; no red appearing anywhere. So different indeed is this fish from the Char of the neighbouring localities, that it is believed by the people resident about Loch Killin to be a species peculiar to their lake, and hence bears another name—“Haddy” being strangely enough the one bestowed upon it. This fish is only taken when spawning, but then in great quantities, either with nets, or a number of fish-hooks tied together with their points directed different ways. These, unbaited, are drawn through the water where the fish are congregated in such numbers, that they are brought up impaled on the hooks. The largest of my specimens is 16 inches in length, and others of similar size were brought to my friend at the same time—on the 26th or 27th September, when about a “cart-load” of them was taken. The flesh of some was “white and soft. They contained ova the size of peas*.” On dissection my specimens were found to be male and female—externally the sex could not have been told with certainty. Their stomachs and intestines were empty. This fish bears a resemblance to the Lough Melvin Char, but differs from it in some characters. It will have been remarked that, in accordance with the Irish fish, the sexes present little difference externally either in form or colour, that their flesh is soft and insipid and very pale, and that neither is designated *Char*. The remarks of Lord Cole on the L. Melvin fish, and of Mr. Langtry on the L. Killin one, were in every respect similar. To the latter gentleman the dozen of L. Melvin fish were shown the day they were received, and in colour, &c., they were pronounced just the same in appearance as the L. Killin fish in an equally fresh state.

In the following instances the CHAR OF IRELAND have

* At this very time, the Char from the neighbouring Loch Corr were in high condition. This is one out of numerous instances which might be adduced respecting the different period of spawning in contiguous localities.

been noticed:—In Camden's 'Britannia' it is remarked—"Lough Esk, near Townavilly [co. Donegal], yields the Char in great abundance: a most delicate fish, generally about 9 inches long." (Gough's ed. vol. iii. p. 644.) I have seen a specimen from this locality in Mr. Yarrell's collection; it was supplied to him by Lord Cole, and is noticed in the Supplement to his 'British Fishes' (p. 27) as *S. Umbla*. Smith, in his 'History of Waterford,' p. 208, observes—"In these mountains [Cummeragh] are four considerable loughs, two of which are called by the Irish Cummeloughs, and the other two Stilloges, the largest of which contains about five or six acres. In these loughs are several kinds of trout; and in the former is a species of fish called Charrs, about 2 feet long, the male gray-, the female yellow-bellied; when boiled the flesh of these Charrs is as red and curdy as a salmon, and eats more delicious than any trout. It is remarkable that this kind of fish is often found in such lakes situated in mountainous places, as we learn from Dr. Robinson's Natural History of Westmoreland and Cumberland." In the British Zoology of Pennant (vol. iii. p. 409, ed. 1812) it is mentioned on the authority of "Dr. Vyse, an eminent physician and botanist at Limerick, that the Charr is found in the lake of Inchigeelagh, in the county of Cork, and in one or two other small lakes in this neighbourhood." In Dubourdiou's History of the county of Antrim (vol. i. p. 119) there is a communication from Mr. Templeton on the Char of Lough Neagh, illustrated by a figure; it is here stated to be the same as the Char of Windermere, as distinguished from the *S. Salvelinus*, Don. Mr. Templeton here informs us that this fish is taken in L. Neagh "from the end of September to the end of November in nets along with Pollans [*Coregonus Pollan*]. They always keep the deep water, except in warm weather, when they are sometimes found in the shallow. The best time for taking them is in nights that are calm, clear, and a little frosty; the capture of the Pollans begins to fail sooner than that of the Whiting,"—the name by which the Char is known at this lake. It is likewise remarked, that "the Whiting is generally about 12 inches long, though I have seen one of 15." Again, in his Catalogue of 'Irish Vertebrate Animals' (Mag. Nat. Hist. vol. i. new series), Mr. Templeton observes,—“In a lake of the county of Donegal, near Dunfanaghy, I observed some boys catching small Char with lines and hooks baited with common earthworms. * * * In L. Eaghish †, in the county Monaghan, I have known them caught agreeing exactly in their

† Incorrectly printed "Esk" in the Magazine.

colour with those of L. Neagh." In two of the localities just noticed the Char have become very scarce, it may be, even extinct. In February 1839, I was informed by Mr. G. J. Allman, of Bandon, that in the lakes at the source of the river Lee—those alluded to in the 'British Zoology'—celebrated till within the last ten years for their fine Char, and which were abundant, that they are not now to be procured, and are nearly, if not altogether destroyed. Their destruction is attributed by anglers and the people of the neighbourhood to the Pike, this voracious fish having much increased of late years—the natural haunts of the Pike and Char are, however, very different. When visiting some of the fishing stations at Lough Neagh, in September 1834, I was told by the fishermen about Crumlin, Antrim, Toome, &c., that they have not known any Char to be taken in the lake for at least ten years, although about twenty years ago they were abundant. Subsequently I was informed by a most intelligent man, now resident in Belfast, but who lived for a long period at Glenavy, on the shore of L. Neagh, and spent much time in fishing, that Char were abundant at the period just mentioned; he has seen five hundred taken at one draught of the net, and this not in the breeding season. A part of the lake, which was the deepest (36 fathoms) within his range of fishing, was called the Whiting-hole, from being the chief haunt of this species. In 1837 I offered a handsome reward for a Lough Neagh Whiting, but it was in vain that the fishermen of Glenavy endeavoured to procure one, although the once-favoured haunts of the species were tried, including the Whiting-hole. The fishermen at a second station tried with no better success.

The cause of its disappearance from such a vast body of water as is contained in this lake, or at least from its old haunts there, I cannot pretend to explain; one fisherman questioned on the subject did, however, and without hesitation, account for it by saying, that "they once went down the river Bann to the sea, and never came back again."!

From the following Irish lakes, in addition to Loughs Melvin and Eask already mentioned, I have seen examples of Char:—

L. KINDUN, county Donegal. A specimen taken by Mr. Wm. Marshall, of Belfast, when fly-fishing here, at the end of June 1837, was kindly submitted to my examination. In length it was $8\frac{1}{2}$ inches, and agreed with the "Northern Char." In an accompanying note it was stated that "its stomach contained numerous small worms."

L. GARTAN, county Donegal*. Hence, on July 18, 1838, I was favoured with a specimen by John Vandeleur Stewart, Esq., of Rockhill, Letterkenny. This gentleman remarked at the same time, that it was taken with the fly about five weeks previously, and that there are a great many Char in the lake, which is seven miles distant from Letterkenny. It is 10 inches in length, and a fine example of the "Northern Char"—the spots, which are numerous, are nearly all below the lateral line.

L. DAN, county Wicklow†. From this lake several Char have been kindly sent me by my friend Mr. R. Callwell, of Dublin. None are above $7\frac{1}{2}$ inches in length; they present some of the characters both of the Northern and Welsh Char, but appertain more to the former. In February 1839, Mr. George Smith, of Baggot Street, Dublin, informed me, that in summer, four or five years since, he, when using small showy flies (with which they are often captured here), took thirteen Char in this lake within half an hour; the water was very rough—they were all taken within the space of two yards, though he fished to some little distance on every side. In the summer of 1838 this gentleman saw about a dozen Char lying dead and much swollen on the banks of Lough Dan. Mr. Smith has, within the last few years, seen Char about 15 inches long caught in Llanberris lake in North Wales. It will be remembered that Pennant mentions this fish as once found here, but as entirely destroyed by the mineral streams from the copper mines contiguous to the lake.

LOUGHNABRACK, county Longford. In Mr. R. Ball's collection is a Char from this locality.

L. CORRIB, county Galway. I have been favoured with an example from this extensive lake by Mr. W. R. Wilde, who states that Char are captured here in great quantity (especially about Cong) in draught-nets along with Salmon throughout the season for taking this fish—from the 1st May to the 12th August. It is commonly called here *Murneene*, and by those who give an English name, "Freshwater Herring." These names are applied to the Char in three lakes in the county Mayo, and from all of which Mr. Wilde has seen specimens. The example from L. Corrib is $13\frac{1}{2}$ inches in length, and would be called the Northern Char—in a dry state, and after being preserved for some time, it is in all respects identical with my specimens from Windermere.

A few very brief remarks may be offered in conclusion. It

* When visiting Lough Derg in this county, in the autumn of 1837, I was assured that Char are abundant in it.

† In the lake of Luggela, in this county, the Char is likewise taken.

would appear that the differences here noticed in the Char are chiefly induced by *locality*, but this, in itself, is rather an effect than a cause. The cause is, I conceive, based on geological influences, as the "formation" in which the lake inhabited by this fish is situated, and whether there be a prevalence of rock, gravel, sand, or peat—if fed by springs or a goodly river, and if the latter the formation through which it flows—the depth of water, &c. According to these features, the quality of the water, and the minute animals constituting the food of the Char will vary, and the latter not only in the quantity produced, but in species. According to its food the external appearance of this fish is influenced, as well as the flavour and colour of its flesh. No proper comparison, again, can in any respect be made between the Char of different localities unless the examples be in similar condition, and which, as before mentioned, they sometimes are not in adjacent lakes at the same period of the year. A great deal might be said on the manifold influences affecting this species, but it is for my friends, the authors of the two great works now in progress—M. Agassiz in his 'Freshwater Fishes of Central Europe,' and Sir W. Jardine in his 'Scottish Salmonidæ'—to descant upon them.

When my attention was first given to this subject, I intended to enter fully into the history of the Char as a British species. This would now be superfluous, and I content myself with contributing the rough notes made upon the subject, as ere long we shall doubtless have before us, in the works just mentioned, a most ample history of the *Salmo Umbla*.

LII.—*A List of Mammalia and Birds collected in Assam by John McClelland, Esq., Assistant Surgeon in the service of the East India Company, Bengal Establishment: revised by T. Horsfield, M.D., V.P.L.S., &c.*.*

[Concluded from p. 374.]

Order II. INSESSORES, Vigors.

Tribus FISSIROSTRES, Cuv.

Fam. MEROPIDÆ.

Genus NYCTIORNIS, Swains. Zool. Illust. II. Pl. 56.

9. *Nyctiornis Athertonii*.

"Toes much longer than the tarsi; outer ones united to the last

* Communicated by Dr. Horsfield to the Zoological Society of London, Oct. 22, 1839, and extracted from the Proceedings of the Society.

joint, and the inner to the first joint: beak compressed, arched equally from the forehead, and terminating in a point formed by both mandibles: nostrils concealed with feathers: body seven, tail five inches long."—*McClelland's MS.*

Fam. HIRUNDINIDÆ.

Genus HIRUNDO, Auct.

10. *HIRUNDO BREVIROSTRIS.* *Suprà nigricans nitore olivaceo; subtùs fuscescens, alis elongatis; caudâ mediore subfurcatâ; rostro brevissimo.*

This species agrees with *Hirundo fuciphaga* in habit, in proportional length of wing, and shortness of beak, and in colour above; but it is darker underneath, and more than one third larger: entire length six inches.

11. *Hirundo Jewan*, Sykes, Proceed. Zool. Soc. 1832, p. 83.

The specimens of this bird sent from Assam by Mr. McClelland agree in all points with those discovered in Dukhun by Col. Sykes.

12. *HIRUNDO BREVICAUDATA.* *Suprà fusca; subtùs cana; uropygio albido; caudâ brevissimâ subæquali.*

This species has the general physiognomy of the *Hir. concolor*, Sykes, but it is considerably smaller, of a lighter tint, and without the white spots on the tail which mark that species,

Fam. TODIDÆ.

Genus EURYLAIMUS, Horsf.

13. *Eurylaimus lunatus*, Gould, Trans. Zool. Soc. of London, I. 175.

The specimens forwarded by Mr. McClelland from Assam agree with those preserved in the Museum of the Zoological Society, which have been examined and marked by Mr. Gould.

14. *Eurylaimus Dalhousiæ*, Jamieson, Edin. New Phil. Journ., vol. 18, p. 389. *Psarisomus Dalhousiæ*, Swainson, Cab. Cyclop. Birds, Vol. II. 261. Royle's Illustr., Part VI. Pl. 7.

Eurylaimus Psittacinus, Tem. Pl. Col. 598.

- Eurylaimus (Crossodera) Dalhousiæ*, Gould, 'Icones Avium,' Part I. Aug. 1837.

"Above grass-green, beneath light bluish-green; throat yellow; crown velvet-black, with blue and yellow spots; quills black on their inner margins, but anteriorly light blue in the middle of the wings; tail slender, light blue above, beneath black; length nine inches."—*McClelland's MS.*

Fam. HALCYONIDÆ.

Genus ALCEDO, Linn.

15. *Alcedo Bengalensis*, Gmel. Linn. I. 450. Little Ind. Kingfisher, Edw.

16. *Alcedo rudis*, Linn. I. 181. Black and White Kingfisher, Edw.

Genus HALCYON, Swains.

17. *Halcyon Smyrnensis*. *Alcedo Smyrnensis*, Linn. I. 181.18. *Halcyon leucocephala*, Gmel. Linn. I. 456.

Tribus DENTIROSTRES, Cuv.

Fam. MUSCICAPIDÆ.

Genus PHÆNICORNIS, Sw.

19. *Phœnicornis princeps*. *Muscipeta princeps*, Gould's Cent. of Himal. Birds, Pl. VII.20. *Phœnicornis brevirostris*. *Muscipeta brevirostris*, Gould's Cent., Pl. VIII. The male.21. PHÆNICORNIS ELEGANS. *Capite elongato, sincipite admodum compresso; capite, collo, dorso summo, alis, rectricibusque duabus mediis nigris; corpore subtus, dorso imo, fasciâ latâ alarum, maculis paucis apud remiges secundarios, rectricibusque laterilibus aurantio-coccineis.*

The character given by Mr. Gould of the *Phœnicornis* (*Muscipeta*) *princeps*, as far as regards the nature and distribution of its colours, applies also to the *Ph. elegans*, but the latter is somewhat less in size, while it is chiefly distinguished by the flatness of the crown, which brings it nearly on a plane with the upper mandible. Mr. McClelland has given on one sheet a comparative view of the *Phæn. elegans, princeps*, and *brevirostris*, in order to illustrate the form of the head in each species, and the depression of the sinciput in *Phæn. elegans*, in which its essential difference consists.

22. PHÆNICORNIS AFFINIS. *Capite colloque suprâ cum regione interscapulari griseis; collo subtus gastræo, dorso imo, maculis tribus alarum, rectricibus interioribus ad basin exterioribus totis flavis: alis caudâque in medio nigris.*

"The male is larger than the female, and distinguished from her by a yellow band on the forehead between the eyes."—*McClelland's MS.*

Mr. Gould has figured this bird as the female of *Phæn. brevirostris*, but by annexing a mark of interrogation to the specific character, has indicated his doubt respecting the correctness of his determination, or its being really a distinct species. This doubt has now been explained by the researches of Mr. McClelland in its native country.

Genus MUSCICAPA, Auct.

23. *Muscicapa melanops*, Vigors, Proceed. Zool. Soc. 1831, 171; Gould's Cent. of Himal. Birds, Pl. VI.24. MUSCICAPA? CAPITALIS. *Capite suprâ tectricibus primariis, rectricibusque suprâ atris; maculâ suboculari utrinque ad occiput productâ albâ; subtus, dorso lateribusque colli saturatè fuscis; crisso et uropygio canis.*

The distinctive character of this species rests on a very concise description of Mr. McClelland, accompanied by a drawing: no perfect specimen was found in the collection. Length five inches.

Genus RHIPIDURA, Vigors & Horsf.

25. *Rhipidura fuscoventris*, Frankl., Proceed. Zool. Soc. 1831, 117, Broad-tailed Fly-catcher, Lath. ?

Genus CRYPTOLOPHA, Swains. Nat. Lib. Ornith. Vol. X., Fly-catchers.

26. *Cryptolopha poiocephala*, Sw., loc. cit. p. 200. Pl. XXIII. *Platyrrhynchus Ceylonensis*, Swains. Zool. Illust., I. 13.

Fam. LANIADÆ, Vigors.

Genus ARTAMUS, Vieill.

27. *Artamus leucorhynchos*, Vieill. *Lanius leucorhynchos*, Linn. Mantis. (1771) p. 524.

Genus DICRURUS, Vieill.

28. *Dicrurus grandis*. *Edolius grandis*, Gould, Proceed. Zool. Soc. 1836, p. 5.

Several specimens of this bird received from Assam agree with the specific character and description given by Mr. Gould (as above cited) in all points excepting the size, being about one-third smaller; but further observations are required to determine with precision the points by which the long-tailed *Edolii* are to be discriminated.

29. *Dicrurus Rangoonensis*. *Edolius Rangoonensis*, Gould, Proceed. Zool. Soc. 1836, p. 5.

One of our specimens agrees accurately with Mr. Gould's specific character; in two others the crest is less developed, and the lanceolated plumes on the throat are less prominent.

30. *Dicrurus Balicassius*, Vieill., Enc. Méth. Ornith., 751. *Corvus Balicassius*, Linn. Syst. I. p. 155. *Le Drongo Balicasse*.

31. *Dicrurus æneus*, Vieill., Enc. Méth. Ornith., 751. *Le Drongo Bronzè*.

Genus TRICHOPHORUS, Temm.

32. *Trichophorus flaveolus*, Gould, Proceed. Zool. Soc. 1836, p. 6. "Yellowish-green above, with a tinge of brown on the wings and tail; beneath bright yellow: crested with narrow feathers, becoming progressively longer from the nostrils to the crown; bill strong, compressed, and slightly hooked; cheeks and nucha scantily covered with feathers. Eight inches long."—*McClelland's MS.*

The specimens sent from Assam agree with those contained in the Museum of the Zool. Society from the Himalaya, which are the originals of Gould's description.

Genus COLLURIO, Vigors.

33. *Collurio nigriceps*, Frankl., Proceed. Zool. Soc. 1831, p. 117. Indian Shrike, Lath.

"Crown, nape, tail, and wings black; throat and breast white; body and secondaries reddish-gray. Length nine inches."—*McClelland's MS.*

34. *Collurio erythronotus*, Vigors, Proceed. Zool. Soc. 1831, p. 42. Gould's Century of Himal. Birds, Pl. XII. fig. 2.

"This species, as found in Assam, compared with the figure in Gould's Century of Himalayan Birds, is considerably smaller, and the colours more dull in the Assam than in the Himalayan bird. I am therefore disposed to think that the species has here reached its south-eastern geographical limit, as the *Irena puella* may be supposed in Assam to have reached its northern limit."—*McClelland's MS.*

Genus HYPSSIPETES, Vigors, Proceed. Zool. Soc. 1830-1, p. 43.

35. HYPSSIPETES MCCLELLANDII, Horsf. *Suprà olivaceo-viridis; capite subcristato vinaceo-fusco, plumis albicante strigatis; subtùs vinacea, abdomine pallidiore; gulá albidá, plumis laxis lanceolatis; rostro flavicante.*

"Head brown; body and tail above yellowish-green; beneath vinaceous-gray, the tints of the abdomen being lighter. (Plumes of the throat white, lanceolate, and straggling, being bedded in a bluish down.) Inner vanes of the quills brownish-black; tarsi slender, and rather short. Length nine inches."—*McClelland's MS.*

36. *Hypsipetes psaroides*, Gould's Century of Himal. Birds, Pl. X.

37. HYPSSIPETES GRACILIS. *Suprà olivaceo-cinerea, crisso pallidiore; subtùs ex diluto cinnamomeo albicans; capite summo atro; remigibus primoribus atris, vexillis exterioribus tenuiter cano marginatis, secundariis canis margine nigro; reatricibus ex diluto olivaceo canescentibus, fasciá latá subterminali nigrá in exterioribus gradatim latiore.*

This species deviates slightly from the character of *Hypsp. psaroides*, the type which served for the definition of the genus, and gradually approaches that of *Kittacincla* of Gould.

Genus GRAUCALUS, Cuv.

38. GRAUCALUS MACULOSUS. *Cærulescenti-canus, alis caudáque saturatioribus obscuro olivaceo nitentibus; reatricibus exterioribus albo apiculatis.*

"Olive-black on the wings and tail; body above dark olive-gray, with light gray longitudinal streaks on the feathers under the throat, and light wavy lines on the abdomen and vent; outer tail-feathers with white tips. Length eight and a half inches."—*McClelland's MS.*

Fam. MERULIDÆ.

Genus IANTHOCINCLA, Gould, Proceed. Zool. Soc. 1835, p. 187.

39. IANTHOCINCLA GULARIS. *Capite suprà pectoreque cærulescenti cinereis; notæo, abdomine, femoribus, reatricibusque exterioribus lætè cinnamomeis in aurantium vergentibus; dorso saturatioribus; reatricibus intermediis nigricantibus; strigá aterrimá a rostri basi sub oculos ad regionem paroticam productá; gulá tarsisque flavicantibus; rostro nigro.*

"Head ash-gray, with a black band passing along the eyes; throat yellow; breast gray; rest of the body light olivaceous-brown, inclining to reddish-yellow; beak compressed, arched above a little more than below, depressed at the point; tarsi strong, longer than the

middle toe, and yellow; wings rather short and round."—*McClelland's MS.*

This bird, although greatly resembling the *Ianthocincla albogularis* of Gould, is clearly distinguished from that species by the yellow colour of its throat, by the absence of the white tips to the exterior tail-feathers, by its yellow tarsi, and by the brighter orange shade of its general tint.

40. *Ianthocincla pectoralis*, Gould, Proc. Zool. Soc. 1835, p. 186.

"Above greenish-brown, beneath yellow and white, irregularly intermixed. A black band extends over each eye, descending on the sides of the neck, unites (from each side) in front of the neck; throat yellowish-white; lower tail-feathers tipped with white; beak compressed, slightly arched above; upper mandible projecting and slightly depressed at the tip; tarsi high and strong."—*McClelland's MS.*

41. IANTHOCINCLA LUNARIS. *Cinnamomeo-olivacea, capite summo caudaque nigricantibus; fronte, gutture pectoreque in medio atris; lunulâ insigni collari a regione parotidâ gulam versus extensâ crissoque latè ferrugineis.*

"Dark olive; throat and lores black, bounded posteriorly by a light brown crescent; vent and a few clouds on the abdomen of the same colour; tail blackish; wings short, and chiefly concealed beneath the downy plumage of the back; tarsus strong, longer than the middle toe; beak arched beneath, compressed, slightly denticulated, but not hooked. Length nine inches."—*McClelland's MS.*

Genus ORIOLUS, Auct.

42. *Oriolus melanocephalus*, Gmel. Linn. I. 383. Black-headed Oriole, Lath.

43. *Oriolus Traillii*. *Pastor Traillii*, Gould's Cent. Himal. Birds, Pl. XXXV.

Genus IRENA, Horsf.

44. *Irena Puella*, Horsf., Linn. Trans., XIII. p. 153. *Coracias Puella*, Lath. Ind. Orn. 171.

Genus IXOS, Temm.

45. IXOS MONTICOLA. "Above grayish-brown; crown black and crested; throat and abdomen white; vent scarlet; lower tail-feathers tipped with white; wings short; body four inches, tail three inches long, and square; a scarlet ring about the eye, but no red tuft beneath this organ; by the latter circumstance it differs from *Ixos jocosus*.

"Inhabits the Kossia mountains, and usually seen in numerous flocks, flying from tree to tree in quest of insects. Their note is shrill and inharmonious, not unlike that of the sparrow."—*McClelland's MS.*

Further observations are required to determine the rank of this bird as a distinct species, or as a variety of *Ixos jocosus*.

46. *Ixos Cafer*. *Turdus Cafer*, Linn. I. 295. *Le Curouge*, Le Vaill.

Genus TIMALIA, Horsf.

- 47.
- Timalia pileata*
- , Horsf., Linn. Trans., XIII. p. 151.

"This is another instance of a species of the Malayan Archipelago having extended itself to Assam, and is more interesting from the smallness of its size, its length being only five and a half inches in Assam, but in Sumatra and Java it is six and a half inches in length. The tail in the Assam variety is marked with obscure bands, which does not appear to be the case with the Java variety; and the plumes of the belly and thighs are shorter in the former than in the latter."—*McClelland's MS.*

Genus GEOCICHLA, Kuhl.

- 48.
- Geocichla Rubecula*
- , Gould, Proceed. Zool. Soc. 1836, p. 7.

Fam. SYLVIADÆ.

Genus MOTACILLA, Auct.

- 49.
- Motacilla variegata*
- , Steph. Pied Wagtail, Lath.
- Mot. pictata*
- , Frankl.

Genus SAXICOLA, Bechst.

- 50.
- Saxicola Rubicola*
- , Temm.

51. SAXICOLA? OLIVEA.
- Supra olivaceo-viridis, subtùs ex plumbeo cærulescens; fronte flavicante.*

"A minute species, olive-green above, leaden-blue beneath, and olive-yellow on the forehead; anterior toes short; tarsi elevated. Length three inches."—*McClelland's MS.*

A single specimen only has been forwarded, which is not sufficiently perfect to determine its true generic character with certainty.

Genus PHÆNICURA, Jard. & Selb.

- 52.
- Phœnicura Reevesii*
- , Gray, Zool. Misc.

Genus ZOSTEROPS, Vigors and Horsf.

- 53.
- Zosterops Maderaspatanus?*
- Catal. of Zool. Specim. Append. to Life of Sir T. S. Raffles, p. 661.

The specimen sent home by Mr. McClelland differs from that brought from Sumatra by Sir T. S. Raffles in being a trifle smaller.

Fam. PIPRIDÆ.

Genus PARUS, Linn.

- 54.
- Parus atriceps*
- , Horsf., Trans. Linn. Soc., XIII. 160.

- 55.
- Parus flavocristatus*
- , De Lafresnage.
- Mésange à huppe jeune.*
- Guerin, Mag. Zool., Pl. 80. Janvier 1837.
- Parus Sultaneus*
- , Hodgson, India Review and Journal of Foreign Science, &c., by F. Corby, Esq., April 1837.

"The female is distinguished from the male by the black colour being less intense, and intermixed more with a greenish tint. For the first specimen of this elegant bird I was indebted to Mr. Griffith, who procured it during our descent from the Kossia mountains

into Assam, in which place, however, they are more common.”—*McClelland's MS.*

Genus LEIOTHRIX, Swains.

56. LEIOTHRIX LEPIDA. *Capite subcristato suprâ nuchâque cinereis in cærulescentem vergentibus ; dorso tectricibusque alarum ex olivaceo cinnamomeis ; alis caudâque suprâ ex parte cæruleis ; remigum pogoniis internis latè nigris, apicibus albis ; reatricibus exterioribus pogoniis internis, omnibus apicibus albis : subtùs ex diluto cinnamomeo canescens.*

“Gray ; bluish on the crown, brownish on the back, and light bluish-gray beneath ; wings and tail blue (inclining to black), with minute white tips and light blue outer margins. Length five inches.”—*McClelland's MS.*

57. LEIOTHRIX SIGNATA. *Olivaceo-fusca abdomine pallidiorè ; alis, caudâque subcastaneis ; guld obsoletè flavicante ; fasciâ collari ex latè-cyaneo nitente.*

“Olive-brown above, lighter beneath ; a Prussian-blue streak on each side of the neck ; tail short and square. Length five inches.”—*McClelland's MS.*

58. LEIOTHRIX ORNATA. *Capite colloque suprâ nigricantibus ; subtùs tenidque ad latera colli per oculos ad rostrum ductâ albis ; notæo cinnamomeo, crisso pallidiorè ; alis caudâque nigris remigibus secundariis albo marginatis, primoribus reatricibusque ad apices albo limbatis, omnibus nitore cruento inductis.*

“Head black, with a white streak passing over each eye ; back brown ; wings and tail black, variegated with scarlet and white ; beneath white.”—*McClelland's MS.*

Tribus CONIROSTRES, Cuv.

Fam. FRINGILLIDÆ, Vigors.

Genus MIRAFRA, Horsf.

59. MIRAFRA ASSAMICA. *Corpore cinereo-brunneo variegato, uropygio pallidiorè ; remigum pogoniis internis caudâque basi rufis ; subtùs ex rufescente cana, plumis pectoris nigro maculatis ; lunulâ obsoletè fuscâ temporibus.*

This species appears to be intermediate between *Mirafra Javanica*, Horsf., and *Mirafra phœnicura*, Frankl., but its characters are sufficiently marked to distinguish it from both.

60. MIRAFRA FLAVICOLLIS. *Suprâ olivaceo-brunnea, vertice saturatiore, tectricibus secundariis albicante marginatis ; subtùs flava, fasciis paucis obsoletè fuscis ; crisso caudâque subtùs albicantibus.*

Length five inches.

Genus PLOCEUS, Cuv.

61. *Ploceus Manyar*. *Fringilla Manyar*, Horsf., Trans. Linn. Soc., XIII. p. 160.

Genus LONCHURA, Sykes, Proceed. Zool. Soc., 1832, p. 94.

62. *LONCHURA MELANOCEPHALA*. *Capite, collo, pectoreque atris ; corpore, alis caudaque saturatè badiis.*

Length four inches.

63. *Lonchura Cheet*, Sykes, *Proceed. Zool. Soc.*, 1832, p. 95.

Fam. STURNIDÆ.

Genus PASTOR, Temm.

64. *Pastor tristis*, Temm. *Gracula tristis*, Lath., *Ind. Orn.*, I. 190.

65. *Pastor Pagodarum*, Temm. *Turdus Pagodarum*, Gmel. *Linn.*

Genus LAMPROTORNIS.

66. *Lamprotornis spilopterus*, Gould's *Cent. of Himal. Birds.*

Fam. CORVIDÆ.

Genus CORVUS, Linn.

"The Raven, the Carrion Crow, and the Rook, are inhabitants of Assam, but are seldom found in the depths of the forests. They rather follow the footsteps of man, and establish themselves in small numbers in the vicinity of villages and such places on the banks of rivers as are frequented by travellers as halting-places. The Hooded Crow is very common, but I did not perceive anything peculiar about it to induce me to add it to my collection."—*McClelland's MS.*

Genus DENDROCITTA, Gould, *Proceed. Zool. Soc.*, 1833, p. 57.

67. *DENDROCITTA FRONTALIS*. *Facie aterrimâ, conterminio exactè circumscripto, alis caudâque nigris ; occipite, vertice, collo, pectoreque albis, diluto canescente lavatis ; humeris, notæo, hypochondriis, femoribusque badiis in ferrugineum vergentibus ; tectricibus secundariis saturato cærulescenti-canis.*

Length of the body seven, of the tail ten inches.

68. *Dendrocitta vagabunda*, Gould's *Cent. Himal. Birds.* *Pica vagabunda*, Vieill., *Encyclop. Méthod. Ornitholog.*, p. 888. *Coracias vagabunda*, Lath., *Ind.*, I. 171.

Genus KITTA,

69. *Kitta venatorius*, Gray, *Illustrations of Indian Zoology*, I. Pl. XXIV.

Genus CORACIAS, Linn.

70. *CORACIAS AFFINIS*. *Capite suprâ æruginoso, nuchâ dorsoque olivaceis, æneo subnitentibus ; fasciâ alarum latâ, tectricibus utrinque, recticibus ad basin, salvis intermediis glaucis, saturatissimè cyaneis ; fasciâ remigum primorum subterminali, secundariorum basali, uropygio, fasciâ latâ terminali recticum, crissoque lætè thalassinis : subtus et lateribus colli vinaceis ; guld plumis laxis, in medio violaceo-vittatis, ornatâ.*

Genus GRACULA.

71. *Gracula religiosa*, Linn. *Syst.*, I. p. 164.

Fam. BUCERIDÆ.

Genus BUCEROS, Linn.

72. *Buceros Malabaricus*, Gmel. Linn., I. 359. Pied Horn-Bill, Lath.

73. *Buceros Homrâi*, Hodgson, Journ. As. Soc. Bengal, Vol. I. p. 251.

Mr. Hodgson's description of the *Buceros Homrâi* applies closely to Mr. McClelland's specimens, and also to the bird figured in the 44th plate of Gould's Century of Himalayan Birds, and to specimens from Sumatra in the East India Company's Museum; while the *Calao à casque concave* of Le Vaillant, according to Dr. Shaw's description and specific character, differs in various particulars.

Fam. LOXIADÆ, Vigors.

Genus PARADOXORNIS, Gould, Proceed. Zool. Soc., 1836, p. 17.

74. *Paradoxornis flavirostris*, Gould, *loc. cit.*, figured in Gould's 'Icones Avium,' Part I. *Bathyrhynchus brevirostris*, McClelland, Quarterly Journal of the Calcutta Med. and Phys. Society, Dec. 1837. With a figure.

"Brown, beneath yellowish-brown; head brown, with a black circle under each eye, the interior feathers of which have white tips; wings short; beak much compressed, strong, shorter than its depth, and thrice the depth of its breadth at the base; mandibles equally arched, and meeting in front, without a hook, in an obtuse point; nostrils small, round, and concealed by recurved feathers."—*McClelland's MS.*

Tribus SCANSORES.

Fam. PSITTACIDÆ.

Genus PALÆORNIS, Vigors.

75. *Palæornis torquatus*, Vigors. *Psittacus torquatus*, Auct.

76. *Palæornis Pondicerianus*, Vigors. *Psittacus Pondicerianus*, Auct.

Fam. PICIDÆ.

Genus BUCCO, Auct.

77. *Bucco corvinus*, Temm. Pl. Col. DXXII.

78. *Bucco cyanops*, Cuv. *Capito cyanocollis*, Vieill., Gal. des Ois. XXXV.

Genus PICUS, Linn.

79. *Picus strenuus*, Gould.

80. *Picus occipitalis*, Gould's Cent. of Himal. Birds, Pl. XLVII.

81. *Picus Nepalensis*, Gray and Hardw. Ind. Zool., Pl. XXXI. Fig. 1.

82. *Picus Macei*, Temm. Pl. Col. LIX.

83. PICUS (*Chrysonotus*, Swainson) GRANTIA. *Fronte, alis, caudâque suprâ ex sordidè aurantio rufescentibus; collo suprâ et ad latera ex viridi flavicante; subtùs fuscus; reetricibus flavicante*

fasciatis; remigibus primoribus fuscescentibus, vexillis alternis flavo-guttatis vel fasciatis.

Length nine inches.

This bird belongs to Mr. Swainson's subgenus *Chrysonotus*, Lard. Cab. Cycl. Birds, II. p. 309, of which *Picus Tiga*, Linn. Tr., XIII. 177, is given as the type.

Genus YUNX, Linn.

84. *Yunx torquilla*, Linn.

The specimens collected by Mr. McClelland agree in all points with the bird as found in Europe.

Fam. CERTHIADÆ.

Genus SITTA, Linn.

85. *Sitta frontalis*, Horsf., Linn. Trans., Vol. XIII. p. 162.

Genus UPUPA, Linn.

86. *Upupa Epops*, Linn.

From comparison with European specimens, it appears that this bird, as occurring in Assam, can scarcely be considered a variety of the *U. Epops* of Linnæus; although Mr. McClelland's specimens are rather smaller, they do not agree with the *U. minor* of Shaw, which is found in Africa.

Genus POMATORHINUS, Horsf.

87. *Pomatorhinus montanus*, Horsf., Linn. Trans., XIII. p. 165.

No essential difference is apparent between a specimen of this bird sent from Assam and the specimens obtained in the Island of Java, from which the original description was made.

Fam. CUCULIDÆ.

Genus PHÆNICOPHAUS, Vieill.

88. *Phœnicophaus tristis*, Lesson?

"Bottle-green above; dark greenish-gray beneath; throat light greenish-gray, with black streaks; naked space around the eyes; superciliary streak white; tail with white tip; beak green. Thirteen inches long."—*McClelland's MS.*

No specimen having been found of this species, it will require further observations to determine its true character.

Genus CENTROPUS, Ill.

89. *Centropus Philippensis*, Cuv.

"This species is very common in villages and cultivated rice-fields in Assam, and in low inundated lands along the banks of rivers. It is tame even in the most deserted places in which it is found, and seldom flies; but if pressed too closely, it rather forces its way into a thick hedge. It delights in moist humid climates, as is proved by the vast numbers of them which occur in the Sunderbunds, the only part of India except Assam in which I have seen them; but I believe they are also seen in the vicinity of Calcutta. I am informed that they are common at Maulmain on the Tenasserim coast, but I question if they are to be found in India further north-west than

Bengal. They have a very peculiar suppressed note, resembling *whono*, uttered with such a degree of ventriloquism, that although you see the individual from which the sound escapes, you do not expect it as the cause. In passing through the Sunderbunds in April last, this *whono* was almost the only sound I heard, and I was at first induced to suppose that it proceeded from some concealed animal in my boat."—*McClelland's MS.*

90. *Centropus lepidus*, Horsf., Linn. Trans., XIII. p. 180.

Mr. McClelland's specimen is comparatively of a large size, but agrees in all particulars with the *Cent. lepidus* from Java.

Genus TROGON.

91. *Trogon Hodgsonii*, Gould, 'Monograph of Trogonidæ.'

Tribus TENUIROSTRES, Cuv.

Fam. CINNYRIDÆ.

Genus CINNYRIS, Cuv.

92. CINNYRIS ASSAMENSIS. *Cinn. nigrescens, capite suprâ gulâque metallicè purpureis; dorso et colli lateribus intensè fuscescenti-rubris; plumis ad partem dorsi posteriorem flavido terminatis; uropygio, tectricibus caudæ superioribus, reatricibusque caudæ duabus intermediis metallicè purpureis; his elongatis; abdomine et crisso flavido lavatis: rostro valdè incurvo, et quàm caput paululùm longiore.*

This species is closely allied to *Cinnyris Gouldiæ*.

93. CINNYRIS LABECULA. *Punicea; gula pectoreque nitidissimis; capite, plumis scapularibus, caudâque metallicè aureo viridibus; alis fuscis viridi nitentibus; subtùs cana.*

Body three inches, tail two inches long.

Genus ARACHNOTHERA, Temm.

94. *Arachnothera inornata*, Temm., Pl. Col. LXXXIV.

Fig. 2.

Fam. MELIPHAGIDÆ.

Genus CHLOROPSIS, Jard. & Selby.

95. CHLOROPSIS CHRYSOGASTER. *Suprà viridis, nitens; pectore abdomineque ex aurantio luteis; gula, jugulo, lateribus colli, arcuque per oculos ducto atris, conterminio arcuè circumscriptis; genis violaceis, maculâ scapulari æruginosâ; tectricibus, remigibus primoribus, reatricibusque nigris, nitore violaceo; pileo aureo subnitente.*

In the specimens of the female the black mark on the throat and neighbouring parts is not apparent; the spots on the chin and shoulders are obscure; but the general colour of the upper and lower parts is the same as in the male.

Genus DICÆUM, Cuv.

96. *Dicæum erythronotum. Certhia erythronotos*, Ind. Orn., I. 290. Red-backed Creeper, Lath., Gen. Hist. of Birds, IV. 241. 'Souimanga à dos rouge,' Ois. dor., II. 57. Pl. XXXV.

LIII.—*Observations on the Great Seal of the Farn Islands, showing it to be the Halichærus griseus, Nilss., and not the Phoca barbata.* By P. J. SELBY, Esq., F.L.S., &c., &c.

THE Rev. L. Jenyns, in his valuable ‘Manual of British Vertebrate Animals,’ and Mr. Bell, in his ‘History of British Quadrupeds,’ having quoted my name as an authority for the occurrence of the *Phoca barbata* upon the coast of Northumberland, I consider it incumbent upon me, now that I feel satisfied of having mistaken the species, to make known, through the medium of the ‘Annals,’ that the Seal, which I had supposed to be the *Phoca barbata*, proves upon further investigation to belong to a different generic division of the group, and is the *Halichærus griseus* of Nilsson, and of Bell’s ‘British Quadrupeds.’ At the time my notice of the Great Seal inhabiting the immediate vicinity of the Farn Islands first appeared, and which is to be found in the concluding paragraph of a descriptive Catalogue of the Birds that inhabit and breed upon that group of islands, published in 1826, in the second volume of the ‘Zoological Journal,’ the natural history of this curious but interesting group of Mammals had been but little attended to by any of our own naturalists, and in consequence the species inhabiting our coasts were imperfectly known and ill-defined, the Seals of a smaller size going under the title of *Phoca vitulina*, and the larger under the general name of the Great Seal.

At this period the generic divisions of the group were only beginning to undergo that necessary revision which a more intimate knowledge of the peculiar characters of the species required, and which has been so ably effected by the labours of Baron Cuvier, his brother M. F. Cuvier, and Professor Nilsson of Lund. The characters of the genus *Halichærus* were consequently at that time unknown to me; and not being in possession of the crania of any other species of Seals, except that of *P. vitulina*, wherewith to compare that of the Farn Island species, I concluded, from the great size of the latter, together with Pennant’s notice of the “Great Seal” sometimes met with at the Orkneys, and considered by subsequent writers as the *P. barbata*, and again, from the Farn animal agreeing with the specimen deposited in the British Museum, and long considered as the *P. barbata*, that it belonged to the same species; and as such it was accordingly named in the short notice to which I have referred. My attention was, however, again directed to this animal, in consequence of what took place at the Meeting of the British Association held at Bristol, where Professor Nilsson, who was present, identified the

crania of certain Seals killed upon the Irish coast, and exhibited by Mr. Ball as those of *Halichærus griseus*; and the same learned naturalist afterwards pronounced the specimen already referred to in the British Museum as also belonging to that animal. From Mr. Ball himself, at a subsequent Meeting at Liverpool, I received the outlines of the crania and dental formulæ of several British Seals, including those of the adult and young *Halichærus griseus*, in order that I might compare them with the skulls of any Seals I might meet with upon the eastern coast, and particularly with that of the Great Seal of the Farn Islands. No opportunity, however, of doing so occurred for two seasons; and it was not until the last summer (when a full-grown animal of the Farn species, was taken a few miles to the north of these islands, and fortunately sent to the Kelso Museum) that its station was correctly ascertained, as, upon dissection by Dr. F. Douglas, it was found to agree in every essential character with the *Halichærus griseus*, Nills., as described in Bell's 'British Quadrupeds.' Since then, or within the last two months, in consequence of having requested the person who at present rents these islands to send me the heads of any Seals he might be fortunate enough to kill, at the usual time of his visiting the island to which they retire to calve, (which they do about the 10th or 15th of November,) I have had an opportunity of examining three heads, which I received in a fresh state about six weeks ago, one being that of an adult female, the other two belonging to younger animals, all of which upon examination proved to belong to *Halichærus griseus*, agreeing in every essential character with Mr. Bell's description of that animal, and with the drawings given me by Mr. Ball; and as no other species of Seal has hitherto been recognised or met with by those who for a long series of years have been in the habit of seeing and taking these animals in this particular locality, I have now scarcely a doubt but that the whole of the colony that has so long inhabited the Farn Islands belongs to this species.

I shall conclude this notice with a few observations on the habits and œconomy of these animals, gleaned not only from the frequent visits I have myself made to the Farn Islands, but also from the long experience of a respectable individual, now upwards of eighty years of age, who succeeded his father, and continued to rent these islands till within the last eight or ten years. From his account it appears that these Seals were much more abundant some forty or fifty years ago than they are now, which he partly attributes to the great destruction he himself committed among them (having been a first-

rate Seal-hunter), and to the annoyance they have since been subjected to by the erection of the present outer lighthouse, which is built upon an island to which they were in the habit of retiring to rest during the recess of the tide.

In the year 1772, this old gentleman informs me that he killed seventy-two young seals, all of this species, and once also killed fourteen old ones, in one day, upon the Crimston Rock, the small island upon which they mostly calve, an event that takes place, as I have previously observed, in the month of November; and as the rutting season begins about the last week in February or first week in March, it would appear that the period of gestation of the *Halichærus griseus* is about eight and a half or nine months. The young when first calved are nearly three feet in length, and grow very rapidly till they quit the rock and are able to follow their dams to the water, which is generally about a fortnight after birth; when first calved they are covered with a longish soft woolly hair, of a yellowish white or cream-colour, which gives place before they quit the rock to a shorter hair of a grisly hue. If an opportunity offers, the young are sometimes tethered by a rope and kept upon the rock a week or two beyond the usual time, in order to get them of as large a size and as fat as possible before they are slaughtered; but this must not be persisted in too long, otherwise the dams are apt to forsake or refuse to come ashore to suckle them at the stated times of tide. The food of the *Halichærus* consists entirely of fish, not restricted, it is supposed, to any particular species, though they show a great predilection for the *Cyclostoma lumpus* (Lump-sucker), particularly to the female, which there goes by the name of the *Hush*. These fish resort in great numbers, towards spring and the early summer months, to the Farn Islands to cast their spawn; and when visiting the islands at this season I have seen the skins of these fish, divested of their contents, floating about in great numbers. When full grown, the male or Bull Seals attain a length of upwards of eight feet: one of the largest ever killed by Mr. Blacket, the old gentleman I have alluded to, measured nine feet in length, and seven and a half feet in girth immediately behind the flippers; it weighed upwards of forty-seven stone, of fourteen pounds to the stone, and produced twenty gallons of excellent oil. The proportion of this valuable product, however, depends more on the condition than the size of the animal. The females are inferior in size to the males, and are readily known by their lighter colour, being usually of a grisly white, rarely piebald, whereas the Bulls appear of a deep gray or nearly black. They swim with great strength and rapidity, and are frequently submerged

for two or three minutes, during which they make great progress, and re-appear many gunshots distant from the place where they went down, and they seem to delight and sport in the rapid and heavy currents which exist among the Islands. They show great curiosity in gazing at anything strange, and will remain stationary for minutes together, with the head and neck out of the water, staring at a boatman or any other object that attracts their attention. This curiosity, in parts where they were not often disturbed, procured me frequent shots with the rifle; for when I observed them basking upon the rocks, twenty or thirty in a herd, during the ebb of tide, I used to land at some distance and make all haste to the point where they were assembled; and though I might not get within shot before they took to the sea, I was sure of some of them re-appearing quite within distance after their first plunge into the water. In this way I have killed several, but never had the good luck to secure the carcass; for even though some of them floated a short time after death, which, however, is rarely the case, they were certain to be swept away and buried in the heavy stream which runs past the point I have mentioned, and where the Seals were generally assembled, before the boat could come round and reach them. I recollect on one of my visits killing a large animal in a quiet bay, by a shot through the neck, which, after a few struggles upon the surface, and tinging the water with its blood, began to sink, and before we could reach the spot with the boat, had descended just beyond the reach of our oars; and we had the chagrin of seeing it settle quietly down to a depth of about thirty feet into a forest of sea-weed below, without any tackling or apparatus in the boat wherewith to raise it to the surface.

The Great Seal seldom wanders to any great distance from the Farn Islands, as it is only seen occasionally as far north as Berwick Bay, and off Dunstanborough and Coquet Island to the south. It also seems jealous of the presence of any other species within its peculiar precincts, as the Common Seal, *Phoca vitulina*, is scarcely ever seen within its territory, though small herds frequent the coast of the main land nearly opposite, upon the bar of Budle Bay, and at Holy Island. This species used formerly to be very abundant at the latter place, but fire-arms and other modes of destruction have greatly reduced its numbers and driven it from its former haunts. This species produces its young in the month of August.

I have never met with any other species of Seal upon this coast, nor have I heard of any other having been observed.

The slight attention, however, that has hitherto been bestowed upon these animals, and the difficulty of capturing them, renders it not improbable that other species may exist. Still it seems very doubtful whether the true *Phoca barbata* has ever yet been found upon the British shores.

LIV.—*On the natural affinities of the Lepidosiren; and on the differing opinions of Mr. Owen and M. Bischoff with regard to them.* By M. MILNE EDWARDS*.

WHEN Zoology is only studied in systematic works, it is often supposed that each class, each family and each genus, present to us boundaries precisely defined, and that there can be no uncertainty as to the place to be assigned in a natural classification to every animal, the organization of which is sufficiently known; but when we study this science from nature herself, we are soon convinced of the contrary, and we sometimes see the transition from one plan of structure to an entirely different scheme of organization take place by degrees so completely shaded one into the other, that it becomes very difficult to trace the line of demarcation between the groups thus connected. The inferior animals present many examples of such gradations; and now comes the *Lepidosiren* to unite, in the same manner, two classes of vertebrate animals, which, till now, had been supposed to be separated by perfectly clear limits. We have, in fact, seen that in certain respects this singular animal resembles Fish, whilst, by other characters equally drawn from its organization, it does not differ from Reptiles.

This mixture of the ichthyological type and of the herpetological type is indeed so complete, that the two naturalists who have best studied the structure of the *Lepidosiren* disagree as to the intimate nature of this animal. In one of our preceding numbers our readers have seen the analysis of Mr. Owen's labours, and the reasons which induced this skilful anatomist to believe that the *Lepidosiren* was to be regarded as a Fish†; whilst from another equally accurate investigation by M. Bischoff, a translation of which‡ has been given in the *Annales des Sciences Naturelles*, the author draws the

* From *Annales des Sciences Naturelles* for Sept. 1840. Zool. p. 159.

† See *Annales des Sciences Naturelles*, 2me Série, tome x. p. 371.

Mr. Owen's Memoir on the Organization of the *Lepidosiren annectens* makes a part of the 18th volume of the Transactions of the Linnæan Society of London. For an abstract of this paper, read April 2, 1839, see *Annals of Natural History*, vol. iii. p. 265.

‡ From a Memoir published at Leipzig in 1840, in 4to.

conclusion that this same *Lepidosiren* is a Reptile. This difference of opinion admits of an easy explanation from the abnormal character of this animal, but proves the want of new arguments, such as may turn the scale on one side or other. I thought, consequently, that it would be useful to examine anew the anatomical structure of the *Lepidosiren*; and as the Museum of the Jardin du Roi possesses a fine specimen, I begged M. Bibron, assistant naturalist in this establishment, to have the kindness to make a dissection of it; he has most obligingly done so, and has thus ascertained the accuracy of the descriptions given by M. Bischoff.

One of the reasons upon which Mr. Owen most insists for placing the *Lepidosiren* amongst Fish, is the want of communication between the nasal cavity and the mouth; but M. Bischoff asserts, that in the species which he dissected there exist hinder-nostrils (arrière-narines) opening into the cavity of the mouth near to the commissure of the lips. I also saw these posterior openings of the nasal cavity in the *Lepidosiren paradoxa* dissected by M. Bibron, and their abnormal position appears to be in part explained by the absence of superior maxillary bones. M. Bibron has also satisfied himself of the existence of the two auricles of the heart, described by M. Bischoff, so that in this important respect the *Lepidosiren* stands remote from Fish, and approaches nearer to most Reptiles. Lastly, he compared the structure of the pulmonary sacs of the *Lepidosiren* with that of the natatory bladder of *Lepisosteus* and *Amia*, and he observed that in the former this organ completely resembles the lungs of several Reptiles; whilst in the two fish which we have just mentioned, the cells of the natatory bladder are much less compressed, less regular, and apparently less vascular. One of the lungs, that on the right side, stretches almost the whole length of the abdomen; but the other is much shorter, a disposition which is very common among the Reptiles. We should remark, that it is also the right lung which is greatly developed in the Ophidians, whilst the left lung remains more or less rudimentary.

This difference of structure between the pulmonary pouches of the *Lepidosiren* and the air-bladder of *Lepisosteus* and *Amia*, would certainly not suffice to negative the analogy which Mr. Owen allows between these organs, and to draw from the presence of the former in the *Lepidosiren* a peremptory argument in favour of the herpetological character of this animal; but there is another consideration which appears not yet to have struck zoologists, and which I think should have some weight in this discussion. The lungs of Mammalia, of Birds and of Reptiles, as every one

knows, always originate from the *ventral face* of the digestive tube, whatever their position may be in the splanchnic cavity, and it is always on the ventral side of the pharynx that the opening of the glottis is found; it is the same with the *Lepidosiren*; and if the resemblance between the lungs of all these animals and the air-bladder of the *Lepisosteii* and of the *Amiæ* was as great as Mr. Owen seems to think it is, we ought to find this same character of organic relationship between the œsophagus and the bladder of these fish. Now it is quite the contrary, for the kind of pseudo-glottis which establishes the communication between this cellular pouch and the digestive tube originates from the *dorsal face* of the œsophagus. There exists then a fundamental anatomical difference between these parts, whatever else may be their physiological functions, and this difference furnishes a fresh argument in favour of the opinion of those who consider the *Lepidosiren* as a Reptile.

I shall also add, that in the *Lepidosiren paradoxa* the abdominal viscera which, for the most part, were wanting in the individuals dissected by M. Bischoff, greatly resembled those of the *Lepidosiren annectens*, whose structure Mr. Owen has made known. M. Bibron and myself have sought there in vain for the traces of a pancreas and of a spleen, and the spiral valve of the intestine appeared to us to be still more developed than in the *Lepidosiren annectens*.

LV.—*Information respecting Zoological and Botanical Travellers.*

THE expedition under Mr. Schomburgk, appointed at the expense of Government, to survey the boundaries of British Guiana, has sailed for Demerara. Messrs. Glascott, R.N., and Mr. Walton accompany it, the first as assistant-surveyor, the latter as artist; but unless we are misinformed, there is no naturalist or collector on the part of this country,—Mr. Richard Schomburgk, brother to the director of the expedition, going out as a naturalist at the expense of the Prussian government and by permission; and thus we fear that the whole fruits, so far as natural history is concerned, of an expedition carried into a rich and partly unknown country at British expense and under British protection, will be carried off to a foreign kingdom, for the want of a person to attend exclusively to that branch, and who could have accompanied the party at comparatively small expense, and under circumstances of advantage of which others have known how to avail themselves. *There is time still to remedy this.*

The “Niger expedition” will also sail in a short time. One of the commanders is already known to be an excellent draughtsman, and

we may expect an ample portfolio from his exertions ;—Dr. Theodore Vogel, a learned German botanist, will be of the party ; Mr. Ansell goes out on the part of the Horticultural Society of London, and Mr. Fraser on that of the Zoological.

Dr. Parnell has again returned to Britain after a residence in Jamaica, Cuba, and others of the West Indian Islands. Ornithology and Ichthyology have been chiefly attended to, and large collections in both departments accompany him. In the latter above 300 species have been procured, with a series of drawings recording the natural colours of the specimens. Dr. Parnell has also been entrusted with all the Ichthyological manuscripts and drawings collected by Dr. Bancroft, and altogether materials have been brought home for a History of the Fishes of Jamaica.

BIBLIOGRAPHICAL NOTICES.

Crania Americana, or a comparative view of the Skulls of various Aboriginal Nations of North and South America, to which is prefixed an Essay on the varieties of the Human Species. By S. G. Morton, M.D. Folio, 78 Plates. London : Simpkin and Marshall.

In the present state of Anthropological science, the value of a work of this kind must depend more upon the accuracy of the anatomical facts which it contains, than upon the opinions expressed by its author on the many difficult questions which are still agitated by the cultivators of this interesting department of natural history. Dr. Morton is aware of this, and has produced a work, in which, while he has not neglected to present to his readers, in an ably written introduction, an abstract of the present state of opinions as to the origin of the races and the geographical distribution of man, he has at the same time evidently directed his whole energy to the formation of a series of chapters, containing anatomical delineations, measurements, and descriptions of the crania of more than forty American nations and tribes, ancient and modern.

The manner in which Dr. Morton has recorded the observations which he has had such ample opportunities of making, shows that he is well acquainted with the exact nature of the facts necessary for the further prosecution of this subject. The lithographic drawings of crania are admirable ; the measurements, both of capacity and size (his mode of taking which he describes), precise ; and the information in reference to each variety judiciously selected.

The author divides the pure Americans into three great classes,—those which live by hunting, fishing, and agriculture. The first embraces the great proportion of the race ; the second includes a few tribes in different and far-distant parts of the two continents ; the third contains those nations which had made the greatest advance in civilization, and whose geographical position afforded facilities for agricultural pursuits.

He considers indolence, combined with courage and fortitude, cau-

tiousness and vigilance, in regard to every action, to be the mental characteristics of the American race.

Dr. Morton commences his Craniology with the Peruvian head, and after describing and representing the naturally and often artificially flattened and retreating forehead, and the extraordinary elongation backwards of the occiput in this race, refers to the very natural question,—how a people, with crania so small and so badly formed, could have arrived at the degree of civilization which architectural remains and historical evidence prove them to have done? He holds that the country was civilized before the advent of the Incas, and that these anciently civilized people constituted the identical nation whose extraordinary skulls he has represented. Without fully assenting to this opinion, it must be admitted, that there is no further evidence of the existence of a race anterior to that which preceded the Incas, except the mere suspicion that it would require better-formed heads than those in question to erect the Cyclopean monuments of Peru.

We are next conducted by Dr. Morton to the crania of the Patagonian in the south; to those of the nations on the Orinoco, and of the tribes of Brazil; to the Mexican head, with its large and massive developments, its full, broad, but retreating forehead, and great interparietal breadth; and to the singular artificially-elevated heads of the Natchez.

He then proceeds to the tribes of eastern North America, and to the nations of the west and the Colombia district, representing and describing the artificially-depressed crania of the Flatheads.

An inquiry into the geographical distribution of the mounds, and an examination of the skulls from these tumuli, leads the Doctor to consider the people who reared them to have belonged to the great Toltecan race.

Lastly, the examination of the skulls of the Esquimaux, the Mongul American of the North, conducts us to the only example of Asiatic configuration in the western hemisphere.

From his extensive inquiries and opportunities for observation, Dr. Morton concludes, 1. That the American race differs essentially from all others, not excepting the Mongolian; and that the feeble analogies of language, and the obvious ones of civil and religious institutions, do not prove at the most anything beyond casual or colonial communication with the Asiatic nations, and that even these analogies may be accounted for in the mere coincidence arising from similar wants and impulses in nations inhabiting similar localities; 2. that the American nations, with the exception of the Polar tribes, are of one race and one species, but of two great families, which resembled each other in physical, but differed in intellectual characters; and, 3. that the cranial remains discovered in the mounds from Peru to Wisconsin belong to the same race, and probably to the Toltecan family.

These conclusions contain much that must still remain doubtful in the present state of the question; but Dr. Morton has effected a most important service in the cause of natural science in contributing a

series of facts so extensive and so accurate as those which his magnificent work contains,

The solution of the great problem of the origin and distribution of the human race has occupied the attention of naturalists, anatomists and linguists, but hitherto with little success. In reference to the future progress of the question, it may be well to remark here, that the same circumstance which has retarded so much the advancement of the physiology of the human body has in like manner retarded the discovery of the mode of origin and distribution of the different races of men. There must be brought to bear upon this subject, in a more exclusive manner than hitherto, a knowledge of the laws of distribution and variation of other species of organized beings—laws which, although counteracted to a certain extent by the intellectual peculiarities of man, have most undoubtedly regulated the various changes which have taken place in the progeny of our first parents.

The Birds of Australia. By John Gould, F.L.S., &c. Part First. Oblong folio. Published by the Author, London, December 1840.

It may be recollected by many of our readers, that an expedition for the purpose of investigating the zoology, but more particularly the ornithology, of Australia, was undertaken by Mr. Gould nearly three years since; that gentleman was accompanied by Mrs. Gould, previously well known as an accomplished ornithological draughtswoman, and they have now returned, after a residence of nearly two years and a half in Australia, Van Diemen's Land, Bass Straits, &c., laden with spoils. Six or eight weeks were often spent together in the most interior "Bush," the time devoted entirely to the study and collection of the animals and birds frequenting the districts visited. Mr. Gould's principal object being ornithology, a very large collection has been made of birds, with their nests, eggs and skeletons. Other departments also have been attended to, and the species in each have been distributed to persons who, from their pursuits and rank in science, are enabled to do justice to the different branches, and we trust that ere long the novelties in each will be made public. To Mr. Brown has been sent the collection of plants, the Rev. Mr. Hope has the insects, and to Professor Owen has been entrusted all the preparations fitted for dissection; even Mr. Denny has not been neglected. The birds and quadrupeds will be Mr. Gould's peculiar charge, and, if illustrated in a manner similar to that which has been begun, they will prove of the utmost importance to our store of works devoted to the illustration of those departments. This undertaking, of which the first number has just appeared, will be published in quarterly parts, uniform in size with the author's previous works, containing seventeen plates each, at a cost of £3.3s. The execution of the plates, and the colouring by Bayfield, are both beautiful, and exhibit all the advantages of having been made from drawings taken on the spot. The real form and colours are represented as in the living bird, and the form of the nostrils and various wattles and bare skins, so prevalent among the Australian forms,

are given as they never could have been under any other circumstances. The native plants are also correctly delineated and grouped with the birds, which renders the work interesting to a botanist.

Among the more remarkable species represented now, is the *Alectura Lathamii*, a bird which has been an object of speculation among ornithologists until the present time. The venerable Latham, to whom it has been dedicated, originally described it as a Vulture, but afterwards saw reason to change his opinion, and to place it among the Rasorial birds. The same view was taken by the authors of the 'Illustrations of Ornithology,' who placed it as the Australian representative of the *Cracidæ* or *Megapodinæ*, but Mr. Swainson in his late Treatise has again restored it to its ancient place. The observations of Mr. Gould have now, however, decided the proper station to be that which Latham assigned to it, and have in addition brought to light some most remarkable points in its œconomy. We have instances of several birds leaving their eggs to be hatched by warmth of the sun, but nowhere have we seen a bed artificially prepared for that purpose so as to generate heat. The *Alectura* collects large heaps of dried leaves and grasses, several of the birds assisting at the same time; and when the heat by fermentation has become sufficient for the purpose, the eggs are placed in an upright position, separated from nine to twelve inches apart, in this dunghill or artificial hot-bed, and apparently left to their fate. It is stated that "it is not an unusual event to obtain nearly a bushel of eggs at one time from a single heap." Another fine bird is figured under the name of *Leipoa ocellata*, possessing the strong feet of the *Megapodinæ*, but in the other parts of its form evidently representing *Penelope*. This bird also leaves its incubation to be performed artificially: the eggs "are deposited in a mound of sand, the formation of which is the work of both sexes; the inside being constructed of alternate layers of dried leaves, grasses, &c., among which the eggs are deposited, to the number of twelve and upwards. They are hatched by the heat of the sun's rays, the vegetable lining of the hillock retaining sufficient warmth during the night." This species is yet little known, and is from Western Australia, frequenting the barren sandy plains of the interior, 100 miles north and east of York, and known to range as far northward as Gautheume Bay. A new species of *Cinclosoma* is figured, besides other interesting birds, and a very extensive list of synonyms is given, to which it would be useful if Mr. Gould would add the date of each author referred to. We are not always certain that the prior name is selected, which appears to be the object when it is quite unobjectionable. We trust the work will meet with the encouragement it deserves, and are happy to perceive that several public institutions, both in England and Scotland have already given their names as subscribers.

Algæ Scandinaviæ exsiccatae, quas distribuit Johan. Ehr. Areschoug.
Fasc. 1. Gotteburg, 1840.

This and the following work have been kindly addressed to us by the author. It is a welcome addition to the various collections of

dried Algæ which have appeared under the auspices of eminent algologists. It contains twenty-five species, of which in general the specimens are excellent, and some of great interest. M. Areschoug is very desirous of entering into correspondence with British algologists, and would most thankfully receive any communication. The following species are contained in the present fasciculus :—

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| 1. <i>Fucus serratus</i> , <i>L.</i> | 14. <i>Conferva cannabina</i> , <i>Areschoug.</i> |
| 2. ——— <i>canaliculatus</i> , <i>L.</i> | 15. ——— <i>fucicola</i> , <i>Velley.</i> |
| 3. ——— <i>vesiculosus</i> , <i>L. var.</i> | 16. ——— <i>pannosa</i> , <i>Areschoug.</i> |
| 4. <i>Gigartina plicata</i> , <i>Grev.</i> | 17. ——— <i>bombycina</i> , <i>Ag.</i> |
| 5. <i>Dictyosiphon feniculaceus</i> , <i>Grev.</i> | 18. ——— <i>rupestris</i> , <i>L.</i> |
| 6. <i>Asperococcus Turneri</i> , <i>Hook.</i> | 19. ——— <i>vadorum</i> , <i>Areschoug.</i> |
| 7. <i>Cladostephus spongiosus</i> , <i>Ag.</i> | 20. <i>Mougeotia genuflexa</i> , <i>Ag.</i> |
| 8. <i>Callithamnion Rothii</i> , <i>Lyng.</i> | 21. <i>Mesogloia rubra</i> , <i>Ag.</i> |
| 9. <i>Polysiphonia bulbosa</i> , <i>Suhr.</i> | 22. <i>Corynephora marina</i> , <i>Ag.</i> |
| 10. ——— <i>byssoides</i> , <i>Grev.</i> | 23. <i>Calothrix fasciculata</i> , <i>Ag.</i> |
| 11. <i>Enteromorpha intestinalis</i> , <i>Lk.</i> | 24. <i>Oscillatoria æstuarii</i> , <i>Lyng.</i> |
| 12. ——— <i>clathrata</i> , <i>Lk.</i> | 25. <i>Lichina confinis</i> , <i>Ag.</i> |
| 13. <i>Conferva Linum</i> , <i>Roth.</i> | |

De Hydrodictyo utriculato dissertatio Botanica. Dr. John Ehr. Areschoug. Lundæ, 1839.

The present academical treatise throws new light on a very interesting subject. It has been long known that a new individual of *Hydrodictyon utriculatum* is developed from each cell in the form of a minute net produced within the cell. The mode of development, however, as far as we know, has not before been observed. No mention of it is made by Meyen, who regrets that when he had abundant specimens at his disposal he had not at hand a sufficiently good microscope.

According to M. Areschoug, the cells, when nearly at maturity, contain a number of active spherical granules, which in the process of reproduction become elliptical, and are attached by their extremities, where an articulation is soon produced, so as to form pentagons or hexagons. Each granule becomes a cell of the new *Hydrodictyon*. It is much to be wished that so interesting an observation should be confirmed by others who have an opportunity of examining the plant in every stage of its growth.

Icones Plantarum Rariorum Horti Regii Botanici Berolinensis. Herausgegeben von H. F. Link, Fr. Klotzsch, Fr. Otto. First and Second Parts (each with two sheets of text and six coloured figures). Berlin, 1840.

The beautiful manner in which this commencement of a new work, with figures of the rarer plants of the Royal Botanical Garden of Berlin, is got up, and the admirable drawing and execution of the figures, leaves us only to wish that the sale may be sufficient to enable the undertaking to be long carried on in the same style. The text of the present work is thus arranged: the generic, then the specific characters in Latin being followed by the description, observations on

the affinities of the species and genus, general considerations on the family, the country, together with the method of cultivation, and the explanation of the plates in double columns in German. The following plants are treated of: *Puya Altensteinii*, n. sp.; *Lobelia discolor*, n. sp., from Mexico; *Olinia capensis*, Kl., from the Cape, of which plant we cannot convince ourselves that it belongs to the *Myrtaceæ*; *Oxalis Ottonis*, Kl., from Cuba; *Microstylis histionantha*, n. sp., from La Guayra; *Oncidium Carthaginense*, Swartz, from Maracaybo; *Begonia punctata*, n. sp., from Mexico; *Asterostrichion sidoides*, n. gen. et spec., Fam. *Malvaceæ*, from New Holland; *Acanthostachys strobilacea*, n. gen. et spec., Fam. *Bromeliaceæ*, from South Brazil; *Sisyrinchium majale*, n. sp., from Valparaiso; *Spiranthes Lindleyana*, n. sp., from La Guayra and Caracas; *Marianthus cæruleo-punctatus*, n. sp., from Van Diemen's Land. *Linnæa*, Part V. 1840.

Verhandelingen over de Natuurlijke Geschiedenis der Nedelandsche Overzeesche Bezittingen, door de Leden der Natuurkundige Commissie in Oost-Indië en andere Schrijvers.

Under this title it is intended to publish, under the direction of the Government, a work which will give an account of the numerous discoveries which have been made in the various colonies of the Netherlands by their scientific expeditions. The Government will name a commission to superintend the printing and execution of the work. The various memoirs will be arranged in three divisions: 1. Zoology, 2. Botany, 3. Geography and Ethnography. Each division will form a volume in small folio, and will be illustrated with several lithographed plates. The price is moderate. *Linnæa*, Part V. 1840.

PROCEEDINGS OF LEARNED SOCIETIES.

LINNÆAN SOCIETY.

November 17, 1840.—Mr. Forster, V.P., in the Chair.

Mr. Janson, F.L.S., exhibited specimens of the *Neottia astivalis*, discovered in August last by himself and Mr. Branch, near Lyndhurst, Hampshire, being the first time it had been observed in England.

Mr. Ogilby, F.L.S., exhibited a specimen in flower of a new species of clover recently introduced from Cabul, remarkable for the quantity of herbage which it yields. The species is very nearly related to *Trifolium resupinatum*.

Read, "Description of *Aucklandia*, a new genus of *Compositæ*, supposed to be the *Costus* of Dioscorides." By Hugh Falconer, M.D., Superintendent of the Honourable East India Company's Botanic Garden at Saharunpore. Communicated by Dr. Royle, F.R.S. & L.S.

This interesting plant, the root of which, under the name of koot, forms an important article of Cashmeer commerce, is considered by Dr. Falconer as identical with the long-disputed *Costus* of the an-

cients, and his opinion appears to be borne out by the accordance of the root with the description given by Dioscorides, by the striking analogy of the Arabian synonym *koost* to its Greek and Cashmeer appellations, and also by the commercial history of the drug.

The roots, which are possessed of a strong aromatic and pungent odour, are collected in large quantities, principally for exportation to China, where they are held in high repute, as an aphrodisiac, and are also burnt as incense in the temples. The quantity annually collected varies from 10,000 to 12,000 khurwars (of 96 seers, or 192 lbs.,) or about 2,000,000 lbs. weight. At Canton the price per cwt. is 2*l.* 7*s.* 5*d.*, while the cost at the depôt in Cashmeer is only 2*s.* 4*d.*

The plant is not held in much repute as a medicine by the Cashmeerians, who are only astonished at the estimation in which it is held in other countries; nor do they apply it to any other use than that of protecting bales of shawls from the attacks of moths: portions of the stem are, however, suspended from the necks of children to avert the "evil eye," and to expel worms.

The plant is regarded by Dr. Falconer as constituting the type of a new genus of *Cynareæ*, which he has named in compliment to the present Governor-General of India; and as it was discovered during a journey in Cashmeer, commenced under Lord Auckland's auspices, and as it yields a valuable product, the application of the name becomes more appropriate from the useful direction of his lordship's views in promoting botanical investigation in India. The *Aucklandia* is a gregarious plant, growing in great abundance on the moist open slopes of the mountains which surround the valley of Cashmeer, at an elevation of from 8000 to 9000 feet above the level of the sea, but like some other plants of that region, it is extremely local, being confined to the immediate vicinity of the valley, although the *Rheum emodi*, *Aconitum heterophyllum*, and *Rhododendron anthopogon*, with which it is associated, are extensively distributed over the western Himalayas. The genus is nearly related to *Saussurea*, and is chiefly distinguished by the rays of its feathery pappus being disposed in two rows, and cohering by twos or threes at the base. The following is the author's character of the genus:

AUCKLANDIA.

Capitulum homogamum. *Antherarum caudæ* lanato-plumosæ. *Pappi setacei lamellæ* biseriales, plumosæ, basi ternatim quadraternatimve coherentes, in anulum deciduum concretæ. *Achenium* glabrum. *Herba* orgyalis, *radice* perenni ramosâ crassâ, *caule* erecto simplici sulcato glabro folioso, *foliis* sublyratis margine setaceo-dentatis supra glabris atrovirentibus subtus glaucescentibus venis puberulis, *capitulis* numerosis terminalibus aggregatis, *floribus* atropurpureis.

Sp. A. *Costus*.

December 1.—Mr. Forster, V.P., in the Chair.

Mr. Gould, F.L.S., exhibited a specimen of a nondescript Lizard from New Holland, remarkable for the extreme aculeation of its scales.

Mr. William Cumming presented specimens of *Lagurus ovatus*, *Briza maxima*, and *Mentha crispa*, gathered by him in the vicinity of Saffron Walden, Essex.

Read, "On a White Incrustation on Stones, from the bed of the river Annan." By Edwin Lankester, M.D., F.L.S.

During a short stay which the author made last summer on the banks of the Annan, in Dumfries-shire, his attention was arrested by the appearance of the stones on the banks of the river. Wherever a mass of gravel was exposed to the air, the surface of the stones appeared covered with a white incrustation, as if they had been white-washed. This appearance was more or less general on all the exposed banks, but was most evident on the stones nearest the water's edge. On examining the stones with a pocket-lens, their surface appeared covered with acicular crystals, and from this it was at first concluded that the incrustation arose from the crystallization of some salt abounding in the waters. On procuring, however, some stones from the water itself, they presented on their surfaces the filaments of a minute conferva, which appeared to be the source of the white crust; but as the existence of the conferva would not explain the crystalline appearance, it was examined under the microscope, and the appearance was found to proceed from minute acicular bodies about $\frac{1}{100}$ th of an inch long and $\frac{1}{2000}$ th of an inch broad, which were most of them arranged in a stellate form, but many were scattered in all directions. Running under the whole were the filaments of a minute conferva, on which the acicular bodies rested.

In Greville's Scottish Cryptogamic Flora, these bodies are referred to the genus *Exilaria*, but the stellate arrangement of the aciculæ gave them a different character to *E. fasciculata*. Hooker, in his continuation of Smith's 'English Flora,' has placed Greville's supposed plant as a synonym of *Diatoma truncatum*, from which *D. fasciculatum* is not distinct.

In Ehrenberg's great work on the *Infusoria*, these bodies are figured and described under the head of Polygastric animalcules (p. 11. tab. xvii.) of the family *Baccillariæ*. The genus to which they belong is *Synedra*, and is distinguished by the animal being furnished "with a simple siliceous prismatic carapace, when young attached by one end, when old often free, without any or only a slightly marked pedicel." The species which it most closely resembles is the *Synedra Ulna* (common Eel-animalcule), which is characterized by being striated with linear corpuscles, straight, truncated at the sides, flat on the back and belly; with the apex a little dilated as they become aged. The bodies from the Annan are not striated, nor are their ends dilated, although they appear full-grown. The siliceous skeletons in which these little animals are invested, will account for their white appearance. Although these bodies have been often described both as plants and animals, no notice appears to have been given of their producing the phenomenon here described.

Read also, "Observations on the Genus *Derbe* of Fabricius." By John O. Westwood, Esq., F.L.S.

After noticing the recent memoirs by Messrs. Percheron and Boheman on this almost unknown Fabrician genus, and its very close relationship to *Otiocerus* and *Anotia* of Kirby, the author shows that the Fabrician type of the genus *D. hæmorrhoidalis* is quite distinct from the group described by the two first-mentioned authors as its type. He accordingly restricts the generic name *Derbe* to the typical species with the following characters :

DERBE. Rostrum ad medium abdominis extensum, articulo apicali minuto. Antennæ breviores. Oculi subrotundati. Alæ longiores, angustiores, costâ anticarum ante apicem incisâ, venis numerosis, longitudinalibus, in medio venis transversis conjunctis, medianâ ramos 10 longitudinales emittente; alæ posticæ venâ postcostali 4-fidâ.

In addition to the typical species and the *D. nervosa*, Klug, Burm., the author adds the two following species to the typical group :

1. *D. semistriata*, luteo-fulva; alis pallidis costâ magis fulvescenti venis nigricantibus strigisque tenuibus fuscis inter venas (nisi cellulis apicalibus) dispositis. Expans. alar. lin. 16½. Brasilia. Mus. Westw.
2. *D. strigipennis*, pallidè fusco-lutea; dorso thoracis et carinâ faciei sanguineis, alarum venis fuscis strigisque tenuibus fusciscentibus inter venas omnes, ad apicem alarum carentibus, pedibus albidis. Expans. alar. lin. 14. Brasilia. Mus. Westw.

MYSIDIA. Rostrum ultra pedes posticos haud extensum. Antennæ mediocres. Oculi rotundati. Alæ breviores, latiores, pulverosæ; anticæ integræ, venis paucioribus, venâ medianâ ramos tres emittente, ramo medio bifido; posticæ venâ postcostali bifidâ aut trifidâ.

The variation in the position and number of the veins of the wings, affording a character of primary importance for distinguishing the preceding groups, the author has at some length entered into an examination of their normal state and direction, and the manner in which they become modified. The following species are referred to this subgenus: *Derbe pallida*, Fabr., (described and figured by Percheron from the Copenhagen Cabinet as the type of the genus), *D. squamigera*, Fab., *D. costalis*, Fab., and probably *D. punctum*, Fab., *D. testacea*, Fab., and *D. nivea*, Fab., as well as the following new species :

- M. albipennis*, parva, tenera; alis albis anticis puncto parvo ante medium costæ, punctis nonnullis ad marginem internum venis transversis punctoque ante apicem nigris lunulisque parvis marginalibus fuscis. Expans. alar. lin. 8. Vera Cruz. Mus. Westw.
- M. lactiflora*, luteo-albida; capitis vertice et collaris margine antico parùm sanguineis, hujus margine postico et margine postico tegularum albis, alis albis margine antico lutescente versus basin maculis tribus parvis maculâque majori ante apicem nigris. Expans. alar. lin. 12½. Brasilia. Mus. Westw.
- M. subfasciata*, alba; alis fusco transversè nebulosis punctoque ante apicem nigro ad basin aræe parvæ triangularis subapicalis venisque 4 transversis obscuris. Expans. alar. lin. Brasilia. Mus. D. Burchell, et Soc. Zool. Lond.

LYDDA. Rostrum brevius. Antennæ breves. Alæ anticæ, valdè elongatæ, apice rotundatæ, directione venarum anomalâ; regione venæ medianæ minimâ, aut potius ejus rami in venæ postcostalis ramos transformati.

The type of this subgenus is *Derbe elongata*, Fab., from New Holland, in the cabinet of the Linnæan Society.

ZEUGMA. Rostrum ultra basin pedum posticorum extensum. Antennæ rotundatæ. Ocelli obsoleti? Prothorax lateribus concavo-dilatatis pro antennis recipientibus. Alæ anticæ oblongo ovatæ, apice subtruncatæ, venis numerosis longitudinalibus; venâ postcostali ramos 8 posticè, medianâ tantùm tres emittente.

This subgenus appears intermediate between *Derbe* and *Thracia* on the one hand, and *Mysidia* on the other. The only species is—

Z. vittata, fulva; alis anticis flavidis vittâ latâ mediâ fuscâ apicem versus deflexâ alterâque posticâ parallelâ apice vittâ abbreviatâ fasciâque tenui transversâ fuscis. Expans. alar. lin. In Mus. Soc. Linn.

THRACIA. Rostrum pectore longius. Antennæ capite ferè duplò longiores. Oculi orbiculati. Ocelli nulli? Alæ anticæ longissimæ, angustæ, apice truncatæ, venis 12 longitudinalibus inter angulum apicalem et analem.

This subgenus is proposed for the two African species, *D. sinuosa* and *D. nervosa*, described by Boheman, and considered by him as constituting the first section of the genus. Notwithstanding the difference of its geographical range, the author adds the following fine species from Java, which agrees with the other two in all the sub-generic characters:

T. javanica, fulva; abdomine obscuriore vittâ centrali pallidiori, alis pallidè hyalinis anticis fasciâ latâ costali fuscâ. Expans. alar. lin. Java. D. Horsfield. In Mus. Soc. Mercat. Ind.

PHENICE. Rostrum pectore vix longius. Antennæ capite manifestè breviores. Oculi oblongi, vel obovati, distinctè emarginati. Ocelli distincti. Alæ anticæ quàm in Thraciâ breviores, apice subrotundatæ, venis ferè ut in *Mysidiâ* dispositis, 12 longitudinalibus inter angulum apicalem et regionem analem.

This subgenus is proposed for the three African species *D. fritillaris*, *fasciolata*, and *stellulata*, described by Boheman, and forming his second section of *Derbe*.

After reviewing the characters of the preceding subgenera, the author expresses the opinion that *Otiocerus* (including *Hypnis*, Burm.) and *Anotia* of Kirby, must also be considered as subgenera of equal rank with the preceding; that *Anotia coccinea*, Guér. Icon. R. An. MS. pl. 58, f. 3, forms another subgenus; and that the two following groups also constitute two other subgenera of *Derbe*:

PATARA. Rostrum ad basin pedum posticorum extensum. Oculi maximi, subtùs emarginati. Oculi obsoleti. Antennæ maximæ, compressæ, verrucosæ, apice subtruncato et setigero. Alæ anticæ longitudine mediocres, apice rotundatæ, venis paucis cellulisque tribus discoidalibus.

P. guttata, capite thoraceque fulvis, alis anticis griseo-fuscis margine albo-guttatis. Expans. alar. lin. Insula S^ti Vincent. D. Guilding. Mus. D. Hope.

P. albida, luteo-albida; antennis nigricantibus, alis anticis albis farinosis apicem versus fusciscenti-tinctis, guttis albis sanguineisque ornatis. Expans. alar. lin. Insula S^{ti} Vincent. D. Guilding. Mus. D. Hope.

CENCHREA. Frons capitis parùm producta. Oculi magni, emarginati. Ocelli 2. Antennæ minutæ, articulo 2do brevi subrotundato. Prothorax latus, lateribus concavo-dilatatis pro receptione antennarum. Alæ anticæ elongatæ, angulo antico apicali valdè obtuso, venis perpaucis longitudinalibus.

C. dorsalis, pallidè testaceo-fulva; alis anticis flavescentibus margine interno fuscis apice punctis duobus purpureis. Expans. alar. lin. Insula S^{ti} Vincent. D. Guilding. Mus. D. Hope.

The species above described, together with their structural characters, and especially the variations in the direction of the veins of the wings, were illustrated by numerous magnified figures.

ENTOMOLOGICAL SOCIETY OF LONDON.

Jan. 6th, 1840.—The Rev. F. W. Hope, M.A., F.R.S., &c., President, in the Chair.

The President announced the safe arrival of W. S. Macleay, Esq., and his collections in New South Wales, and his intention to publish descriptions of various remarkable Australian groups. He had ascertained that the *Agaristæ* are diurnal in their flight, thus confirming their relation with the *Uranieæ*, as suggested in his memoir in the Transactions of the Zoological Society.

Mr. Westwood announced the capture of a species of *Cerapterus* (but forming a separate subgenus) near Rio Janeiro, all the other species of the family *Paussidæ* being inhabitants of the old world.

Mr. Waterhouse exhibited some remarkably small specimens of *Garden white butterflies*, captured in Devonshire, but very confined in their locality.

The President exhibited specimens of *Goliathus torquatus* ♀, *Eudacilla Morgani*, and other rare insects, recently received by him from Sierra Leone; also a new species of *Adelotopus* and another genus allied thereto, with other insects from New Holland.

Mr. Westwood exhibited a living specimen of *Clerus alvearius*, which he had recently reared from a nest of *Osmia muraria*, brought by him from France two years and a half previously.

The following memoirs were read:

Description of a new species of *Trachyderes*. By Edward Newman, Esq., F.L.S.

Trachyderes venustus, N. *Piceus, elytrorum fuscis duabus maculæque singuli subrotundæ apicali læte stramineis: scutello elongato sublineari medio longitudinaliter impresso, piceo.* Corp. long. 1, 15 unc. Inhabits Demerara. Mr. Schomburgk.

Observations on the species of Spiders which inhabit cylindrical tubes, covered with a moveable trap-door. By J. O. Westwood, Esq., F.L.S.

After noticing the various species of Spiders which have been described as making trap-door nests, and determining the West Indian

species to be the *Aranea venatoria* of Linnæus, and to belong to the genus *Actinopus*, Pty. (*Sphodros*, Wlck.) instead of *Mygale* and *Cteniza*, to which it has been referred, a very detailed description is given of a new species congenerous with the last-mentioned insect, of which living specimens had been forwarded to the Society from Barbary by Edward A. Drummond Hay, Esq., Her Majesty's consul-general at Tangiers, with the following characters.

Actinopus ædificatorius, W. *Piceo-niger nitidissimus, corpore subtus pilisque maxillarum pallidioribus; abdomine obscuro fuscosericeo, subtus ad basin maculis 4 luteis; cephalo-thorace supra et postice semicirculariter valde impresso, pedibus longitudine fere æqualibus.* Long. corp. lin. 14. Inhabits Barbaria. Mr. Drummond Hay.

Observations on the structural characters of the Death-watch, with the description of a new British genus belonging to the family of *Psocidæ*. By J. O. Westwood, F.L.S.

After noticing the inaccuracies into which several recent authors have fallen relative to the structure of the Death-watch, a new British genus is characterized as follows :

CLOTHILLA, W. *Corpus apterum. Caput subtriangulare. Antennæ longæ, articulis circiter 27. Prothorax brevis. Pedes simplices, tarsi 3-articulatis.*

Clothilla studiosa, W. *Luteo-albida, oculis brunneis, antennis fuscis, labro albido, incisuris abdominis brunneis, pedibus albidis.* Long. corp. lin. 1. Inhabits the interior of houses.

February 3rd.—The Rev. F. W. Hope, President, in the Chair.

Mr. Westwood exhibited some original drawings of *Crustacea* made by Mr. Wallcot of Bristol, also various larvæ forwarded to him by Mr. Wallcot, jun., including one which that gentleman had no hesitation in considering as that of *Platyrrhinus latirostris*, which, however, closely resembled the larva of a *Leptura*.

He also exhibited drawings of a minute white *Acarus*, found on the backs of books placed against a damp wall, and also of the larva and pupa of a species of *Latridius* found in the same situation, and of an exceedingly minute 6-footed *Acarus* (visible only with a lens of high power) found amongst the hairs of the body of the last-mentioned larva.

Mr. S. Stevens exhibited a beautiful moth of large size from the interior of Africa, having the appearance of the genus *Erebus*, but with short palpi and shortly bipectinated antennæ, belonging to the family *Bombycidæ* (*Saturnia Isis*, Westw. MSS., of which a figure and description will shortly appear in the 'Naturalist's Library').

Mr. Hope exhibited a *Scolopendra* from New South Wales, in which one of the two hind feet was very much smaller than the other, and which was supposed to have resulted from the reproduction of the limb.

The conclusion of Mr. Westwood's memoir on Trap-door Spiders was read.

March 2nd.—The Rev. F. W. Hope, President, in the Chair.

A quantity of silk cocoons from the Cape of Good Hope was presented by Mr. Dukeford, who requested information as to the possibility of their being serviceably employed in the silk trade.

Mr. Bainbridge exhibited a monstrous *Lucanus Cervus*, one of the mandibles of which was strangely distorted.

Mr. Shuckard exhibited a specimen of *Macropis labiata*, a genus of bees recently described by M. L. Dufour in the 'Annales de la Société Entomologique de France,' and which had been captured (for the first time in this country) by Mr. Walton in the New Forest, near Lyndhurst.

The following memoirs were read :

Descriptions of new species of *Cetoniada* in the collection of the Rev. F. W. Hope, with observations on the genus *Osmoderma*. By Mr. W. Bainbridge.

After noticing the doubts which exist relative to the true locality of *Osmoderma scabrum*, and dividing that genus into two sections from the difference in the sculpturing of the elytra, the following species are described :—

Osmoderma Beauvoisii, B. *Nigrum, clypeo convexo, thorace fortissime punctato seu varioloso lateribus subserratis, lined mediâ longitudinali parum impressâ; elytris thorace multo latioribus, striis fortiter insculptis; corpore subtus nigro.* Long. corp. lin. 10. Inhabits Æquinoctial Africa.

Osmoderma scabrum, H. *Cupreo-æneum seu bronzeum, clypeo valde reflexo postice foveato, thorace creberrime punctulato sulco longitudinali lato fortiter impresso: elytris thorace parum latioribus striis rugoso-punctatis; corpore subtus bronzeo punctulato.* Long. corp. lin. 9. Inhabits North America. Mr. Doubleday.

Gnathocera nigrita, B. *Nigra, clypeo quadrato, dente brevi utrinque armato, thorace hexagono varioloso, elytris antice scabris, postice levioribus et tuberculatis, pedibus atro-piceis.* Long. corp. lin. 9. Inhabits Sierra Leone. Mr. Strachan.

Gnathocera amabilis, B. *Smaragdina nitida, pedibus roseo-opalinis, clypeo emarginato, antennis nigro-piceis, thorace trigono, lateribus marginatis, atro-punctato.* Long. corp. lin. 10. Inhabits Sierra Leone. Mr. Strachan.

Diplognatha holosericea, B. *Nigra, thorace subtilissime punctulato, elytris striatis et punctatis; corpore infra nigro nitido, aureo-pubescente; abdomine lined mediâ longitudinali rubrâ impressa.* Long. corp. lin. $9\frac{1}{2}$. Inhabits Sierra Leone. Mr. Strachan.

Diplognatha Rama, H. *Rufescens, clypeo rotundato, thorace et elytris purpureo-variegatis; corpore subtus nigro, sterno rotundato rubro, pectore utrinque maculâ latâ rubrâ.* Long. corp. lin. $8\frac{1}{2}$. Inhabits Japan. Allied to *Cet. Hebrææ*, Oliv.

Diplognatha? pectoralis, H. *Fusco-rubra, clypeo bidentato, pectore flavo-maculato, segmentis abdominalibus utrinque flavo notatis;*
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pedibus piceis. Long. corp. lin. $7\frac{1}{2}$. Inhabits Sierra Leone. This species seems to unite *Compsiura*, H. with *Diplognatha*, G. and P.

Stripsipher ambiguus, H. *Niger, aureo-pubescentis; clypeo antice porrecto, thorace punctatissimo, lateribus angulatis, scutello magno punctulato; elytris lineis 4 elevatis aliâque abbreviatâ marginali*. Long. corp. lin. $6\frac{1}{2}$. Inhabits Sierra Leone. Lieut. Sayers.

Cetonia Withillii, B. *Cuprea, thorace maculis duabus minutis discoidalibus albis; elytris flavo-maculatis, corpore infra roseo-cupreo maculato; pedibus cupreis*. Long. corp. lin. $12\frac{1}{2}$. Inhabits the East Indies. Col. Withill.

Cetonia Saundersii, B. *Supra aurato-viridis nitida punctatissima albo-guttata, antennis tarsisque nigricantibus, elytris apice inermibus, abdomine utrinque albo-maculato*. Long. corp. lin. 8. Inhabits the East Indies. W. W. Saunders, Esq. Allied to *Cet. albo-guttata*, Vig.

Amphistoros affinis, B. *Nigra, thorace lineis tribus albis, elytris flavis ad apicem albo-punctatis, ano utrinque maculâ rotundatâ, corpore infra nigro-piceo, medio abdominis concolori, lateribus albo-maculatis*. Long. corp. lin. 7. Inhabits Sierra Leone. Allied to *Cet. elata*, Fab. and *Amph. varians*, G. and P.

STETHODESMA, H. *Forma Gymnetidis. Clypeus fissus. Thorax trigonus, postice disco protenso. Elytra gradatim e basi ad apicem attenuata, medio acuminata. Sternum valde prominens, antice porrectum. Femora antica bispinosa, 4 postica inermia.*

Stethodesma Strachani, H. *Nigricans rubro marginata, elytris atris postice albo-punctatis apiceque rubro, corpore infra rubro-piceo, segmentis abdominis serie duplici macularum*. Long. corp. lin. $12\frac{1}{2}$. Inhabits Sierra Leone. P. S. Strachan, Esq.

Observations on the *Scolia fulva*. By W. E. Shuckard, Esq.

A female of this species was figured from the collection of the Rev. F. W. Hope, in Griffith's 'Animal Kingdom,' in which a very short description was given of it with the erroneous locality of South America, the species being from New Holland. Mr. Hope having obtained the other sex, Mr. Shuckard gives a detailed description of the species, which belongs to the first section of the genus with three submarginal cells and two recurrent nerves. "It is very rare in coloured *Scolia* that the sexes are alike, but here we have a complete resemblance, except in structural details peculiar to the sexes."

Observations on some Mummied Beetles. By the Rev. F. W. Hope.

The insects noticed in this communication were taken from the inside of a mummied Ibis by Sir Gardner Wilkinson, and belonged to two genera, *Pimelia pilosa*, F., (*Trachyderma pilosa*, Latr.) and *Akis reflexa*, Fab., both of which are met with in great abundance in Egypt at the present day. Several entire specimens of the former and the limbs of others, with sundry limbs of other insects, were obtained. A specimen of *Trachyderma pilosa* is also attached to the

case of an Egyptian mummy in the British Museum. Mr. Hope then enters into various arguments in proof of his opinion that the insects had been devoured whole by the Ibis (which feeds on serpents, insects, &c.), and that they had not been separately embalmed and then placed in the inside of the Ibis.

April 6th.—The Rev. F. W. Hope, President, in the Chair.

Professor Owen exhibited a *Dipterous Larva*, which had lived two days in urine after it had been discharged therewith by a patient; and stated that another specimen had been similarly discharged after an interval of five weeks. He observed, that although larvæ had repeatedly been obtained from the human subject, none had hitherto been noticed in the urinary discharge; he therefore considered this as a most remarkable case and most difficult to be accounted for, since although those larvæ which passed through the stomach might have been accidentally introduced into it in an ordinary manner, yet it was not to be supposed that these larvæ could have passed from the intestinal into the urinary canal.

Mr. Westwood stated that this larva was of a species and genus distinct from that described by the Rev. L. Jenyns in the Transactions of the Entomological Society, discharged from the intestines of a patient; not being furnished with any of the lateral filaments which Mr. Jenyns had considered as branchiæ. Mr. Newport mentioned that Dr. Carter had communicated to him the case of the larva of an *Æstrus* discharged from the frontal sinus of a female; another female had likewise vomited a *Geophilus*.

Mr. Westwood exhibited the following insect monstrosities:—

Cræsus septentrionalis, one of the hind legs of which, although perfect, was considerably smaller than the other. From the collection of the Rev. W. Kirby, F.R.S.

Lucanus Cervus, the left mandible of which was short and recurved, as well as the palpi on that side. From Mr. Waterhouse's collection.

Vanessa Urticæ, the hind wing of which was furnished with an additional perfect wing of very small size, and

Vespa vulgaris, with the abdomen distorted. Both from Mr. Stephens's collection.

Carabus nitens, with one of the hind tarsi diminished in size; and

Aspilates gilvaria, with the two wings on the left side confluent. Both from his own collection.

A species of *Clythra*, the males of which had one of the mandibles singularly distorted (this might however be a specific character rather than an accidental monstrosity).

A Brazilian *Prionus*, one of the hind tarsi of which was tripled, the middle one of these three tarsi being minute.

Mr. Waterhouse also exhibited a Brazilian *Prionus*, in which the terminal joint of one of the antennæ was doubled. Mr. Stephens also stated that he possessed a specimen of *Carabus intricatus*, in which the 11th as well as the 10th joint of the antennæ was implanted upon the 9th; and Mr. W. W. Saunders mentioned that he

had captured a large *Ichneumon*, which wanted one of the posterior tibiæ and tarsi.

Mr. W. W. Saunders exhibited some mud-nests sent from Albania by Mr. S. S. Saunders, and which had been formed by a species of *Pelopæus*, which was thus proved to be a working and not a parasitic insect. Mr. Shuckard also mentioned, upon the authority of Mr. E. Doubleday, that the American species of this genus are well known as the fabricators of those mud-nests, and are thence called *Mud-dabs*.

Mr. W. W. Saunders also exhibited the larva of *Cerambyx heros*, which had completely eaten through a piece of timber, likewise exhibited.

GEOLOGICAL SOCIETY.

*From the Anniversary Address of the Rev. Prof. Buckland,
President, Feb. 21, 1840.*

DEVONIAN SYSTEM.

In the Home Department of Positive Geology, the most striking circumstance has been an announcement by Professor Sedgwick and Mr. Murchison of the conclusion to which they were led by Mr. Lonsdale's suggestion in December 1837, founded on the intermediate character of the fossils in the Plymouth and Torbay limestone—that the greater part of the slate rocks of the south of Devon and of Cornwall belong to the old red sandstone formation.

The order of the observations which have led to this important result, is nearly as follows:—

In a paper read at Cambridge, during the winter of 1836–37, Professor Sedgwick considered the fossiliferous slates on both sides of Cornwall to be of the same formation, and coeval, or nearly so, with the calcareous rocks that lie between the slates of South Devon.

In 1836 and 1837 also*, Messrs. Sedgwick and Murchison proposed to transfer the culmiferous or anthracitic shale and grits (Shil- lot and Dunstone) of *North* Devon to the carboniferous system; withdrawing them from the grauwacke in which they had before been included, and thus assigning a much more recent date than heretofore to the strata which occupy nearly one third part of the map of Devonshire.

But the relations of the slates and limestones of *South* Devon still remained to be determined; the mineral characters of the former being different from those of the old red sandstone beneath the carboniferous group, in many parts of South Wales and in Herefordshire, while the true position of the limestones (e. g. those of Plymouth, Torbay, and Newton Bushell,) was doubtful. At this period (1837), the fossils of this district were examined by Mr. Lonsdale and Mr. Sowerby, to whom the organic remains, both of the car-

* In August 1836, at the Meeting of the British Association at Bristol; and in a paper read before the Geological Society, May and June, 1837, now published in the Geological Transactions, Second Series, vol. v., Part 3.

boniferous and Silurian systems, were familiar. It was soon perceived, that while some of the South Devonshire fossils approached to those of the carboniferous strata, and others to those of Siluria, there were still many species which could not be assigned to either system; the whole, taken together, exhibiting a peculiar and intermediate palæontological character. Mr. Lonsdale therefore suggested, that the difficulties which had perplexed this inquiry could be removed by regarding the limestones of South Devon as subordinate to slaty rocks, which represent the old red sandstones of Hereford, Wales, Scotland, and Ireland,—their true place in the series of Devonshire being intermediate between the culmiferous basin of North Devon, and the Silurian strata,—if the latter exist in that county.

The value of this suggestion was not at first appreciated; but after the lapse of more than a year, Mr. Lonsdale's views were adopted (March 1839) by Messrs. Sedgwick and Murchison*, who soon afterwards applied this new arrangement not only to the groups of Devonshire originally under review, but with a boldness which does credit to their sagacity, extended it to the whole of the slaty and calciferous strata of *Cornwall*, till then known only as grauwacke, clay-slate, or killas; assigning to those strata, likewise, the date of the old red sandstone, and resting this determination entirely on the character of the fossils. This change—the greatest ever made at one time in the classification of our English formations—was announced in a memoir read before the Geological Society in April 1839; the authors then also proposing for the whole series (including both the old red sandstones of Herefordshire, and the fossiliferous slates and limestones of South Devon and Cornwall,) the new name of "*the Devonian system*," and expressing their belief, that many of the groups hitherto called grauwacke, in other parts of the British Islands and on the continent, would ere long be referred to the same geological epoch.

The proposed alteration, therefore, will terminate the perplexity hitherto arising from the circumstance, that the *old* red sandstone of Werner has been frequently confounded with the *new* red sandstone formation of English geologists. It also explains the cause of the English old red sandstone having been rarely recognised on the continent:—for if the Devonian slates afford the normal type of

* It is to be observed here, that Mr. Murchison, having previously shown that the fossils of the Silurian æra are distinct from those of the carboniferous period, had also pointed out "the vast accumulations" (in which few fossils had at that time been discovered) "then known to separate the two systems." He mentions especially, that "the *fishes* of the old red sandstone—entirely distinct as to form and species—are as unlike those of the Silurian system, as they are to those of the overlying carboniferous system:" adding, "that he has no doubt, although at present unprovided with geological links to connect the whole series, that such proofs will be hereafter discovered, and that we shall then see in them as perfect evidence of a transition between the old red sandstone and carboniferous rocks, as we now trace from the Cambrian, through the Silurian, into the old red system."—See *Silurian System*, p. 585, line 22, *et seq.*

this formation, whilst the marly sandstones and conglomerates of Herefordshire are abnormal exceptions in it, we see the reason why their slaty continental equivalents, like the greater part of the South Devon slates, have been referred to the undivided Wernerian formation of *grauwacke*.

Mr. De la Beche in his map of Devon and Cornwall, published in 1839, has adopted divisions of the strata, similar to those of Professor Sedgwick and Mr. Murchison, as to their order of sequence; applying, provisionally, to the culmiferous rocks the name of *Carbonaceous series*, and to the Devonian and Cornish slates the appellation of *Greywacke*.

We know also on the authority of Mr. De la Beche that tin mines are worked in carbonaceous rocks at Owlescomb near Ashburton, on the east side of the Dartmoor granite, and on its west side at Wheal Jewel near Tavistock. He further informs us that one of the richest tin mines now worked in Cornwall, namely the Charles-town mine, east of St. Austle, is in a fossiliferous rock containing Encrinites and corals, and that the same corals occur also near tin mines at St. Just; and in the neighbourhood of Liskeard the Rev. D. Williams has found slates which contain vegetable impressions, dipping under other slates which are intersected by lodes of tin and copper.

From these new facts, we learn that the killas and other slate rocks of Cornwall and the south of Devon do not possess the high antiquity which has till lately been imputed to them; and that tin occurs, as copper, lead and silver have long been known to do, not only in slate rocks that contain organic remains, but even in the coal formation.

Mr. Greenough, in the new edition of his map of England, represents nearly the same boundaries and order of succession in Devon and Cornwall as we find in the maps of Mr. De la Beche and Messrs. Sedgwick and Murchison; but in his memoir connected with the map, adopting the name of *Carbonaceous series* for the culmiferous rocks, he substitutes that of *Upper killas* for the Devonian system of Sedgwick and Murchison, (including under that term the old red sandstone of Herefordshire,) and *Lower killas* for the slates inferior to the Silurian system, which they have termed Cambrian.

Mr. Greenough, in his memoir, also shows by quotations from Dr. MacCulloch, that the undisputed old red sandstone of the north of Scotland exhibits, at intervals, the same great changes of mineral character, that occur in the strata intermediate between the Carbonaceous and Silurian systems in the west of England and on the borders of Wales; and justly infers the inadequacy of any one term to characterize formations which vary so much in lithological composition, that at one place they present the condition of a fine-grained silky slate, at another of sandstone, and at a third that of coarse gravel and conglomerate rock.

Thus, with respect to the slate rocks of Devon, Cornwall and Wales, the difficulties are reduced to those of an unsettled nomen-

clature; whilst nearly all parties are in unison as to the fundamental fact of referring the slates of South Devon and Cornwall to the epoch of the old red sandstone formation. The term *grauwacke*, however, I rejoice to think, will not be condemned to the extirpation which has been threatened from the nomenclature of geology; it may still retain its place as a generic appellation, comprehending the entire transition series of the school of Freyberg, and divisible into three great subordinate formations:—the Devonian system of Sedgwick and Murchison being equivalent to the upper *grauwacke*, the Silurian to the middle *grauwacke*, and the Cambrian system to the lower.

In this threefold distribution of the vast series of strata which have hitherto been indiscriminately designated by the common term *grauwacke*, we are, as it were, extending the progressive operations of a general inclosure act over the great common field of geology; we propose a division, founded on measurements, surveys, and the study of organic remains, analogous to that of the secondary strata, from the chalk downwards to the coal formation, established by William Smith, and to the separations of the once undivided territory of the great tertiary system, effected by Cuvier and Brongniart, Desnoyers, Lyell, and Deshayes.

To the uninitiated in geology, rectifications in the distribution of strata upon so large a scale may seem calculated to shake confidence in all the conclusions of our science; but a contrary inference will be drawn by those who know that these corrections have never been applied to conclusions established on the sure foundation of organic remains, but to those rocks only of which the arrangement had been founded on the uncertain character of mineral composition.

FOSSIL VEGETABLES.

Mr. Barber Beaumont, in a communication respecting these same trees, considers that no drifted plants occur in coal fields, and that all the vegetables which are now converted into coal, grew upon swampy islands covered with luxuriant vegetation, which accumulated in the manner of peat bogs; that these islands, having sunk beneath the sea, were there covered with sand, clay and shells, till they again became dry land, and that this operation was repeated in the formation of each bed of coal. In denying altogether the presence of drifted plants, the opinion of the author seems erroneous; universal negative propositions are in all cases dangerous, and more especially so in geology: that some of the trees which are found erect in the coal formation have not been drifted, is, I think, established on sufficient evidence; but there is equal evidence to show that other trees, and leaves innumerable which pervade the strata that alternate with the coal, have been removed by water to considerable distances from the spots on which they grew. Proofs are daily increasing in favour of both opinions: viz. that some of the vegetables which formed our beds of coal grew on the identical banks of sand and silt and mud, which being now indurated to stone and shale, form the strata that accompany the coal; whilst

other portions of these plants have been drifted, to various distances, from the swamps, savannahs, and forests that gave them birth, particularly those that are dispersed through the sandstones, or mixed with fishes in the shale beds.

The cases are very few in which I have ever seen fossil trees, or any smaller vegetables erect and petrified in their native place. The Cycadites and stumps of large Coniferous trees on the surface of the oolite in Portland, and the stems of Equisetaceous plants described by Mr. Murchison in the inferior oolite formation near Whitby, and erect plants which I have found in sandy strata of the latter formation near Alencon, are examples of stems and roots overlaid by sediment and subsequently petrified without removal from the spots in which they grew. At Balgray, three miles north of Glasgow, I saw in the year 1824, as there still may be seen, an unequivocal example of the stumps of several stems of large trees standing close together in their native place in a quarry of sandstone of the coal formation.

SUPERCRETACEOUS FORMATIONS.

Mr. Lyell has communicated to us a paper full of elaborate detail of facts, and of ingenious speculations respecting the Boulder formation, or drift, associated with freshwater deposits, in the mud cliffs of Eastern Norfolk. These cliffs are in some places 400 feet high, and consist of chalk, crag, freshwater deposits, drift mud and sand, stratified and unstratified;—with superficial accumulations of flint gravel. The centre of his observations is the town of Cromer; he considers the Boulder formation to have been accumulated on land permanently submerged, and not, by one or many, transient advances of water over dry land, and therefore proposes, as Mr Murchison and others have already done, to substitute the term of Drift for that of Diluvium, which many other writers have assigned to it. The Drift, or Diluvium, is of two kinds; one composed of sand, loam, clay, and gravel, all regularly stratified; the other consisting of clay, not divided into beds, and containing boulders of granite, trap and other rocks.

This clay is known on the east and north-east coast of Scotland by the name of Till. He considers the stratified Drift and Till to be contemporaneous formations, and compares the latter to moraines formed at the termination of glaciers. He imagines that drifted masses of ice, charged with earthy matter and fragments of rock, may have deposited the Till as they melted in still water, and the occasional intercalation or juxta-position of stratified materials is ascribed to the action of currents on materials also falling from melting icebergs.

Mr. Lyell refers the complicated bendings and tortuous foldings of many beds of this formation near Mundesley and Cromer to lateral pressure from drifting ice, especially where extremely contorted beds repose upon undisturbed and horizontal strata. But he admits that some of them may be due to landslips of ancient date, and which had no connection with the present line of cliffs. At

the bottom of the boulder formation, and immediately above the chalk, extensive remains of a buried forest occur, the stools of the trees being imbedded in black vegetable earth. From the position of this forest a vertical subsidence of several hundred feet and a subsequent rise of the land to the same amount is inferred. This forest and a bed of lignite are connected with fluviatile or lacustrine deposits, which occur about the level of low water below the drift; but at Mundesley they are partly above it, and the freshwater shells which they inclose being nearly all of British species, show that they, as well as the contemporaneous drift, all belong to the newer Pliocene period.

In an Address formerly delivered from this chair, in 1836, and in a subsequent edition of his "Principles of Geology," as well as in his "Elements," Mr. Lyell has called our attention to some differences of opinion which had been expressed by several eminent conchologists as to the number of fossil shells of the crag of Norfolk and Suffolk which could be identified with living species. So great was the discordance of the results at which M. Deshayes, Dr. Beck, and others seemed to have arrived, that their announcement was calculated materially to impair our confidence in the applicability of the chronological test so much relied on by Mr. Lyell for the classification of the tertiary formations; namely, that derived from the proportional number of recent and extinct species discoverable in each deposit. In the hope of arriving at some definite conclusion on this important point, Mr. Lyell visited Norfolk and Suffolk during the last year, and having obtained a considerable collection from the crag near Norwich and Southwold, he instituted, with the assistance of Mr. Searles Wood and Mr. George Sowerby, a thorough comparison between them and recent species. The fossil shells of this formation, which the author calls the Norwich crag, are partly marine, and partly freshwater, and indicate a fluvio-marine origin, and the proportion of living species was found to be between 50 and 60 per cent. This deposit, therefore, the author refers to the older Pliocene period. A similar examination was then made of 230 species of shells from the Red Crag in Mr. Wood's museum, and it was found that 69 agreed with living species, being in the proportion of about 30 per cent. This group therefore Mr. Lyell ascribes to the Miocene era. A collection of 345 species of Coralline Crag shells in Mr. Wood's cabinet was then compared in like manner, and sixty-seven were determined to be identical with recent species, being about 19 per cent. Mr. Lyell, therefore, considers that the Coralline Crag is also Miocene, although belonging to a more remote part of that period than the Red Crag. Having obtained from M. Dujardin a collection of 240 shells from the Faluns of Touraine, he found with Mr. George Sowerby's assistance that the recent shells were in the proportion of twenty-six per cent., so that he has now come round to the opinion long ago announced by M. Desnoyers, that upon the whole the Crag of Suffolk corresponds in age with the Faluns of Touraine, both being Miocene, although the species in the two countries are almost entirely distinct, those of England having a northern and those of

France a sub-tropical character. I am also informed by Mr. Lyell, that out of 400 marine and freshwater species, from the Eocene strata of the London and Hampshire basins, Mr. G. Sowerby was scarcely able to identify two per cent. with living shells. It is satisfactory therefore to observe that the test of age derived from the relative approach to the recent Fauna is in perfect accordance with the independent evidence drawn from superposition. We ascertain for example by superposition that the freshwater strata of the mud cliffs of East Norfolk rest on Norwich crag, and are the newest formation of all. They are then followed in the descending series by, 1st, the Norwich, 2ndly, the Red, and 3rdly, the Coralline Crag, beneath which is the London Clay. The same order of sequence is indicated by the organic remains considered independently, and simply with reference to the degree of their correspondence with the existing Fauna.

It has been known for many years, that near Bridlington, in Yorkshire, sand and clay containing marine tertiary shells had been exposed on the coast. From an examination of the shells collected there by Mr. Bean, Mr. Lyell finds the deposit to agree in age with the Norwich Crag.

I cannot conclude these remarks without observing, that some part of the confusion and apparent inconsistency of the opinions of different conchologists, respecting the age of the Crag, must have arisen from the intermixture of fossils derived equally from the Norfolk and Suffolk beds, or from strata, some of which now turn out to be referable to the Older Pliocene, others to the Miocene period.

From an examination of some fossil shells, identical with recent species collected by Capt. Bayfield from the most modern deposit near the Gulf of St. Lawrence, and near Quebec, Mr. Lyell infers, that the climate of Canada was colder than now during the era immediately antecedent to our own times. The shells, which were determined by Dr. Beck, differ in great part from those now living in the Gulf of St. Lawrence, agree more nearly with arctic genera and species, and resemble those which Mr. Lyell collected at Uddevalla, in Sweden; whereas, if the living shells most abundant in the Swedish and Carnadian seas are contrasted, they differ almost entirely. From notes sent by Capt. Bayfield, it appears that at different depths in the stratified sand and clay containing the fossil shells, near Quebec, insulated boulders are numerous, which, it is presumed, have been brought down at distant intervals by drift ice, and have dropped to the bottom of the sea as the ice melted.

While Mr. Lyell, by the aid of Dr. Beck's determination of fossils, had adopted these views respecting the climate of Canada, Mr. James Smith, of Jordan Hill, had been led by independent observations to a similar conclusion respecting the climate of Scotland during the Newer Pliocene era, arguing from the arctic character of the Testacea found in the raised beds of the valley of the Clyde, and other localities. In the first of two papers communicated by this

author, he regarded all the deposits abounding in recent shells in Scotland and Ireland as belonging to one group; but in his second memoir he contends that there are two distinct formations on the Clyde, in the older of which there are from ten to fifteen per cent. of extinct or unknown species of shells, which he refers to the Newer Pliocene system of Lyell; whereas all the species found in the newer, which he calls Post-tertiary, exist also in the present seas. During this Post-tertiary period, which is considered to have been anterior to the human epoch, an elevation of at least forty feet took place on the shores of the Clyde. Mr. Smith affirms that the Till, or unstratified accumulation of clay and boulders, belongs not to the Post-tertiary, but to the older Pliocene division.

PALÆONTOLOGY.

In the department of *Palæontology* Prof. Owen has, during the past year, contributed many papers, with his usual zeal and ability, to the elucidation of this most essential and perhaps most generally interesting branch of our subject. At the head of these we must place his determination of a tooth and part of a jaw of a fossil monkey, of the genus *macacus*, with part of the jaw of an opossum, and the tooth of a bat, in Eocene strata of the English tertiary formation. These remains were found at Kingston, near Woodbridge in Suffolk, by Mr. Colchester, in strata which Mr. Lyell has referred to the London clay; thus proving the existence of quadrumanous, marsupial, and cheiropterous animals in this country during the Eocene period. We have now evidence of fossil *Quadrumana* in the tertiary formations, not only of India and Brazil, but also of France and England; respecting which Mr. Owen has observed, that they appear under four of the existing modifications of the quadrumanous type: viz. the tailless ape (*Hylobates*), found fossil in the South of France; the gentle vegetable-feeding *Semnopithecus*, found fossil in India; the more petulant and omnivorous *Macacus*, found in Norfolk; and the platyrrhine *Callithrix*, found in Brazil. This genus is peculiar to America, and its extinct species is of more than double the stature of any that exists at the present day. This geographical distribution of *Quadrumana* adds further weight to the arguments derived from the tropical aspect of vegetable remains that abound in the London clay at Sheppy, showing that great heat prevailed in the European part of the world, as well as in India and South America, during the Eocene period.

The probability of high temperature is further corroborated by Mr. Owen's recent recognition of four petrified portions of a large serpent (*Palæophis Toliapicus*), eleven feet long, and in several points resembling a boa, or python; and also of a bird allied to the vultures (*Lithornis vulturinus*), all from the London clay of the Isle of Sheppy; wherein the occurrence of fossil Crocodilians and Testudinata, and of fossil fruits, having a tropical aspect, allied to cocoa-nuts and many other fruits of palms, has been long known. Can we account for these curious facts without supposing that at the Eocene period of the tertiary epoch, the very clay on which London now stands was in the condition of a nascent spice-island,

its shores covered with basking reptiles*, and the adjacent lands waving with cardomums and palms, and thuias and cypresses, with monkeys vaulting and gamboling upon their branches, and gigantic serpents entwined around their trunks; the seas also swarming with sting-rays and saw-fishes, with chimæras and enormous sharks? for all these together with countless shells of pearly nautili occur among the fossil remains of the numerous extinct species of fishes, which, during the early ages of the tertiary period, crowded the tepid seas of our now humid and chilling climate.

Mr. Owen has also determined the character of a new genus of Pachydermatous animal (*Hyracotherium*) intermediate between the Hyrax, hog, and Chæropotamus, found in the London clay at Herne Bay, near Margate, by Mr. Richardson.

Mr. Lyell having submitted to Mr. Owen some fossil teeth from the Red Crag of Newbourne in Suffolk, they proved to be referrible to the leopard, bear, hog, and a large kind of deer, and afford the first example of mammalian remains being found in England in any of those divisions of the Crag which Mr. Lyell, in a paper already alluded to, has ascribed to the Miocene period; these genera are known to occur in the Miocene formations of France and Germany. The numerous Mammalia in the fluvio-marine crag of Norwich, are decidedly of a later date; among these Mr. Lyell enumerates the teeth and jaw of *Mastodon longirostris*, a tusk of an elephant with serpulæ attached, and bones of a horse, hog, and field-mouse; there occur bones of birds, many fishes, and numerous shells, partly marine, and partly freshwater and terrestrial.

The recent discoveries in Brazil by Dr. Lund of extinct Mammalia, that probably lived in some late portion of the tertiary epochs, form a new and important chapter in Palæontology. The largest of these are referrible to more gigantic forms than at present exist of families now peculiar to South America—*e. g.* to Sloths and Armadillos; just as most of the fossil mammalia of New Holland belong to families and genera which are still peculiar to that country. In a paper on one of these animals from Buenos Ayres, Mr. Owen has shown that the bony armour, which several authors have referred to the Megatherium, belongs to the Glyptodon, an animal allied to the Armadillo, and of which a head containing teeth, and attached to a tessellated bony covering of the body and tail, resembling those of an Armadillo, has been lately found near Buenos Ayres, and is figured by Sir Woodbine Parish in his interesting work on that country, 1838.

The Glyptodon differed from the Megatherium in the structure and number of the teeth, and from all known Armadillos in the form of the lower jaw, and the presence of a long process descending from the zygoma; and approached in both these respects to the Megatherium. The teeth differ from those of Armadillos, in having two deep grooves both on the outer and inner surface, are more complex than those of any known Edentate, and indicate a passage from that family into the Toxodon. The ungual phalanges are

* This stands in striking contrast to the supposed Glacial period.—EDIT.

wholly unlike those of the Megatherium, and most nearly resemble those of Dasypus, but are short broad and flat, and seem to have been covered with hoof-like claws. The form of the foot most nearly resembled that of the fore foot of the Mole. Having appropriated to the Glyptodon the armour supposed to belong to the Megatherium, Mr. Owen next proves that the latter animal was unprovided with any such bony covering, arguing from a comparison of its vertebral column and pelvis with that of the Armadillo; and from the absence of the oblique processes, which in the loricated Edentata resemble as to form and use the *tie-bearers* in carpentry, that support the weight of a roof. The vertebral conditions of the Megatherium are nearer to those of the Sloths and Ant-eaters. We have accounts of twelve skeletons of Megatherium, not one of which was found to be accompanied by bony armour. Cuvier considered the Megatherium more nearly allied to the Ant-eaters and Sloths than to the Armadillos.

Captain Martin has found that many parts of the bottom of the English Channel and German Ocean contain in deep water the bones and tusks of Elephants. They have been dredged up between Boulogne and Dungeness, in the mid-sea between Dover and Calais, and at the back of the Goodwin Sands; also mid way between Yarmouth and the coast of Holland. In 1837 a fisherman enclosed in his net a vast mass of bones between the two shoals called Varn and Ridge, that form a line of submarine chalk-hills between Dover and Calais. Captain Martin says these bones do not occur on the top of banks or shoals, but in deep hollows or marine valleys. Sir John Trevelyan possesses the molars of a large Elephant from gravel in the bed of the Severn, near Watchet, and we have long known that the bones of Elephants occur in great abundance in the oyster grounds off Yarmouth.

In subterranean Ornithology three important discoveries have been made during the past year; the first in the Eocene formation by Professor Owen, who has recognised the fossil Vulture before alluded to in the London clay of Sheppy; the second, by Lord Cole and Sir P. Egerton, who have acquired from the chalk of Kent the humerus of a bird most like that of an Albatross, but of larger and longer dimensions; the third by Professor Agassiz, who has found in Switzerland a nearly entire skeleton of a small bird (not unlike a Swallow), at Glaris, in the indurated blue slate beds of the lower region of the chalk formation. We know that the bones of a Wader, larger than a Heron, have been found by Mr. Mantell in the Wealden formation of Tilgate Forest; and that the Ornithichnites in the New Red Sandstone of Connecticut have been referred to seven species of birds.

We have an interesting accession to our knowledge of the anatomy of the Ichthyosaurus in Mr. Owen's description of the hinder fin of an *Ichthyosaurus communis*, discovered at Barrow-on-Soar by Sir Philip Egerton; this fin distinctly exhibits on its posterior margin the remains of cartilaginous rays that bifurcate as they approach the edge of the fin, showing in this respect a new approximation to

the fin of a fish, and more fully justifying the propriety of the name *Ichthyosaurus*. Traces are also preserved of scutiform compartments on the integument of the fin. It is singular that this structure should never have been observed in any of the numerous specimens from Dorset and Somerset that have come under our notice; whilst at Barrow-on-Soar, from whence the paddle in question was derived, even the fibres of the skin and folds of the epidermis are sometimes accurately retained*.

Mr. Owen's first part of his report on fossil Saurians, read at the British Association at Birmingham in August last, forms the commencement of a most important addition to the history of extinct reptiles. His recent investigations in Odontography have also supplied to the geologist a new and most efficient instrument of investigation, enabling him to distinguish genera of extinct animals by the microscopic structure of their teeth; and as, of all fossil remains, the teeth are the parts most perfectly preserved, and in the case of cartilaginous fishes the teeth and spines are generally the only parts that have escaped decomposition, this method assumes an especial importance in fossil Ichthyology, as affording exact characteristics of animals long swept from the surface of the earth, and whose very bones have been obliterated from among the fossil witnesses of the early conditions of life upon our planet. By this microscopic test applied to the family of Sharks, Mr. Owen has confirmed the views of Agassiz respecting the affinities between the living *Cestracion* and the extinct genera *Acrodus*, *Ptychodus*, *Psammodus*, *Hybodius*, *Cochliodus*; in the case of animals also of the higher orders, he has settled the much-disputed places of several extinct gigantic Mammalia by the same unerring test. Thus he has shown the supposed reptile *Basilosaurus* to be a Cetaceous mammifer, allied to the *Dugong*; the *Megatherium* to be, as Cuvier had considered it, more nearly allied to the Sloth than to the Armadillo; and the *Saurocephalus* to be, as Agassiz had supposed it, an osseous fish.

Dr. Malcolmson, in a memoir on the Old Red Sandstone of the north of Scotland, has done important service in showing that the rocks composing that group are divided into three formations, the two lower of which are clearly distinguished from each other by their fossil fishes. The cornstone or central formation is charged with numerous remains of Ichthyolites, including *Holoptychus nobilissimus*, a new species of *Cephalaspis*, and other forms not yet described. The lower division, consisting in this region of conglomerates, shales and sandstone, is characterized by the genera *Dipterus*, *Diplopterus*, *Cheiracanthus*, &c., of Agassiz, as well as by the occurrence of a singular Ichthyolite, which seems to offer close analogies to certain forms of Crustacea. By help of these Ichthyolites, the author has been enabled to connect certain strata of Orkney and Caithness, and determine their relations to the beds of Old Red Sandstone containing fossil fishes in the basin of the Tay, and in the border counties of England and Wales, where they had been described by Mr. Murchison.

* See Buckland's *Bridgewater Treatise*, Pl. 10.

Mr. Williamson, in a notice on the fossil fishes of the coal-fields of York and Lancaster, says that these coal measures are very rich in Ichthyolites, which abound so much at Middleton colliery, near Leeds, that the workmen have given to one bed the name of fish coal; they are usually in fine bituminous shale above and below the coal, and most frequent in the roof immediately above it, where, as at Burdie House, near Edinburgh, there is a thin seam of coprolitic matter; they are rarely mixed with any great quantity of vegetable remains. In the lower measures of Lancashire they are associated with Goniatites and Pectens, and in the higher measures of Lancashire and Yorkshire with freshwater shells allied to *Unio*, and with Entomostraca. Exact observations as to facts of this kind are of inestimable importance, for it is only by careful induction from a sufficient number of such-like phenomena, and from similar details as to the local distribution and condition of animal and vegetable remains in the marine and fluvio-marine and lacustrine deposits which compose the carboniferous series, that we shall arrive at a solution of the grand problem of the formation of coal.

CRUSTACEANS.

The Rev. T. B. Brodie has discovered in the Wealden formation near Dinton, in the vale of Wardour, the remains of Coleopterous and Hymenopterous insects, and a new genus of *Isopodous Crustacea* in the family Cymothoidæ. The Isopods are clustered densely together; the lenses in their eyes are sometimes preserved; there are also traces of legs, but of no antennæ. With them he has found a large species of Cypris. The insects are chiefly small Coleoptera; there are several species of Dipterous, and one Homiopterous insect, and the wing of a Libellula. Mr. Brodie's discovery is the first yet made of insects in the Wealden formation, and also the first example, in a secondary formation, of Isopods that approximate in form to the Trilobites of the Transition series.

ICHOLOGY.

About twelve years ago we witnessed the creation of a new department in geological investigations, viz. the science of Ichnology, founded on the evidence of footsteps made by the feet of animals upon the ancient strata of the earth; this new method commenced with the recognition of the footmarks of reptiles on the New Red Sandstone near Dumfries, and not long after (1834) was followed by most curious and unexpected discoveries in Saxony and America. The *Chirotherium* of Hessberg and *Ornithichnites* of Connecticut were among its early results. Our own country has during the last two years been abundantly productive of similar appearances in many localities.

In recent excavations for making a dock at Pembray, near Llanelly, in Pembrokeshire, tracks of deer and of large oxen have been found on clay subjacent to a bed of peat, the lower peat being moulded into the footsteps; similar impressions were also found upon the upper surface of the peat beneath a bed of silt, and bones both of

deer and oxen in the peat itself. Footmarks of deer have been also noticed in Mr. Talbot's excavations for a harbour near Margam burrows on the east of Neath.

Near Liverpool Mr. Cunningham has successfully continued his researches begun in 1838, respecting the footsteps of *Chirotherium* and other animals in the New Red Sandstone at Storeton Hill, on the west side of the Mersey. These footsteps occur on five consecutive beds of clay in the same quarry, the clay beds are very thin, and having received the impressions of the feet, afforded a series of moulds in which casts were taken by the succeeding deposits of sand, now converted into sandstone. The casts of the feet are salient in high relief on the lower surfaces of the beds of sandstone, giving exact models of the feet and toes and claws of these mysterious animals, of which scarcely a single bone or tooth has yet been found, although we are assured by the evidence before us of the certainty of their existence at the time when the New Red Sandstone was in process of deposition.

Further discoveries of the footsteps of *Chirotherium* and five or six smaller reptiles in the New Red Sandstone of Cheshire, Warwickshire and Salop, have been brought before us by Sir P. Eger-ton, Mr. J. Taylor, jun., Mr. Strickland, and Dr. Ward.

Mr. Cunningham, in a sequel to his paper on the footmarks at Storeton, has described impressions on the same slabs with them, derived from drops of rain that fell upon thin laminae of clay interposed between the beds of sand. The clay impressed with these prints of rain drops acted as a mould, which transferred the form of every drop to the lower surface of the next bed of sand deposited upon it, so that entire surfaces of several strata in the same quarry are respectively covered with moulds and casts of drops of rain that fell whilst these strata were in process of formation.

On the surface of one stratum at Storeton, impressed with large footmarks of a *Chirotherium*, the depth of the holes formed by the rain drops on different parts of the same footstep has varied with the unequal amount of pressure on the clay and sand, by the salient cushions and retiring hollows of the creature's foot; and from the constancy of this phænomenon upon an entire series of footmarks in a long continuous track, we know that this rain fell after the animal had passed. The equable size of the casts of large drops that cover the entire surface of the slab, except in the parts impressed by the cushions of the feet, record the falling of a shower of heavy drops on the day in which this huge animal had marched along the ancient strand; hemispherical impressions of small drops, upon another stratum, show it to have been exposed to only a sprinkling of gentle rain that fell at a moment of calm.

In one small slab of New Red Sandstone found by Dr. Ward near Shrewsbury, we have a combination of proofs as to meteoric, hydrostatic, and locomotive phænomena, which occurred at a time incalculably remote, in the atmosphere, the water, and the movements of animals, and from which we infer with the certainty of cumulative circumstantial evidence, the direction of the wind, the depth and course

of the water, and the quarter towards which the animals were passing; the latter is indicated by the direction of the footsteps which form their tracks; the size and curvatures of the ripple-marks on the sand, now converted to sandstone, show the depth and direction of the current; the oblique impressions of the rain drops register the point from which the wind was blowing, at or about the time when the animals were passing.

Demonstrations founded solely upon this kind of circumstantial evidence were duly appreciated, and are well exemplified, by the acute author of the story of *Zadig*; who from marks he had noticed on the sand, of its long ears, and teats, and tail, and from irregular impressions of the feet, declared the size and sex, recent parturition and lameness of a bitch he had never seen; and who from the sweeping of the sand, and marks of horse-shoe nails, and a streak of silver on a pebble that lay at the bottom of a single footstep, and of gold upon a rock against which the animal had struck its bridle, inferred that a horse, of whose existence he had no other evidence, had recently passed along the shore, having a long switch tail, and shod with silver, with one nail wanting upon one shoe, and having a bridle studded with gold of twenty carats value.

March 25.—A paper was first read “On the Age of the Limestones of South Devon;” by W. Lonsdale, F.G.S.

The object of this communication is to show the nature and limits of the author’s claim to having been the first to infer from zoological evidence that the limestones of South Devon would prove to be of the age of the old red sandstone; and it was drawn up at the request of Mr. Murchison, in consequence of the subsequent adoption and extension of the proposed classification by Professor Sedgwick and that gentleman; and at the request likewise of Dr. Fitton, in consequence of the same views having been applied to some of the infra-carboniferous formations of Belgium and the Boulonnais. The paper commences with a summary of the opinions previously entertained respecting the age of the limestones. The authors quoted are, Woodward, 1722; Da Costa, Maton, Playfair, Berger, L. A. Necker, De Luc, T. Thomson, Kidd, W. Smith, Brande, W. Phillips, Hennah, Greenough, Sedgwick, W. Conybeare, J. J. Conybeare, Buckland, Dufrénoy, Elie de Beaumont, De la Beche, Prideaux, Boase, J. Phillips, Austen, Murchison, Bakewell and J. de Carle Sowerby.

By these geologists the limestones are placed in the primary, transition or graywacke and carboniferous series; Mr. Prideaux being the only author who ascribes them in part, and on mineral characters, to the old red sandstone; and Mr. J. Phillips, in his article on geology in the *Encyclopædia Metropolitana*, hesitating to place them in a definite position, in consequence of the resemblance of many of the shells to species found in the mountain limestone. Mr. De la Beche, in his memoir on Tor and Babacomb Bays, also states that the limestones of that district rest on old red sandstone; and in his Report on Cornwall and Devonshire (1839), he says, “that those who rely very exclusively on the character of organic remains would

probably feel disposed to consider the Torbay and Plymouth beds as equivalent to some such rock as the old red sandstone." The author of the paper refrains from all reference to the memoirs of the Rev. David Williams and Mr. Weaver, because his attention is more particularly confined to the limestones of South Devon. In allusion to the diversity of opinions which have been entertained respecting these rocks, even on some occasions by the same geologist, he is of opinion that it must be ascribed to the want, at the time the memoirs were written, of that preponderating weight of evidence which enables the mind to rest steadily on its own decisions; and that if a better result be now attainable, it must be ascribed to the mass of evidence, which has been recently accumulated in various parts of the kingdom. Until the organic remains of the mountain limestone and Silurian system had been determined, the former overlying and the latter underlying the old red sandstone, and shown by Mr. Murchison to graduate regularly into that formation, and to contain perfectly distinct suites of fossils, it was impossible to determine the age of a series of beds, the fossils of which were in part new, and in part closely allied to carboniferous shells; and procured from a region but partially examined, without a base line, beset with faults, and traversed by igneous rocks.

Mr. Lonsdale then proceeds to show, what was the zoological evidence on which he ventured in December, 1837, to conclude that the South Devon limestones would prove to be of the age of the old red sandstone. Previously, he had examined in part the corals of the Silurian region and South Devon, and ascertained that some of the species are common to both; he had also examined with Mr. J. Sowerby, Mr. Hennah's valuable collection of fossils from the neighbourhood of Plymouth, and had become aware, from the decisions of Mr. Sowerby, that certain of the shells could with difficulty, if at all, be distinguished from mountain-limestone species; and that some were distinct. In December, 1837, he examined with Mr. Austen a portion of that gentleman's collection of Newton Bushell fossils, and though he ventured to differ from some of the identifications with mountain-limestone species pointed out to him, yet these shells agreed so much in aspect with testacea of the carboniferous fauna, that he could not doubt there was a connexion between the beds from which they had been obtained and the mountain limestone system: the same collection also proved that, associated with these shells were corals of Silurian species. He had also been informed by Mr. Austen, that in beds connected with the limestone, the *Calceola sandalina* had been found. It was therefore by combining the amount of the above evidence, the presence in the same strata of shells, identical, or nearly identical, with mountain-limestone species, of Silurian corals, the *Calceola sandalina*, and a numerous distinct testacea, that he suggested the South Devon limestones would prove to be of an age intermediate between the carboniferous and Silurian systems, and consequently of that of the old red sandstone. In alluding to Professor Sedgwick and Mr. Murchison's adoption of the suggestion in 1839, and their bold application of it

to all the older sedimentary rocks of Devon and Cornwall, the author states, that the fullest testimony is borne in the papers, containing their present views of the structure of those counties, of the source whence the suggestion was derived.

Appended to the notice was a list of fossils, necessarily very incomplete, from the limited nature of the materials at the author's command. It consisted of sixty-three species; twelve considered common to the Carboniferous and Devonian limestones, forty-two peculiar to the Devonian strata; and nine, seven of which are corals, common to the Devonian and Silurian formations; doubts were, however, entertained respecting the identification of the two species of shells. The author then observes,—should it be urged that it was unjustifiable to assume, from organic remains alone, the age of the Devonshire limestone, it may be replied, that in a district of which little in 1837 was positively known, which is cut off by the granite of Dartmoor from the only base line of the country, the culm measures of central Devon, proved in 1836 by Prof. Sedgwick and Mr. Murchison to be the representative of the true coal measures, organic remains were the only test by which the age of strata so situated could be determined; and in support of his argument, he advanced the recent establishment in Cutch and the Desert to the east of it, from the examination of suites of fossils brought to England by Capt. Smee and Capt. Grant, and others procured by Colonel Pottinger at the request of Colonel Sykes, of a series of beds unquestionably of the age of the oolites of England, the fossils agreeing in their general characters with those of that geological epoch in this country, and being in many instances specifically undistinguishable. In this case, mineral characters and order of superposition would have been valueless guides, for the rocks are totally different in character from those of the same age in England; and there was no predetermined series of beds from which an order of superposition could be derived. Another instance was noticed of the value of organic remains, if rightly applied, in determining the relative age of a distant region, and in this case of one inaccessible to Europeans, in the Ammonites obtained from the Tartar side of the Himalayan mountains. These fossils prove the existence in that unexplored country, of rocks of the secondary epoch, by possessing that peculiar character in the sutures, which is not found in Ammonites of any other epoch; they are moreover accompanied by Belemnites.

In advocating the value of fossils, the author, however, begs it may be clearly understood, that he would not expunge from the geologist's consideration, the aid to be derived from order of superposition, and under a right control, from the use of mineral composition and lithological structure; and he would advise the observer not to depend upon his own limited sources of knowledge, but to seek the aid of the philosophical zoologist, who can teach him to reason justly on the distribution of animal life,—the accidents to which it is liable,—the changes which such accidents may produce, or the means provided by nature to resist them,—and on the effects

which a permanent alteration in the inhabiting medium may work in the form and size of a shell or coral.

Of the importance of organic remains in identifying districts less widely separated, the two following instances were noticed. In M. Dumont's work on the geology of the province of Liege, published in 1832, and justly valued for unravelling the structure of a most intricate country, the strata immediately beneath the mountain limestone are divided into three systems, but without any definite comparison with the formations which underlie that deposit in England. At the meeting of the Geological Society of France, at Mezieres, in September, 1835, Dr. Buckland proposed the following first comparison between the systems of M. Dumont and the subdivisions of the Silurian system established by Mr. Murchison:—

<i>Système calcaireux supérieur.</i>	Mountain limestone.
	(Old red sandstone wanting.)
<i>Syst. quartzo-schisteux supérieur.</i> .	The Ludlow rocks.
<i>Syst. calcaireux inférieur.</i>	The Dudley and Plymouth limestone.
<i>Syst. quartzo-schisteux inférieur.</i> .	The Caradoc sandstone.
	(Builth and Llandeilo flags wanting.)

Terrain Ardoisier.

This comparison was principally founded on the resemblance of the corals with those obtained at Dudley and Wenlock. M. Constant Prevost pointed out the resemblance of the *calcaire bleu* of the *système calcaireux inférieur* of M. Dumont with the Plymouth limestone, and of the marble of Heer, subordinate to the *système quartzo-schisteux supérieur*, with the limestones of Babacombe. Mr. Greenough, however, doubted the identity of the Plymouth and Dudley limestones, and he stated that he had remarked the total absence of the Dudley Trilobites in the *système calcaireux inférieur*. During the Mezieres meeting, Dr. Buckland identified certain beds beneath the mountain limestone near Namur, Dinant, and Huy, and at Engis, with the old red sandstone*; and at an ordinary meeting of the Geological Society of France, in December, 1837, M. Rozet repeated his belief, that the old red sandstone is well developed between Dinant and Namur; and M. Constant Prevost stated, that he had also during the Mezieres meeting, determined its existence in those districts. In 1838, M. Dumont visited England for the purpose of examining the Silurian region; and on his return to Belgium, he laid before the Royal Academy of Bruxelles a table, differing from that of Dr. Buckland only in drawing more closely the terms of comparison, and in identifying the two upper divisions of the Terrain Ardoisier with the Cambrian system. He stated also, in a report which accompanied the table, that the old red sandstone was most probably wanting in Belgium, or, if it exist, that it must

* In the "Outlines of England and Wales" (1822), the Rev. W. D. Conybeare places all the Belgian beds between the carboniferous limestone and the transition slates in the old red sandstone.—Note, 468.

be considered as a great development of the superior part of the Upper Ludlow Rock. In M. Dumont's work, before mentioned, lists are given of the fossils from each system; and on examining them, for the purpose of determining how far the comparison of the Belgian and Silurian systems could be established by organic remains, the author of this notice ascertained, that out of twenty-two species, only four could be considered as peculiar to the Silurian system; and of these he believes two may be erroneous identifications; that five species are common to the Belgian beds and the mountain limestone, and thirteen to the Belgian and Devonian systems. These lists, Mr. Lonsdale states, are small, but, he adds, they bear internal evidence of having been carefully drawn up without any preconceived theory; and he conceives that they afford sufficient proof that the beds from which they were obtained do not belong to the Silurian system, but partake of the same intermediate character as the Devonian limestones. The other case, alluded to in the paper, refers to the older beds of the Bas Boulonnais. These strata were identified by M. de Verneuil in 1838, with the Silurian series of England, particularly a bed of limestone containing corals and other fossils with the Wenlock limestone; and M. Dumont, who examined the country with M. de Verneuil, states in his report to the Bruxelles Academy, that his four systems occur in the Boulonnais. The above bed of limestone, M. Rozet had also, in 1828, placed below the old red sandstone; but in a subsequent memoir, published in the *Annales des Sciences Naturelles* (xix. p. 145. 1830), he assigns it to the old red sandstone. At the Meeting of the Geological Society of France at Boulogne, in Sept. 1839, and at which some of the Fellows of the Geological Society of London assisted, the identification of the Boulonnais beds with the Silurian system was fully admitted. When, however, doubts were recently thrown out respecting the age of the formations in the Liege districts on account of the nature of their fossils, Mr. Murchison, who was present at the Boulogne Meeting, stated to the author of this notice, that if the Liege country had been wrongly identified, the older beds of the Boulonnais had been wrongly identified also. To determine the question, as far as fossils would assist, Mr. Murchison procured, by the kind assistance of M. Dutertre Yvart, a collection of specimens in the Museum at Boulogne. An examination of these specimens with published lists, proved that the inference was just, and that there exists in the Bas Boulonnais, the same mixed assemblage of mountain limestone, Silurian and Devonian, or peculiar fossils, as in the province of Liege and in Devonshire.

Nov. 4.—A paper was read on Glaciers, and the evidence of their having once existed in Scotland, Ireland, and England, by Professor Agassiz, of Neuchatel.

M. Agassiz commences by observing, that the study of glaciers is not new, as Scheuchzer visited, and even drew, most of the glaciers of Switzerland; and as, at a later period, Gruner and De Saussure

examined them in great detail, and left few of their phænomena uninvestigated. Hugi also, in his account of the Alps, and Scoresby, in his descriptions of the arctic regions, have communicated much valuable information respecting glaciers, but without giving rise to any important geological results; and it was Venetz and De Charpentier who first ascribed to them the transport of the erratic boulders of Switzerland, supposing that the Alps formerly attained a greater altitude than at present, and that the glaciers extended to the plains of Switzerland, and even to the Jura. This assumed greater height of the Alps M. Agassiz dissents from, as no geological phænomena compel him to admit it; and the arrangement of the boulders proves that the blocks were not pushed forward by the glaciers, as conjectured by M. Charpentier. Moreover, the phænomena of erratic boulders extend over all the temperate and northern regions of Europe, Asia and America, and, consequently, could not depend upon so local an event as a greater altitude of the Alps. The consideration of these difficulties induced M. Agassiz to resume the study of glaciers; and after devoting the suitable portion of five successive summers to the study of their details, and all that has been written respecting their structure, he has arrived at the conviction, that the formation of glaciers did not only depend upon the actual configuration of the earth, but was also connected with the last great geological changes in the surface of the globe, and with the extension of the great mammifers still found in the polar ice. He has also convinced himself the glaciers did not advance from the Alps into the plains, but gradually withdrew towards the mountains from the plains which they once covered. In this belief, he says, he is supported by many considerations which escaped previous observers, depending chiefly on the form and relative position of the erratic blocks, and the commonly called diluvial gravel, the former being in Switzerland always angular, and resting on the latter, which consists of rounded materials. Considered in this point of view, glaciers assume an entirely new importance, for they introduce a long period of intense cold between the present epoch and that during which the animals existed, whose remains are buried in the usually called diluvial detritus.

Having established his theory as completely as he could, by repeated investigations of Switzerland and the adjacent portions of France and Germany, M. Agassiz became desirous of examining a country in which glaciers no longer exist, but in which traces of them might be found. This opportunity he has recently enjoyed, by examining a considerable part of Scotland, the north of England, and the north, centre, west and south-west of Ireland; and he has arrived at the conclusion, that great masses of ice, and subsequently glaciers, existed in these portions of the United Kingdom at a period immediately preceding the present condition of the globe, founding his belief upon the characters of the superficial gravels and erratic blocks, and on the polished and striated appearance of the rocks *in situ*.

M. Agassiz does not suppose that his views respecting glaciers

will at once meet with the general concurrence of geologists; and he admits that the study of the phænomena of glaciers in different latitudes, as well as at different altitudes, together with the examination of their different effects where in contact with the sea, will introduce many modifications in the consideration of analogous phænomena in countries where glaciers have disappeared; but he is prepared to discuss his theory within the limits of observed facts, conscious of having searched for truth solely to advance the interests of science.

To avoid useless discussion, he states, that in attributing to the action of glaciers a considerable portion of the results hitherto ascribed exclusively to that of water, he does not wish to maintain that everything hitherto assigned to the agency of water has been produced by glaciers; he only wishes that a distinction may be made in each locality between the effects of the different agents; and he adds, that long-continued practice has taught him to distinguish easily, in most cases, the effects produced by ice from those produced by water.

Proceeding to the consideration of facts, he says the distribution of blocks and gravel, as well as the polished and striated surfaces of rocks *in situ*, do not indicate the action of a mighty current flowing from north-west to south-east, as the blocks and masses of gravel everywhere diverge from the central chains of the country, following the course of the valleys. Thus in the valleys of Loch Lomond and Loch Long, they range from north to south; in those of Loch Fine and Loch Awe from north-west to south-east; of Loch Etive and Loch Leven from east to west; and in the valley of the Forth from north-west to south-east, radiating from the great mountain masses between Ben Nevis and Ben Lomond. Ben Nevis, in the north of Scotland, and the Grampians in the south, are considered by the author to constitute the great centres of dispersion in that kingdom; and the mountains of Northumberland, of Westmoreland, Cumberland, and Wales; the hills of Ayrshire, Antrim, the west of Ireland, and Wicklow, to be other points from which blocks and gravel have been dispersed, each district having its peculiar debris, traceable in many instances to the parent rock, at the head of the valleys. Hence, observes M. Agassiz, it is plain the cause of the transport must be sought for in the centre of the mountain ranges, and not from a point without the district. The Swedish blocks on the coast of England do not, he conceives, contradict this position, as he adopts the opinion that they may have been transported on floating ice.

In describing the phænomena presented by erratic blocks and gravel, M. Agassiz first insists upon the necessity of distinguishing between stratified gravel and mud containing fossils, which could not have been accumulated by true glaciers, although the materials may have often been derived from them, and unstratified masses, composed of blocks, pebbles, and clay. These stratified deposits he considers to be of posterior origin to the glacier epoch. The till of Scotland, or the great unstratified accumulation of mud and

gravel, containing blocks of different size heaped together without order, and containing no organic remains but bones of Mammalia and insignificant fragments of shells, he is of opinion was also not produced by true glaciers, although intimately connected with the phenomena of ice. The polished and striated surfaces of the blocks leaves no doubt on M. Agassiz's mind that these masses have been acted upon by ice in the same manner as the blocks which are observed under existing glaciers, and which are more or less rearranged by water derived from the melting of the glaciers.

Similar detritus fills the bottom of all the Alpine valleys, as that of the Rhone to its junction with the Lake of Geneva, and the valley of Chamonix: it is found between the Hospice du Grunsel and the borders of the lower glacier of the Aar; thence to the neighbourhood of Goutharen in the Oberhasli, at Inn Grund; also in the plains of Meyringen, Interlaken, and between Thun and Berne. At all these localities the blocks were left, when the glaciers extended to them.

With respect to the valley of the Aar, M. Agassiz says it is easy to prove that the rounded pebbles spread along its whole course were not transported to their present position by that river, because between the glacier from which it issues and Berne the flowing of the stream is interrupted by the barrier of Kirchet, the Lake of Brientz, and the Lake of Thun; and because between these lakes its velocity is so small, that it transports only mud and very fine gravel, and that the pebbles over which the river flows below Thun do not issue from the lake. Supposing that the volume of the Aar was formerly greater, why, asks M. Agassiz, are not the lakes of Brientz and Thun filled in the same manner as the plains of Meyringen and the bottom of the valley which separates the two lakes? All difficulties, however, he is of opinion, vanish, if the pebbles be considered the detritus of retreating glaciers, and that the hollows occupied by the lakes of Brientz and Thun were filled with glaciers.

The existence of a glacier in this valley is not imagined by the author to explain the origin of the detritus, as its having existed is proved by the polish on the rocks *in situ* from the glacier of the Aar to Meyringen, a distance of twenty English miles, and even on the shores of the Lake of Thun. Similar phenomena have been noticed by M. Agassiz in Scotland, in the valleys of Loch Awe and Loch Leven, near Ballachalish, and in England in the neighbourhood of Kendal.

The author then proceeds to describe the moraines of Switzerland, or the accumulations of blocks and pebbles deposited longitudinally on the borders, and transversely in front, of glaciers, and successively abandoned by them in their retreat. These moraines differ from glacier-detritus remodelled or spread out by water, in being disposed in ridges with a double ta'us, one flank of which is presented to the glacier, and the other to the side of the valley; and their continuity and parallelism at the same height easily distinguish them from the blocks disposed along the bottoms of valleys by currents. They occur on the flanks of all glaciers, but they have been also observed by M. Agassiz where no glaciers exist, as in the valleys of

the Rhone, the Arve, the Aar, &c. ; likewise in Scotland, near Inverary, Muc Airn, at the outlet of Loch Traig, at Straukaer, and on the borders of the bay of Beuley ; in Ireland to the south-east of Dublin, and near Enniskillen ; and in England in the valley of Kendal, as well as near Penrith and Shap.

The common origin of moraines, and of accumulations of rounded blocks and pebbles, M. Agassiz says, cannot be doubted. The former are simple ridges formed on glaciers ; the latter, materials rounded under glaciers, or great masses of ice, and exposed by the melting of the ice, and re-arranged by the water thus produced.

The author then proceeds to describe the internal arrangement of these various accumulations. In the stratified deposits the materials are comparatively much smaller than in glacier-detritus ; the pebbles also are elongated, and fine gravel and mud ordinarily form the upper beds. On the contrary, in the detritus of glaciers large and small materials are associated without order, the largest blocks being often in the upper part ; and where very large *angular* blocks occur, they rest on the surface. In moraines there is a further distinction, in blocks of all dimensions and every form being intermingled ; and this difference, he says, is easily understood, by recollecting that moraines are composed of the angular blocks which fall on the surface of the glacier, as well as of pebbles rounded on their edges.

The striated and polished surfaces, so often observed on solid rocks *in situ*, is next described by M. Agassiz. Without denying absolutely the power of water to produce such effects, he says that he has sought for them in vain on the borders of rivers and lakes, and on sea-coasts, and that the effects of water consist in sinuous furrows on the softer portions of rocks ; not in even uniform polished surfaces, such as those presented by the rocks under discussion, and which are independent of the composition of the stone. This view of the nature of these polished rocks is borne out by the effects of existing glaciers, the rocks in contact with them having the angles rounded off, and the surfaces polished, as well as striated. These phenomena M. Agassiz has traced under the glacier of the Aar, and he has observed them in the valley of the Rhone, and of Chamonix ; also in Scotland, on the banks of Loch Awe and Loch Leven ; and he says they are very remarkable in the environs of Kendal.

The most striking points in the distribution of the striæ, are their diverging at the outlets of the valleys, and their being oblique, and never horizontal on the flanks, which they would be were they due to the agency of water. The cause of this obliquity the author assigns to the upward expansion of the ice, and the descending motion of the glacier.

The most remarkable striated rocks in the Alps are near Handeck, and near the cascade of Pissevache ; and the best examples M. Agassiz has seen in Scotland, are those of Ballahulish, and in Ireland those of Virginia.

If the analogy of the facts which he has observed in Scotland, Ireland, and the north of England, with those in Switzerland, be correct, then it must be admitted, M. Agassiz says, that not only

glaciers once existed in the British Islands, but that large sheets (nappes) of ice covered all the surface, and that the former were the remnants of the latter.

The author then details the proofs that glaciers did not descend from the mountain summits into the plains, but are the remaining portions of the sheets of ice which at one time covered the flat country. It is evident, he says, if the glaciers descended from high mountains, and extended forward into the plains, the largest moraines ought to be the most distant, and to be formed of the most rounded masses; whereas the actual condition of the detrital accumulations is the reverse, the distant materials being widely spread, and true moraines being found only in valleys connected with great chains of lofty mountains.

It must then be admitted, the author argues, that great sheets of ice, resembling those now existing in Greenland, once covered all the countries in which unstratified gravel is found; that this gravel was in general produced by the trituration of the sheets of ice upon the subjacent surface; that moraines, as before stated, are the effects of the retreat of glaciers; that the angular blocks found on the surface of the rounded materials were left in their present position at the melting of the ice; and that, as the advance and disappearance of great bodies of ice produce debacles and considerable currents, so it may be inferred, that by such operations in times past masses of ice were set afloat, and conveyed in diverging directions the blocks with which they were charged. He believes that the Norwegian blocks found on the coast of England have been correctly assigned by Mr. Lyell to a similar origin.

Another class of phenomena connected with glaciers, is the forming of lakes by the extension of lateral moraines into a main valley; and M. Agassiz is of opinion, that the parallel roads of Glen Roy are the effects of a lake which was produced in consequence of a glacier projecting across the glen near Bridge Roy, and another across the valley of Glen Speane. Lakes thus formed naturally give rise to stratified deposits and parallel roads, or beds of detritus at different levels.

The connexion of stratified very recent deposits with glacier-detritus, M. Agassiz observes, is difficult to explain; but he conceives that the same causes which can bar up valleys and form lakes, like those of Brientz, Thun and Zurich, may have formed analogous bars at the point of contact of glaciers with the sea sufficiently extensive to have produced large salt-marshes to be inhabited by animals, the remains of which are found in the clays superimposed on the till of Scotland; and he adds, that the known arctic character of these fossils ought to have great weight with those who study the vast subject of glaciers.

In conclusion, the author remarks, that the question of glaciers forms part of many of the great problems of geology; that it accounts for the disappearance of the great mammals inclosed in the polar ice, as well as for the disappearance of the organic beings of the so-called diluvian epoch; that in Switzerland it is associated with the

elevation of the Alps, and the dispersion of the erratic blocks; and that it is so intimately mixed up with the subject of a general diminution of the terrestrial heat, that a more profound acquaintance with the facts noticed in this paper will probably modify the opinion entertained respecting it.

ZOOLOGICAL SOCIETY.

March 10, 1840.—Professor Owen in the Chair.

A paper by G. Gulliver, Esq., entitled 'Notes on the Ova of the *Distoma hepaticum*, and on certain Corpuscles obtained from the genera *Cysticercus*, was read.

The physiology of the Common Liver-Fluke is extremely interesting, on account of the connection which this parasite has with a very frequent and fatal disease of that useful animal the sheep.

"If we obtain," says Mr. Gulliver, "from the bile-ducts of the sheep some of the larger ova of the entozoon, and subject them to careful examination, it will be found that the cyst of the ovum presents a very clear outline, the continuity of which is uninterrupted, except at one end, where a well-marked *operculum* may be seen, as represented in the drawing.

"The size of these ova differs considerably; their average length is about $\frac{1}{250}$ th of an inch, and their breadth $\frac{1}{400}$ th.

"The interior of the cyst is occupied by granular matter, often contained within secondary and more delicate cysts or cellules, generally of a circular figure, and occasionally having within them a third still smaller cyst. The diameter of the latter is about $\frac{1}{4000}$ th of an inch, and of the secondary cysts $\frac{1}{1500}$ th of an inch is a common size, although their magnitude is very variable. The granules within the cells or cysts also differ much in size, but they are very commonly about $\frac{1}{8000}$ th of an inch in diameter.

"When the ova of the *Distoma* are compressed forcibly, the operculum is lifted up, or even separated entirely, and the granular matter extruded, with its containing cells or cysts generally broken.

"The operculum does not appear to exist in the smaller and immature ova. The drawing No. 2. represents this in some ova obtained from the uterus of the Fluke.

"Whether what is commonly called the ovum of the entozoon, may not be a cyst containing numerous ova within it, and furnished with an operculum, to allow of their extrusion when mature, and fit for propagation, appears to me to be an interesting question. At all events it should be ascertained if the cysts be discharged with the dung of the diseased sheep, whether the granules have escaped or not, and whether they are to be found in the pasturage of those localities, where the entozoon is sometimes known to be propagated so quickly as soon to infect entire flocks of sheep.

"I could never see anything like a small fluke in the outer cyst, at any period of its growth, although the operculum was often observed just ready to open and give exit to its contents, as above described.

“The granules may possibly be regarded as yolk-globules, in which case I apprehend the numerous secondary cysts, or cells, must be considered as so many different yolks.

“*On the oval Corpuscles of the Cysticercus.*”

“If the opaque part near the head of this entozoon be gently pressed, a little rather viscid fluid will escape, which on examination will be found to be pervaded by a great number of oval corpuscles, presenting a very beautiful microscopic object. They have a remarkably distinct dark outline, with a brilliant surface, semitransparent, and apparently homogeneous, except very rarely, when they appear to contain an inner corpuscle or cellule.

“They are generally but slightly oval, their length often scarcely exceeding their breadth by a third, as exhibited in the drawing, though they may occasionally be seen nearly twice as long as they are broad. A common size of the corpuscles is about $\frac{1}{13000}$ th of an inch long, and $\frac{1}{20000}$ th broad.

“The bladder-like body of these hydatids is everywhere pervaded by distinct spherules, presenting a bright oil-like appearance, varying in diameter from $\frac{1}{200000}$ th to $\frac{1}{40000}$ th of an inch. They have no resemblance whatever to the oval corpuscles.

“Hydatids are described as being without discernible generative organs. Whether the remarkable oval corpuscles shown in the drawing be ova or gemmules, must be determined by future observation. That they are the former appears probable, from their form and general regularity of size. Besides they are situated in one particular part of the parent, never appearing in the walls of the transparent sac. If this conjecture should be confirmed, the cysticercus can no longer be regarded as destitute of any distinct generative organ, for the part in which the ova are contained will correspond to the uterus of the higher entozoa, and probably lead to a further knowledge of the method by which the different species of this genus are propagated.

“I am indebted to the kindness of Mr. Siddall for the accompanying drawings, which have been made by the aid of the camera lucida. As they were taken from dried specimens, the internal structure of the ova of the *Distoma* is not well exhibited, though the form is faithfully shown.”

May 26.—William Yarrell, Esq., Vice-President, in the Chair.

A letter from Hugh Cuming, Esq., was read. This letter is dated Manila, November 5, 1839, and gives an account of some cases of specimens forwarded to the Society. Mr. Cuming states that he has not yet been successful in procuring a certain Ruminant, known by the name Tamaroo, but he entertains hopes of having a specimen forwarded to England after him, he being about to return. With the exception of this animal, he had procured all the quadrupeds of the Philippines of which he could obtain any information. The letter, moreover, states that he observed two varieties of the Monkey he had sent home (*Macacus cynomolgus*), and which is the only spe-

cies found in the Philippine Islands; one was variegated with black and white, and the other is of a light chestnut colour, and varied with white. Only one of each of these varieties was seen by Mr. Cuming, and the variety was, in both cases, in company with ordinary coloured individuals.

A letter from the President of the Society, the Earl of Derby, was also read; it is dated Prescott, May 13, 1840, and relates to some crosses which have taken place among the animals in his Lordship's menagerie. "A female common Zebra (*Equus Zebra*)," says his Lordship, "has lately taken to my young Dshiggetai (*Equus hemionus*), and is the only animal he has yet appeared to notice in this way. The produce, if any, would, I should think, be curious.

"I think I have often heard that Foxes will not breed in confinement, but I have a female which, about two days since, produced three young; they only lived about two days. The sire is from America."

His Lordship has reason to believe that a female Fox also produced a similar litter about four years back, but destroyed them.

On the 'Great Water' of his Lordship's park, a Bernicle paired with, and constantly accompanied, a Canada Goose, but there was no produce; this happened last season. In the present one the same Bernicle has paired with a white-fronted Goose, and the pair have a nest with nine or ten eggs. It is not known, in either case, which was the goose and which the gander.

The Polish Swan has bred with the common species, and his Lordship further states, that this year a pair of their cross-breed have laid again, but the eggs are not yet hatched.

In a letter from Madame Power, dated Messina, March 25, 1840, which was read, that lady states that she had forwarded for the Society's museum some packages containing some bird-skins, and also some molluscous animals and zoophytes, preserved in spirits, from Sicily.

A paper by John Wyllie, Esq., describing the peculiar structure of the branchial appendages of one of the Indian *Siluridæ*, was read.

"The fish to whose singular branchial appendages I wish to draw the attention of the Society," says Mr. Wyllie, "is named 'Singee' in the Mahratta, and 'Bichoo-Mutchie' (Scorpion Fish) in the Hindostanni language. It is the *Silurus Singio* of Dr. Hamilton's 'Fishes of the Ganges.'"

"The following description is drawn from memoranda taken at Nagpoor, December 6, 1825:—

"B. 7; D. 6; P. $\frac{1}{6}$; V. 6; A. 65; C. 14; Cirrhi, 8.

"Length of body $7\frac{3}{4}$ inches, breadth at anus one inch. Head much depressed, very hard, without scales, terminating posteriorly in three equal spinous processes, resembling a trident.

"Body elongated, much compressed; above rounded, below carinated, naked. Colour, when alive, of a very dark olive green; when dead, of a bluish black. Ventral and dorsal fins opposite; pectoral quadrangular with one very strong sharp bony ray, and

six soft rays; anal extending as far as the tail; lateral line mesial.

“Cirrhi of nearly equal length, one pair arising immediately before the nostrils; another from the angles of the mouth; and a third and fourth from the lower jaw, near the angles of the mouth.

“Stomach small, with a moderate cul-de-sac; intestines equal, without cæca, of several convolutions, measuring seven inches in length.

“No air-bladder.

“The peculiar organs to which I wish to direct attention are situated exterior of the abdomen: there is one on each side, lying immediately over the transverse processes of the vertebræ; and in the angle formed between them and the spinous processes they are loosely attached to the surrounding parts, and covered only by the general integuments. They have the form of cylindrical tubes, are about the size of an ordinary black-lead pencil; they are closed at the posterior extremity, which extends within about three inches of the tail, and they open under the base of the cranium, between two of the branchial pairs. They are of loose cellular texture, of a whitish gray colour, speckled with numerous minute black points; they are traversed from one extremity to the other by a blood-vessel (vein?) of considerable size, into which numerous smaller branches open at right angles.

“These sacs are perhaps intended for reservoirs of water, to enable the animal, during its migrations from tank to tank, to maintain the gills in a constantly moist condition. They may also perhaps serve, in ordinary circumstances, as an extension of the respiratory surface, and the numerous blood-vessels that are seen on their coats would tend to give a probability to such a conjecture.”

Mr. Ogilby pointed out the characters of a new species of Antelope, which was exhibited to the Meeting. This animal lived for some time in the menagerie, having been presented to the Society by W. Willshire, Esq., Corresponding Member, who procured it at Mogadore. It is closely allied to the *Antelope Dorcas* and *A. Arabica*, and most nearly resembles the latter in its colouring, but is readily distinguished by its much greater size; its total length, from the tip of the muzzle to the tail, being about forty-three inches, and its height twenty-eight inches: the ears of the Mogadore animal are moreover proportionately larger, measuring in height about $6\frac{3}{4}$ inches, or rather more. Like *A. Arabica*, it has a black patch on the upper surface of the muzzle, and a black line on either side of the face, extending forwards from the eye, and terminating above the angle of the mouth: the dark band on the flanks is very broad, and of a deep brown colour, inclining to black; there is also a distinct broadish black mark on each side of the rump; the fore knees are furnished with distinct black tufts. The specimen is a female, and has slender horns, about equal to the ears in length; the horns are indistinctly lyrated, in fact, nearly straight, and exhibit eleven or twelve annulations, four or five of which, at the base of the horn, are very close together. Mr. Ogilby stated that he had observed

specimens of the same species in the Paris Museum, and that it was the intention of M. F. Cuvier to have described them; he should therefore propose the name *Cuvieri* be used to distinguish the species.

The Secretary also called the attention of the Members present to a species of Musk Deer, from Sierra Leone, which had been brought from that part of Africa by Mr. Whitfield, who had kindly allowed it to be exhibited to the Meeting. In general colour, and in the markings on the throat, this species most nearly resembles the *Moschus Sanleyanus*, but its body has spots and markings nearly similar to those in the *M. meminna*; it is much larger, however, than either of these species, being, in size, about midway between them and the *M. moschiferus*. The chief interest attached to this animal is the locality in which it is found, the well-established species of *Moschus* being either from the continent of India or the islands of the Indian Archipelago. Mr. Ogilby stated that the present animal could not be identified with the *Moschus Guineensis* of Brisson, Gmelin, and some other of the older authors; it was therefore necessary to give it a new name, and he proposed for that purpose the name of *M. Aquaticus*, in allusion to the peculiar habits of the species which will be described more at length in the Transactions of the Society.

June 9.—William H. Lloyd, Esq., in the Chair.

A paper "On Parthenia, a new genus of Recent Marine Shells or Mollusks, containing British Species," by the Rev. R. T. Lowe, M.A., was then read.

GENUS PARTHENIA.

Testa eximie turrita, acuminata, imperfecta, plerumque lactea, epidermide pallida s. fere nulla; spira apertura longiore; anfractibus plurimis, costis striisque eleganter sculptis, sæpe cancellatis. Apertura ecanaliculata, ovata, integra: columella simplex, antice effusa, postice aliquando torta s. plicata: labrum tenue, simplex.

Obs. Testæ figura et sculptura elegantissimæ, parvulæ. *Animal* corpore admodum spirali; pallio simplici, ecanaliculato; pede antice abrupte truncato, postice attenuato exappendiculato, operculifero. Tentacula duo, triangularia s. prismatica, basi coalita, oculis sessilibus, superne ad basin internam positis, approximatis. Buccæ labiales coalitæ, infra tentacula exsertæ, proboscidem abbreviatam, depressam, profunde emarginatam s. bilobam referentes. Operculum apertura fere magnitudine, corneum, tenue, ovatum, integrum; nucleo ?

Obs. Animal marinum, branchiis pectinatis, corpore capiteque simplicibus, sc. nec velo nec membranis neque ciliis instructum. Tentacula figura fere *Limnææ*; sed elongatiora, e membrana longitudinaliter ab apice ad medium basis conduplicata constare videntur. Figura pedis inter Gasteropodes non siphoniferos infrequentior, in *Rissois* tamen æque obtinet.

Genus et animale et testa distinctissimum, cum *Melaniis*, *Eulimis* *Turritellis*, &c., a testaceologis recentioribus diutius confusum.

The group proposed for generic distinction consists of several shells remarkable for their elegance of form and sculpture, but which it has been neither easy to associate with others in established genera, nor advisable, in the absence of all knowledge of the animal, to place apart. Accordingly, they have been variously arranged by different authors. Philippi, in his excellent *Enumeratio Molluscorum Siciliae* (Berol. 1836), whilst uniting some of them with several species of *Eulima*, Sow., under the head *Melania*, Lam., has not failed to remark their discrepancy as marine shells from the last-named genus, and to point out the probability of their formation into a genus or subgenus, "quando animalia eorum cognita erunt": the species which belong to *Eulima*, Scw., being, after Bronn, considered by him to be congeneric with *Niso* of Risso. The genus *Eulima*, as proposed by Risso, consisted of the same exceptionable kind of mixture; but being now ably defined by Sowerby, and restricted within its proper limits to the latter of these groups, the type of which is the *Turbo politus* of some British authors, I am induced to bring forward, in relation to the other, some materials obtained twelve or thirteen years ago, which at the time indeed immediately suggested the formation of the genus *Parthenia*, but which the progress of Conchology, in the more recent establishment of *Eulima*, seems to have rendered really interesting.

The genus *Turbonilla* (rectius *Turbinella*) of Risso, though perhaps composed in chief of true *Parthenia*, is not so constituted, even should this supposition prove correct, as to supersede or clash with the reception of *Parthenia*. Its definition is extremely incomplete and faulty, and it differs no less in its limits than its constitution; whilst its very author places in his *Eulima* and in *Turritella* some undoubted species of *Parthenia*. The name, moreover, rightly spelled, is long preoccupied by a well-known genus of Lamarck.

The group, however, constituted as above, appears sufficiently distinct from every other. From *Melania* it is distinguished primarily by being marine instead of fluviatile, and in the shell being destitute of a dark-coloured epidermis. It differs from *Rissoa* or *Cingula*, Flem., in the animal, much as *Limnæa* does from *Physa*, and in the shell, as *Turritella* does from *Littorina*; whilst from *Eulima*, Sow., the shells are at once distinguished by their rough or sculptured, ribbed, and generally cancellated surface; and the animal wants the lateral membranes and subulate tentacula of *Turritella*, from which the shells also differ in the transverse ribs or plaits of the volutions, and in the shape of the aperture and of the opercle, the nucleus of which is also probably eccentric and anterior; but this, without destruction of the specimens, I cannot ascertain.

The name is formed from *παρθενος*, a virgin; the word *παρθενια*, virginity, expressing well, in contrast with *Melania*, the simple elegance and purity so remarkably characteristic of these shells, which are wholly colourless, and of a spotless milk or ivory whiteness.

Several recent species of this group are found in the Mediterranean, and two at least in the British seas. Others appear also to occur subfossil, in the tertiary beds of Sicily and Nice.

The animal of the shell, called by Montagu *Turbo unidentatus* (*Odostomia* of Fleming), would appear, from the observations of my friend, the Rev. M. J. Berkeley, to be very similar. But the shell, in most points, differs, except in having a fold or plait upon the columella. Still future observations may warrant possibly the modification of the characters of *Parthenia*, for the reception of this shell and its allies.

Species quædam.

1. PARTHENIA BULINEA. *P. testa subcylindræo-attenuata, oblongiuscula, juniore ovato-tereti: anfractibus planis, elegantissime reticulato-cancellatis, striis spiralibus crebris æquidistantibus, transversis æquidistantibus decussantibus; sutura distincta impressa: columella postice torta, uniplicata.*

a. subventricosa.

$$\frac{\text{Lat.}}{\text{Long.}} = \frac{1\frac{1}{2} - 1\frac{2}{3}}{5} \text{ lin.} : \frac{\text{Long. apertæ.}}{\text{Long. testæ}} = \frac{1\frac{1}{2}}{5} \text{ lin. vel } \frac{3}{10} \text{ millim.}$$

Turbonilla Humboldti, Risso, Hist. IV. 394. f. 63. male. *Testa junior.*

Tornatella? clathrata, Phil. Enum. 166.

β. gracilis, angustata.

$$\frac{\text{Lat.}}{\text{Long.}} = \frac{1\frac{1}{4} - 1\frac{1}{3}}{5} \text{ lin.} : \frac{\text{Long. apertæ.}}{\text{Long. testæ}} = \frac{1\frac{1}{2}}{5} \text{ lin.}$$

Anfractus 8 in utraque varietate.

Hab. in mari Maderensi, rara; vv. Animal omnino lacteum.

Dredged in deep water in the bay called Labra at P^{ta} Saõ Lourenço, in the spring of 1827, by H. Richardson, Esq. This shell in form resembles a *Bulinus*.

2. PARTHENIA TEREBA. *P. testa elongato-turrita, gracili, sensim attenuata: anfractibus convexiusculis, transverse obsolete costatis s. plicatis, striisque exiguis, concinnis, crebris, spiralibus, alias creberrimas, transversas, tenuissimas, plicasque decussantibus: sutura distincta, impressa.*

$$\frac{\text{Lat.}}{\text{Long.}} = \frac{2}{7} \text{ lin.} : \frac{\text{Long. apertæ.}}{\text{Long. testæ}} = \frac{1\frac{1}{2}}{7} \text{ lin. Anfr. 12.}$$

Turritella cancellata, Risso, Hist. IV. 110. f. 40?

Hab. in mari Maderensi cum priore rariss. v. m.

Of two examples dredged up without the animal, one is in perfect condition. The columella is quite simple, without any fold or plait. The whole shell is sub-opaque or milk-white, and in form resembles a *Turritella*.

3. PARTHENIA ELEGANTISSIMA. *P. testa elongato-turrita, gracili, sensim attenuata, lævi: anfractibus convexiusculis, costis transversis validis, latis, obliquis, confertis, æquis sculptis: interstitiis lævibus, costis angustioribus: sutura simplici, distincta: columella postice subtorta.*

$$\frac{\text{Lat.}}{\text{Long.}} = \frac{\text{vix } 1}{3} \text{ lin.} : \frac{\text{Long. apertæ.}}{\text{Long. testæ}} = \frac{\frac{3}{4}}{3} \text{ lin. vc. } \frac{1\frac{1}{2}}{6\frac{1}{2}} \text{ millim.}$$

Anfr. 9-11.

Turbo elegantissimus, Mont. Turt., &c., &c.

Turritella elegantissima, Flem. Brit. An. 303. n°. 218.

Eulima elegantissima, Risso, Hist. IV. 123. n°. 296.

Melania Campanellæ, Phil. Enum. 156. t. 9. f. 5?

Hab. in mari Britannico, Mediterraneo; Maderensi, rariss. vv. Animal lacteum, omnino ut in *P. bulinea*, nisi quod tentacula obtusiora sunt.

Dredged with the former. Found also in 1824 at Sheean Ferry, near Appin, in Argyleshire.

Aliæ species videntur :

4. *Parthenia crenata* (*Turbo crenatus*, Mont. inedit. *Melania rufa*, Phil. Enum. 156. t. 9. f. 7?); quæ a *P. elegantissima* interstitiis costarum spiraliter striatis potissimum differt.

Hab. in mari Britannico rariss. vm.

5. *Parthenia pallida*. *Melania pallida*, Phil. Enum. 157. t. 9. f. 8. An *Turbo unicus*, Mont. Turt. Dict. 209, &c.?

Hab. in mari Siculo (Britannico?).

6. *Parthenia scalaris*. *Melania scalaris*, Phil. Enum. 157. t. 9. f. 9. An *Turbo simillimus*, Laskey, Turt. Dict. 209?

Hab. in mari Siculo (Britannico?).

The genus *Turbonilla* of Risso (Hist. IV. 224. ff. 70. and 72.) appears to contain some fossil species also of *Parthenia*, besides the recent one above referred to. Other species are indicated by Philippi as figured by Brocchi.

The following paper was next read. It is entitled "Observations on the Blood Corpuscles of the Snowy Owl and Passenger Pigeon," by George Gulliver, F.R.S., Assistant Surgeon to the Royal Regiment of Horse Guards.

"Although I have found generally less difference in the blood corpuscles of birds than in those of the Mammalia, yet in some of the former there are peculiarities in the size and shape of the red particles, which appear to me, after a careful examination of the blood of upwards of two hundred different species, deserving of especial attention. As examples of this kind, I select from my notes an account of the blood corpuscles of the Snowy Owl and Passenger Pigeon, and, by way of comparison, of one or two other allied species.

"In the following measurements, as noted in the first observation, the common-sized corpuscles are first indicated; then the small and large extremes, and lastly, the average size, deduced from the whole. They are all expressed in fractional parts of an English inch.

Obs. 1.

In the Snowy Owl (*Surnia nyctea*).

Long Diameter.		Short Diameter.	
1·1600	} Common sizes.	1·4000	} Common sizes.
1·1500		1·4570	
1·1455		1·5333	
1·2000	} Extreme sizes.	1·3000	} Extreme sizes.
1·1333			
<hr/>		<hr/>	
1·1550 Average.		1·4042 Average.	

The nuclei of the corpuscles, exposed by the action of acetic acid, were generally 1-3200th of an inch long, and 1-10666th broad.

Obs. 2.

In the Common Brown Owl (*Syrnium Aluco*).

Long Diameter.	Short Diameter.
1·2000	1·4000
1·1895	1·3555
1·1777	1·5333
1·2400	1·3000
1·1714	<hr/>
<hr/>	1·3801
1·1930	

Obs. 3.

In the Passenger Pigeon (*Columba migratoria*).

Long Diameter.	Short Diameter.
1·2133	1·4800
1·2000	1·4570
1·1895	1·5333
1·1777	1·4000
1·1714	<hr/>
1·2666	1·4626
1·1542	
<hr/>	
1·1909	

Obs. 4.

In the Russet Pigeon (*Columba rufina*).

Long Diameter.	Short Diameter.
1·2400	1·3428
1·2286	1·4000
1·2666	1·3000
1·2000	<hr/>
<hr/>	1·3429
1·2314	

“ From the observations on the blood corpuscles of the Snowy Owl, it results that their average long diameter is 1-1550th, and their average short diameter 1-4042nd of an inch, so that their length is

considerably above twice and a half greater than their breadth; while in the Brown Owl the corpuscles are scarcely twice as long as they are broad.

“ Now both the absolute size of the latter, as well as the relation between their long and short diameters, approach very nearly to the dimensions frequently presented by the corpuscles of various birds. But in the Snowy Owl the corpuscles are not only peculiarly long, in proportion to their breadth, but their absolute length is much greater than is often to be found in the red particles of other birds, whether belonging to the rapacious order or not. Indeed it is probable that the difference generally between the blood-disks of any two orders of birds is not greater than that now indicated between the disks of two species of one natural family, the *Strigida*.

“ The corpuscles of the Snowy Owl, therefore, are very remarkable and characteristic, as any one may immediately see who will take the trouble to compare them with those of the Common Brown Owl. I have examined the blood of several other species of this family, and find the size and shape of the corpuscles of the Barn Owl (*Strix flammea*) to approximate most nearly to those of the Snowy Owl.

“ It will be seen that the nuclei of the blood particles of the Snowy Owl, exposed by acetic acid, were fully three times the length of their breadth; and it may be noticed incidentally, that in most birds the nuclei thus exhibited have a more elongated ellipse than the outline of their envelopes*.

“ We might expect to find an exact resemblance between the elementary parts of such a truly natural family as the *Columbida*, and yet the observations show a striking difference between the blood corpuscles of the Passenger and Russet Pigeons, the average long diameter of the former being 1-1909th, and the short diameter 1-4626th of an inch, while the latter are 1-2314th of an inch long, and 1-3429th broad. Although I have examined the blood of many different species of the *Columbida*, in no instance did the corpuscles agree in figure with those of the Passenger Pigeon; in the Turtle Dove (*Columba Turtur*) the long diameter appeared to be nearly similar, but the short diameter agreed with that observed in the disks of the Russet Pigeon. Hence there was a remarkable difference in shape, and the corpuscles of the Passenger Pigeon, as far as I have yet ascertained, are quite peculiar, since the singularly narrow ellipses which they present have not hitherto been found in the red particles of other species of the *Columbida*.

“ It should be recollected, however, that the results of my observations may exhibit differences rather apparent than real, since our knowledge of the blood corpuscles is at present so limited, that we are not sure whether their size and shape may not be subject to some variation in relation to season, to the habits, or to certain conditions of the animal. In Man, and some of the other Mammalia, I have seen remarkable changes in the appearance of the blood corpuscles,

* See Dublin Medical Press, No. 59, March 4, 1840.

apparently in connection with disease; and their size and shape are undoubtedly liable to modifications, from the effect of causes which have not yet been clearly explained. The observations recorded in this paper have been made with so much care, to obviate any source of fallacy, that I am disposed to place much confidence in the results; but even if it should ultimately appear that the differences which I have described are not permanent, but merely within the limits of variation to which the blood-disks are liable, this would be some addition to our knowledge of these curious bodies, and would, at all events, be sufficient to reconcile the numerous discrepancies apparent in the measurements of various eminent observers.

“In conclusion, it may be remarked, that however paradoxical the history of the red particles may be, still, that of the blood generally is in many respects equally so. As we can only expect to obtain a knowledge of the physiology of the corpuscles by the multiplication of observations, it is especially desirable that persons residing abroad should avail themselves of opportunities of examining the blood of such animals as are not easily to be seen alive in this country. Among the birds, it may be mentioned that an examination of the blood of the different species of Temminck’s orders *Anisodactyli* and *Inertes* is especially required; and when made, it is not improbable that some interesting results may be obtained.”

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

Mr. Ogilby characterized a new species of Monkey, under the name of *Papio ochreatus*. “I saw this animal” (observed Mr. Ogilby) “in a travelling collection last June. It was of a uniform dull black colour on every part of the body, both above and below, except the arms and legs, from the paws to the elbows and knees, respectively, which were dark gray, as was likewise the space between the scrotum and the callosities; the scrotum itself was dirty flesh-colour; the face and ears naked and black; the naked part of the hands and feet brown, and there was a large naked patch, of the same colour, surrounding the callosities; but whether natural, or the effect of accident, I am unable to determine. The ears were rounded, and less pointed than in the *Papios* generally; the countenance resembled that of the Pig-tailed Baboon (*P. Nemestrina*), but the face was more attenuated; size that of the Pig-tail. I was unable to learn whence the individual here described had been obtained. It constitutes a very distinct species, and may be characterized as follows:—

“The Booted Baboon, *PAPIO OCHREATUS*: *P. supra subtusque niger, brachiis et cruribus canis.*”

A species of *Trionyx*, or, according to MM. Dumeril and Bibron, *Gymnopus*, was exhibited. This specimen had lived for some time in the Society’s menagerie, having been sent from the Euphrates by Colonel Chesney.

The following description and observations relating to this animal were communicated by Mr. Martin:—

“ Total length, from the tip of the muzzle to the end of the tail, two feet; width about one foot; head and neck, measuring to the anterior edge of the carapace, seven and three quarters inches: carapace slightly convex and oval, slightly truncated posteriorly; composed of nine costal plates, the ribs being eight in number; a double mesial furrow runs along the back, leaving a slightly convex elevation between them: between the first, and most anterior, of these plates and the second, are two depressions, each about half an inch in diameter, placed near the mesial line, and separated by a space less than a quarter of an inch in extent. The whole upper surface of the carapace, excepting at the margin, irregularly reticulate. The depressions between the costal plates are well marked. The length of the carapace is nine inches, and the breadth seven and three quarters inches; on the sides of the body the coriaceous membrane extends about two inches beyond the lateral margins of the carapace, the ribs themselves extending about one inch and a half beyond the carapace. Towards the hinder part of the body the membrane gradually increases in width, and posteriorly over the tail it had attained a width of nearly six inches: here the free portion of the membrane is about two and a half inches in width. The head is in the form of an elongated triangle; the snout is considerably produced and attenuated: the width of the head at the base is two inches and a quarter; the total length of the skull is three inches five lines; the space from the eye to the upper lip, beneath the nostrils, is eleven lines; the space between the orbits is five lines; on the vertex, above and between the orbits, the skull is smooth and convex. In both the fore and hind feet the first or front claw is the largest. The tail is rather short and thick; its length is about four inches and a half.

“ When alive this animal was of an uniform mud colour, slightly tinted with olive-green.

“ In many respects this animal agrees with the *Gymnopus Ægyptiacus* (*Trionyx Ægyptiacus*), as described by M. Bibron, but neither the head nor the margin of the carapace is spotted with yellowish white, as in that species; besides, the two nearly confluent depressions on the anterior part of the carapace are not alluded to in the account of *G. Ægyptiacus*; they are, however, very conspicuous in the animal in question. There are, it may be added, no pellucid scales, placed in a transverse direction, on the under surface of each elbow, nor are there any depressed convex tubercles, either anteriorly or posteriorly, on the cartilaginous expansion of the carapace, as are often, though not invariably, found in the *G. Ægyptiacus*.

“ With respect to the *Gymnopus Euphraticus* (*Trionyx Euphraticus*), originally described by Olivier (*Voyage en Perse*, tom. iii. p. 453, tabl. 41.), the carapace is described as being broader behind than before, which, if reference be extended only to the osseous disc, is not the case in the present animal. As in that species, however, the circumference of the carapace is smooth, and the skin is folded at the elbow-joint above, but does not simulate scales. The circumstance of a mesial depression, or rather double channel, with a convex line between, down the vertebral column, is not noticed as cha-

racteristic of the *G. Euphraticus*, nor yet are the smooth anterior oval foveæ.

“Still, however, it is not improbable that the animal in question may be identical with that described by Olivier; but it remains to be seen whether his species be distinct from *G. Ægyptiacus*, a point which his short and imperfect account does not enable us to solve.

“The sternum of the specimen having been removed by the animal preserver, and lost, has prevented my noticing this part in the above description.”

A skull of an adult Chimpanzee, recently purchased by the Society, was exhibited, and Professor Owen pointed out the distinguishing characters between this and the skull of the Orang, also on the table; he also called attention to certain points of agreement between this skull and that of the Hottentot.

ROYAL SOCIETY OF EDINBURGH.

December 21, 1840.

At this, the second ordinary meeting of the year, communications were read—“On the Nutrition of Vegetables, by Dr. H. Madden;” and “On the Fossil Fishes of the Old Red Sandstone of Orkney, among which is a nondescript Species of *Diplopterus*, by Dr. Traill.”

Beautiful specimens of the fossil fishes of Orkney were exhibited and presented to the Society, chiefly from the “Orkney Slate,” considered as a portion of the old red sandstone formation; and the new species of *Diplopterus* was proposed to be dedicated to the Ichthyologist of Neufchatel, as *D. Agassiz*. It was stated to be characterized specifically by its large head and rounded snout, wide mouth and large scales. A very interesting collection of the fossils of the old red sandstone, from different parts of Scotland, also lay upon the table.

At the conclusion of public business an important resolution was moved by the Council—“That the Society do vote the sum of £300 to Sir John Robison, in acknowledgment of his long services as general Secretary,—that being the form adopted in the case of each of his predecessors.” This was carried after some difference of opinion had been expressed upon the principle of the remuneration.

January 4, 1841.—The only paper read was the conclusion of one commenced at a former meeting, by Dr. Alison, “On certain Physiological Inferences which may be drawn from the study of the Nerves of the Eyeball.” From the length of which paper the other communications were delayed. Sir Charles Bell at some length combated the inferences drawn by the author.

January 18.—Professor Syme communicated a paper by John Goodsir, Esq., M.W.S., “On the mode in which musket-balls and other foreign bodies become enclosed in the ivory of the tusks of the Elephant.”

In this paper, the author, after stating the various doubts and contradictory opinions entertained by Camper, Blumenbach, Lawrence

and Cuvier on the subject, observed that the principal difficulty has been to explain how a tusk—a non-vascular organ—can repair injuries which it has sustained, and especially how shot-holes in its parietes are filled up. He remarked that in proceeding to investigate this subject two facts should be borne in mind; 1. that a tusk undergoes no change from vital action in its tissue or configuration after it is once formed; and, 2. that it is an organ of double growth, the ivory being formed from without inwards, the cement from within outwards. He then proceeded to state, that in all cases of wound of the tusk-pulp, the latter ossifies round the wound as the first step towards the separation of the injured portion from the system. The ivory constituting this ossification he termed *irregular*, and announced its anatomical identity with the peculiar ivory which fills the cavity of the tusk of the Walrus, and the teeth of the Cetacea, consisting of central ramifying Haversian canals, of secondary medullary tubes, and of terminal wavy bundles of Retzian tubes, interspersed with irregular cells. The irregular ivory is limited in its formation, which is terminated by the closure of the orifices of the Haversian canals, and the consequent separation of the enclosed portion of ramified pulp, from the general system. After this closure of the orifices of the Haversian canals, the irregular ivory assumes the appearance of a mass covered with stalactitic processes, and its surface stands in the same relation to the surface of the general pulp, as to the internal surface of the general ivory of the tusk. Regular ivory—that composed of undulating Retzian tubes perpendicular to the surface of the pulp—now forms upon the surface of the irregular ivory, and the latter at last becomes enclosed. When a musket-ball passes across the cavity of a tusk, the wound of the surface of the pulp ossifies, but the track does not necessarily do so. There are two exceptions, however, the author stated, to the non-ossification of the track; that part of it where the ball lodges, and the whole or any part of it which may suppurate or form a sinus. In the first case the irregular ivory forms an isolated hollow sphere around the ball, and studded with stalactitic masses, such as have been figured by Ruysch, &c., and specimens of which were exhibited to the Society; in the second it assumes the form of a tube or irregular shell leading to one of the shot-holes.

Mr. Goodsir then went over in detail the various kinds of wounds which the Elephant's tusk might sustain, as observed by himself and described by others. Foreign bodies may enter the tusk from above, through the base of the pulp, without wounding the ivory. A case of this kind is described by Mr. Combe in the *Philosophical Transactions*. A ball may enter through the free portion of the tusk, and the hole become closed by the protruding portion of the ossified pulp, and various curious appearances may present themselves, according as the ball may lodge in the opposite wall, or sink below the level of the shot-hole, or be left behind it by the advance of the tusk. Balls or spear-heads may also penetrate the tusk through its socket, and these are the wounds which have so much puzzled anatomists. In such cases, the hole, when filled up, is closed by the ossification of the pulp in-

ternally, and by the application to this externally of cement, formed by the follicle of the socket, which, although wounded, was proved by specimens to be able occasionally to perform its function,—a task which is generally completed by the advance of the hole opposite another portion of the membrane. When the hole is not completely closed, the attempt to accomplish it is exhibited in the protrusion of portions of ossified pulp, and in the rounded and tubercular appearance of the perforated cement. It was also stated that fractures of the enclosed portion of the tusk are healed by the same process, without any reproduction of true ivory, and that after all severe wounds the growth of the organ is stunted, so that the portion formed after the injury is of diminished diameter. From the whole investigation of the subject, Mr. Goodsir concluded that doubts might be removed and contradictory opinions reconciled by bearing in mind the following facts: 1. that a tusk is an endogenous as well as an exogenous organ; 2. that the pulp ossifies round foreign bodies; and, 3. that the membrane of the follicle plays an important part in all wounds of the tusk through the socket.

Professor Traill communicated an analysis of the Berg Meal, from Umea, Lapmark. It was discovered about 100 miles west of Umea, and being subjected to various tests, was found to be composed of

22	organic matter, combustible.
71·13	silica.
5·31	alumina.
0·15	oxide of iron.

98·59

Loss.

100·

When subjected to a high magnifying power, it was found to exhibit imperfect fragments of Ehrenberg's Infusoria; and some portions of it examined in a similar manner by Dr. Greville, confirmed Dr. Traill's opinion of an animal origin; while at the same time he discovered a few forms of those minute Algæ which contain siliceous matter.

WERNERIAN NATURAL HISTORY SOCIETY.

November 14, 1840.—The following Gentlemen were elected the Office-Bearers for the ensuing year:—

President, Robert Jameson, Esq., F.R.S.S.L. & E., Prof. of Nat. Hist. in the University of Edinburgh.

Vice-Presidents, Dr. Walter Adam; Dr. T. S. Traill, F.R.S.E.; W. A. Cadell, Esq., F.R.S.S.L. & E.; Dr. Robert Hamilton, F.R.S.E.

Secretary, Dr. Pat. Neill, F.R.S.E.—*Assistant Secretary*, T. J. Torrie, Esq., F.R.S.E.—*Treasurer*, A. G. Ellis, Esq.—*Librarian*, James Wilson, Esq., F.R.S.E.—*Assistant Librarian*, R. J. H. Cunningham, Esq.—*Painter*, P. Syme, Esq.—*Assistant*, W. H. Towns-
end, Esq.

Council, Dr. Robert Graham, F.R.S.E.; Sir William Newbigging, F.R.S.E.; David Falconar, Esq.; Dr. Robert Paterson; Edward Forbes,

Esq.; Robert Stevenson, Esq., F.R.S.E.; David Milne, Esq., F.R.S.E.; John Stark, Esq., F.R.S.E.

Met in the University, on the 12th of Dec., Professor Traill in the Chair, when there were read interesting notes of an expedition to the Sutledge and in the Himmalehs, by Mr. Jameson, assistant-surgeon in the Honourable Company's Service, and nephew of the Professor of Natural History in the University.—A paper on the frozen soil of North America, by Dr. Richardson, of Arctic celebrity. It appears that, during the past years, 1838 and 1839, pits were dug at the different fur stations of the Hudson's Bay Company, and the temperature tried with thermometers sent from England. Near York Factory the soil was found frozen to the great depth of seventeen feet; but the average yearly freezing at most of the stations does not exceed two or three feet.

Mr. Goodsir read a paper 'On certain peculiarities in the structure of the Short Sun-fish (*Orthogoriscus Mola*).'

The author first described a *tough, white tissue*, which envelopes the whole body of the animal, and which is converted into gelatine by boiling. Under the microscope it is seen to be composed of a congeries of primitive cells, with nuclei and nucleoli. No true dermis can be seen, and the gelatinous vesicular tissue, which varies from half an inch to six inches in thickness, and which contains in its substance the peripheral parts of the cartilaginous skeleton, must be looked upon as the true skin, or more correctly, as a mass of the primitive vesicular tissue of the embryo-fish which has never been converted into fibrous tissue. The author next alluded to the peculiar *tail* of the Sun-fish, and explained the arrangement of the skeleton upon which this depends, viz. the stunting of the spinal column, which terminates in simple coccygeal vertebræ, each of the caudal fin rays being supported upon free interspinous bones, the whole arrangement exhibiting a natural analysis of the tail in the class of Fishes. He then adverted to the total deficiency of the *lateral muscles* of the spine and of the muscles of the abdomen, and showed that the want of the former was supplied by the enormous development of the *muscles of the dorsal and anal fins*. Lastly, the author alluded to the embryonic condition of the tissues in the order of Fishes to which the *Orthogoriscus* belongs, and to the existence of certain general teleological laws, viz. the progressive development, and the arrest of development, of tissue in the animal series, and the subordination of tissue to form.—Dr. Traill laid on the table some large and beautiful specimens of carbonate of baryta, from a new locality, in North Wales. This mineral is found in considerable veins, traversing the clay-slate which lies below the carboniferous limestone, between Holywell and Denbigh, and it is worked for the purpose of being mixed up with white-lead paint.

DEVON AND CORNWALL NATURAL HISTORY SOCIETY.

The Members of the Devon and Cornwall Natural History Society met for the first time on Monday evening, the 4th of January, in their new rooms, at the Royal Union Baths, Plymouth. There was a crowded attendance of Members and their friends, amongst whom

were many ladies resident in the town and neighbourhood. This Society has been established about three years, and numbers above a hundred Members. Lectures are delivered weekly during the six summer months, and monthly conversaciones held during the winter. Zoological, Botanical, Geological and Statistical Sections have been formed, which meet at stated periods, and from which much valuable local information may be anticipated. Lieut.-Col. Hamilton Smith, K.H., K.W., F.R.S., F.L.S., &c. &c. &c., the well-known naturalist, is the President of the Society.

Captain Creyke, R.N., one of the Vice-Presidents, was requested to preside on this occasion.

Capt. Creyke, on being called to the chair, mentioned the encouraging prospects of the Society on the opening of their new rooms at the commencement of the new year, and the pleasing business of the evening, the presentation of the portrait of their highly talented and esteemed President.

A testimonial relative to this gratifying object having been read by Mr. Markes, as Secretary of a Committee appointed for the purpose, Mr. G. W. Soltau congratulated the Society upon having obtained a room so well qualified for the delivery of its Lectures, and possessing such excellent accommodation for the reception of the Museum, which he hoped at no very distant period would rival any in the West of England, and in a situation so accessible to country subscribers and to all who might visit the neighbourhood; and alluded to the advantages of such Societies from that friendly feeling which is engendered amongst all classes in the search of truth and investigation of nature.

"Plymouth," observed Mr. Soltau, "presents peculiar attractions for the formation of a Natural History Society, when we reflect that we are situated in one of the largest harbours of England, which daily offers additions to our Museum, obtained from every quarter of the globe; that we are situated in the midst of the most extensive mining district in Britain, and that our soil produces some of the rarest specimens of the vegetable world. We have now a place suitable for the reception of those wonders of nature, and which is at all times open to any individual who may take pleasure in their investigation; and allow me specially to remark, that we are most ready at all times to further and assist the most humble inquirer after knowledge. Allow me now, in behalf of several of the Members of this Institution, to present the portrait of Lieut.-Col. Hamilton Smith to this Society. His name, his talents, his acquirements, are too well known here, are too well known wherever science is appreciated or knowledge sought, to require any remarks from me. Long, long may the original of that portrait remain amongst us, to benefit us by his counsel, to aid us by his advice, and add lustre to the Devon and Cornwall Natural History Society!"

The Chairman, having warmly expressed his sense of the talents and worth of the President, and the obligations which he had conferred upon the Society, the adoption of the testimonial proposed by the Committee having been carried by acclamation, the Chairman resigned the chair to Lieut.-Col. Hamilton Smith, who delivered the following address:—

"Gentlemen,—At length we have the pleasure of meeting in our new locality; in a situation where I trust the Society will long continue to flourish in zeal and unanimity, with advantage to the studious portion of these towns and honour to itself. The situation where we are now assembled is one of the most convenient that could be selected, for Members residing at opposite distances will find it nearly central. The space we already possess, with the additional rooms which we shall obtain on or before next Midsummer,

will supply all the accommodation the Society can reasonably want for some years; and should the pursuit of natural history become so prosperous that by that time our space within this building should become insufficient, I am sure every Member present will admit such a result would be one of congratulation more than regret. As far as my own opinions are concerned, I feel we are now in possession of a Lecture Room sufficient for the wants of the Society, and of additional space for the exhibition of our geological and mineralogical specimens, for a Committee Room and Library, and for a Store Room, all on one floor, exclusively tenanted by ourselves, in a handsome building and remote from noisy interruptions. I deem it a favourable omen, that on this day of our first assembling here the Meeting should be graced by the presence of ladies. Here let us hope that we shall often be again honoured by their presence; nay, more, that they will deem it time well employed, occasionally to come and participate in some branches of our pursuits. Here we may look forward, in the course of next August, to find a portion of the British Association, such, for example, as the Medical Section, promulgating and discussing some of those immensely important discoveries which the zeal and profound abilities of the first men of their class in Europe are constantly bringing forward on occasion of their Annual Meetings; and before I proceed, I beg to announce to the Society, that I have received an official communication from the Plymouth Council, appointed to make the preparatory arrangements,—a communication which the Secretary will have the goodness to read to you in the course of this evening. But to proceed: it is in this room I fondly hope the Society will pursue, with renovated spirit, the several subjects of inquiry embraced by its Sections: here Zoology and Botany will receive their due share of attention; Geology and Mineralogy will be carried on with that enlightened zeal which is already beginning to bear fruit in the vicinity. Here, as soon as fit elements can be created, I shall be anxious to propose the formation of an Agricultural and Horticultural Section, with a view of spreading in these counties, among the smaller proprietors and agriculturists, information on the progress made in other districts and abroad.”

The President then expressed the sincere gratification he felt at the spontaneous and valuable testimony of approbation of his exertions in the cause of science, and of personal regard which he had received.

The letter from the Local Council stated that the British Association would visit these towns in the early part of the ensuing autumn, and that the liberal support of the nobility and gentry of the two counties was looked forward to with confidence by the Council.

Mr. J. C. Belamy, one of the Curators, announced the following donations to the Society since the last Meeting:—

A valuable collection of Minerals, from Sir George Magrath; Fossils, Minerals, Birds and Shells, Rev. W. S. Hore; Minerals, W. R. Newton, jun.; Land Shells of Devon and Cornwall, Rev. C. A. Johns; Coral, Lieut.-Col. H. Smith; *Ornithorhynchus paradoxus*, Capt. Smith; Fossils, Dr. Tripe; Birds, Mr. A. Pincombe; Birds, Rev. F. Lyte; Grasses, &c., Adj. Stevens, R.M.

The Rev. C. A. Johns, F.L.S., rose and said, “I cannot allow the evening to pass without proposing a resolution, which I am confident will meet with the cordial support of every Member present. We are all aware that the very being of a Natural History Society depends upon its Museum; for without the opportunity of constantly referring to specimens, neither the tyro nor the proficient in natural history can expect to derive much benefit. Through the kindness of our numerous Members our Museum already contains a great number of specimens; but this is not enough, for without order and arrangement their value is greatly diminished. This desirable object was effected, so far as space would allow, in our late rooms, and for this we

are indebted to our Curators. Within the last fortnight, however, every case with its contents has been removed, and the specimens re-arranged."

Mr. Johns concluded by moving thanks to the Curators, which was carried.

The Rev. W. S. Hore, F.L.S., F.G.S, in returning thanks on behalf of himself and colleague, said that the requisite time and labour had been most readily and willingly given. "We only regret," he added, "that the limited means of the Society prevented us from making a more splendid display this evening, though the additional labour might to us have been sensibly increased. Numerous specimens of rare Mammals and Birds are in our drawers, which the expense of mounting alone prevented us from displaying amongst our other treasures. I would also beg to remind the Members that the geological and mineralogical specimens possessed by the Society are not exposed to view in consequence of the room intended as the Museum for that branch of Natural History not having yet been prepared for their reception. When exhibited, they will prove that much attention has been paid to the geology of this and the neighbouring county by the Geological Section." Mr. Hore then alluded to the advantages of the location which had been selected, and which, independently of the increased accommodation, would afford facilities to such residents in Devonport and Stonehouse as might feel inclined to join the Society, which already presented encouraging prospects of increase.

Mr. J. C. Bellamy also returned thanks, and acknowledged the valuable assistance which had been received from Mr. Sampson, and from Mr. Pincombe, the Preserver to the Society.

Votes of thanks were also passed to Mr. P. F. Bellamy, Treasurer, and Mr. R. Saunders, Secretary.

MISCELLANEOUS.

Dianthus plumarius.—Since the publication of my note upon this plant in the 'Annals of Nat. Hist.' vi. 313, Mr. Dillwyn has been so kind as to send for my inspection another specimen of *Dianthus*, gathered by him on July 13, 1809, at "Black Rock, about a mile from Cork," in company with Mr. Drummond, Mr. Jos. Woods and Dr. Leach. This specimen turns out to be the true *D. plumarius*, which will therefore retain its place in the Flora of Ireland. It is singular that the *only specimen* seen by Mr. Mackay, and expressly referred to by him, should be different from those gathered from the rock by the above gentlemen.—CHARLES C. BABINGTON.

Salicaria luscinoides.—Since our record of the occurrence of this species in Cambridgeshire, we have been favoured with a communication from Joseph Clarke, Esq., of Saffron Walden, stating that he possesses one example of this Warbler, and that another is in the collection at the Museum of Saffron Walden. From other circumstances that have come to our knowledge, there is reason to believe this is not so rare a bird in the British Islands as might be supposed, and has very probably been undistinguished from *Salicaria arundinacea*.

The Tomtits and the Beehives.—"One of our lads came to us one

morning with a face full of importance, to inquire if we were aware of the depredations that the Tomtits were committing on the Beehives. He had, he said, been watching them for some time, and the way in which the Tits proceed is to strike hard with their bills on the boards on which the hives are placed; this noise awakens the bees, who come forth to learn from whence it proceeds, and their artful and merciless assailants immediately pounce upon and kill all who are not fortunate enough to escape, and either eat them on the spot or fly off with them to a neighbouring tree or shrub, and there devour them; and in this way great numbers are destroyed. The child further told us that he had witnessed the same attacks on his father's bees at their cottage among the woods, and that his parents are in the habit of setting traps for the cannibals, and he requested to be furnished with mouse-traps; these were given to him, and he placed them on the board at the mouth of each hive, and has already succeeded in killing five or six of the felons, who have thus paid with their lives for their murderous thievery."—*From a Correspondent in West Kent* *.

Larus glaucus:—*Larus capistratus*.—Mr. S. Mummery, of Bath-road, Margate, informs us of his having shot at Kingsgate, on the 6th of January (the weather being snowy with a strong easterly wind), a Glaucous Gull, one of the finest specimens he had ever seen, a male in full plumage, and now in the Margate Museum.—Also that two fine specimens of the Brown-headed Gull had been captured; one of them having been shot at Westgate-bay, between Margate and Birchington. This was alone and very tame, allowing Mr. Mummery's friend, who shot it, to approach very near before it attempted to fly. The other was shot by himself near Kingsgate. Both are males: one of these is now in the museum, and the other is for sale. In reference to Mr. Jenyns's remark that the food and nidification of this Gull are unknown, Mr. Mummery states that they feed on small fish that are near the water's edge, such as dace, &c., also on shrimps and worms. Their nests they build in the high cliffs of Dover, where specimens in full plumage can be obtained in the spring; as also their eggs, by lowering a man over the cliffs. The birds are to be seen flying about half-way up in great abundance.

Mr. Mummery offers, in the exercise of his occupation as a collector, to furnish those who may apply to him with nearly the whole of the aquatic birds in their different stages of plumage, with their eggs, in exchange for inland birds.

A strange News-Carrier.—A friend lately arrived from sea has furnished us with the following information, copied from a shipping

* [Our esteemed correspondent will find that Mr. Yarrell (*Birds*, vol. i. 341) states of the Marsh Titmouse, that "it is said to be an enemy to bees;" and mentions, under *Parus cœruleus*, an item in a churchwarden's account for seventeen dozen of Tomtits' heads. They are said to crush the bees with great adroitness transversely in their beak repeatedly, so as to escape being stung.—ED.]

report at St. Helena :—"The brig Memnon, belonging to Nantz, when off the Cape of Good Hope, caught an Albatros, having a ribbon round its neck, with a quill sealed at both ends, containing a slip of paper with the following words, viz. 'Ship Leonidas of Salem, bound to New Zealand, 74 days out, latitude 40° south, longitude 26° east.' The Leonidas, Eagleston master, sailed from this port (Salem, Massachusetts) on the 9th of August, 1839, and this is the first intelligence from her."—*Essex (Massachusetts) Register*, Feb. 1840.—J. M.

Locusts at Sea.—The *Essex* (Massachusetts) Register publishes the following account, on authority of a letter from the mate of the brig *Levant*, of Boston, to his friend in Beverly, dated Montevideo, Jan. 17, last port. The mate writes, that after having encountered a severe gale on the 13th September, when in latitude of 18° north, and the nearest land being over 450 miles, they were surrounded for two days by large swarms of Locusts of a large size; and in the afternoon of the second day, in a squall from the north-west, the sky was completely black with them. They covered every part of the brig immediately, sails, rigging, cabin, &c. It is a little singular how they could have supported themselves in the air so long, as there was no land to the north-west for several thousand miles. Two days afterwards, the weather being moderate, the brig sailed through swarms of them floating dead upon the waters.—J. M., March 1840.

Santa Cruz.—"The travelling in Santa Cruz is rapid and easy, and the evening drives through the picturesque valleys in the neighbourhood of West End, afford a luxurious enjoyment, even for invalids.

"On the top of the spiral rod of the cabbage-palm I have frequently observed a handsome gray bird, somewhat less than a thrush, called the Chincherry, Like the king-bird of North America, it is said to mock even the hawk, and to assert its dominion over all the fowls of the air. Humming-birds and bright little barbets are seen contending for the blossomed sweets of the yellow cedar; a sly-looking black bird, in shape like a jay, and generally called the black witch, abounds in the hedges; quails and minute doves are numerous, and a small species of bittern is often seen floating along over the lower grounds of the island. Lastly, the brown pelicans, on the sea-coast, flopping lazily over the waters, and ever and anon diving for their prey, are as numerous as gulls on the coast of Great Britain. It may be well to observe that the southern part of Santa Cruz is an extensive plain, I believe of shell-limestone formation. The highlands, composed of an indurated clay, conspicuously stratified, and tossed into various angles by some vast impulse from below, form the northern barrier; and very beautiful is their undulation. The loftiest of these hills is Mount Eagle, which rises 1200 feet above the level of the sea. An hour's ride from West End brings you to the top of Prospect or Bodkin Hill, from which there is a magnificent bird's-eye view both of the hills and plains, all, with

little exception, under careful sugar cultivation. But it is on the sea-shores of Santa Cruz that the American or English visitor will probably find his greatest amusement. The large blushing conks and other shells which strew the beach; the corals, madrepores, sea-fans, and sponges of many definite and curious shapes, not to mention the 'soldier-crabs,' dressed in regimentals of purple and scarlet, and inhabiting every empty shell they can find, cannot fail to attract the attention of the lovers of nature, even when, like myself, they have little pretensions to science. Yet it must be confessed that all these rarities are nothing in comparison with the fishes.

"The fish-market at West End is held under some cocoa-nut trees, on the shore, a little before noon, every day. To watch the arrival of the boats on these occasions, and to examine the live fish, before they are taken out, or after they are laid on the grass, under the shade, is a source of almost endless amusement. The variety of the kinds, and the brightness of their colours, are truly surprising. I know only their vulgar names, and vulgar indeed they are; but I cannot do justice to my theme without specifying the *grunt*, striped with alternate lines of yellow and purple; the *goat*, pink and silver; the *doctor*, of burnished copper; the *Welshman*, pink with yellow stripes; the *hind*, white with red and brown spots; the *rock-hind*, green with brown spots; the *parrot*, dark brown, blue, and yellow; the *silk-fish*, of a bright pink; the *blare-eye*, pink with a prodigious white eye; the *Spanish hog*, bright yellow and brown; the *angel*, of the finest gold and purple; to which list might be added a multitude of others. These fishes are generally from one to two pounds in weight, and with others of a larger dimension, but not so splendid, are generally good for the table—no small resource even for the poorer inhabitants of Santa Cruz. Our friend, Dr. Griffith, an able naturalist from the United States, who was with us on the island, was very successful in preserving these gaudy creatures, without destroying their colour. I understand that he has since presented his collection to one of the scientific institutions in Philadelphia."—*A Winter in the West Indies*, by Joseph John Gurney, pp. 14—16.

St. Thomas.—"Perhaps the greatest object of curiosity in this island is a prodigious specimen of the *Bombax Seva* [*Ceiba*?], or silk cotton-tree, which grows about two miles to the westward of the town. This tree, which bears a light foliage and pods full of silky cotton (suitable, we are told, for the manufacture of hats), loses its leaves once in the year. In the present instance it was quite bare—its trunk about fifty feet in circumference, of a contorted shape, with high thin battlements or projections,—its vast branches, spreading to a great distance, at right angles with the trunk, and shooting out others nearly at right angles with themselves, some parts of it encumbered with enormous knots. This tree is of African descent; the specimen now described may fairly be called a vegetable monster. We were amused by observing upon it the works of a species of ant, called the wood-louse. The central city of these little creatures occupied a fork formed by two of the branches; and from this

point streets or avenues were seen diverging over the tree in every direction, all teeming with a busy population."—*Ibid*, pp. 29, 30.

Dominica.—"The zoology of Dominica is quite interesting. The wild boar is found in the woods; a species of boa constrictor is also met with, and not unfrequently pays a fatal visit to the poultry-yard. Paroquets are numerous, and several kinds of humming-birds abound. Immense numbers of land-crabs, at certain seasons, afford excellent food for all who take the trouble of catching them. The same may be said of the crapeaus, very large frogs, which frequent the pure, running waters, and are, as we can testify, an excellent article of diet, the meat tasting like that of a chicken. But it is the vegetable luxuriance of this island which is the most striking to the eye of a stranger, far exceeding anything that we have elsewhere witnessed, except, perhaps, in some parts of Jamaica. Innumerable shrubs, plants and trees, novel to us, with broad-leaved creepers of various kinds, cover the hills with a remarkable depth of verdure. The most beautiful of these productions is the tree-fern, which grows to the height of twenty or even thirty feet, and waves its bright green feathers over the whole scenery of the island."—*Ibid*, pp. 77, 78.

METEOROLOGICAL OBSERVATIONS FOR DEC. 1840.

Chiswick.—Dec. 1. Hazy: overcast and mild. 2. Very fine. 3. Frosty: fine. 4. Sharp frost: overcast. 5, 6. Hazy. 7. Overcast. 8. Rain. 9. Frosty: clear. 10. Thawing: hazy. 11. Hazy. 12, 13. Overcast and cold. 14. Sharp frost. 15. Dry frosty air. 16. Overcast: snowing. 17. Snowing: cloudy: severe frost at night. 18. Frosty: overcast and cold. 19. Hazy: rain. 20, 21. Overcast and cold. 22—24. Severe frost. 25. Intense frost: Dense fog. 26. Thick hoar frost. 27—29. Foggy. 30. Clear: cloudy: rain at night. 31. Cloudy: clear and fine.

The mean temperature of this month was lower than that of any December within at least the last forty years.

Boston.—Dec. 1. Cloudy: rain early A.M. 2—4. Fine. 5—7. Cloudy. 8. Rain: rain early A.M. 9. Fine. 10—13. Cloudy. 14. Cloudy: snow P.M. 15. Cloudy: snow A.M. 16. Snow. 17, 18. Cloudy. 19. Rain. 20, 21. Cloudy. 22—24. Fine. 25—29. Cloudy. 30. Fine: rain P.M. 31. Fine.

This is the coldest December since 1829.

Applegarth Munse, Dumfries-shire.—Dec. 1. Raw but fair. 2, 3. Fine and fair. 4. Slight showers. 5, 6. Drizzling. 7. Wet and stormy. 8. Fair, but cloudy. 9, 10. Fair, but wet preceding night. 11—13. Fair throughout. 14—16. Hard frost. 17. Thaw, with slight drizzle. 18. Frost again. 19. Slight frost A.M.: drizzle. 20. Frost: Aurora Borealis. 21—24. Frost. 25. Frost A.M.: thaw P.M. 26. Frost again, but cloudy. 27. Thaw A.M.: cloudy and dark. 28. Frost but slight. 29. Frost—moderate. 30. Thaw and snow. 31. Raw and drizzly.

Sun shone out 21 days. Rain fell 9 days. Snow 1 day. Frost 14 days.

Wind north 1 day. North-north-east 1 day. North-east $7\frac{1}{2}$ days. East-north-east 1 day. East 4 days. East-south-east 3 days. South-east 3 days. South-south-east 1 day. South 1 day. South-west $3\frac{1}{2}$ days. West south-west 1 day. West 2 days. North-west 2 days.

Calm 12 days. Moderate 3 days. Brisk 6 days. Strong breeze 1 day. Boisterous 4 days.

Mean temperature of the month 36°

Mean temperature of December 1839 ... 34.9

Mean temperature of spring-water 42.16

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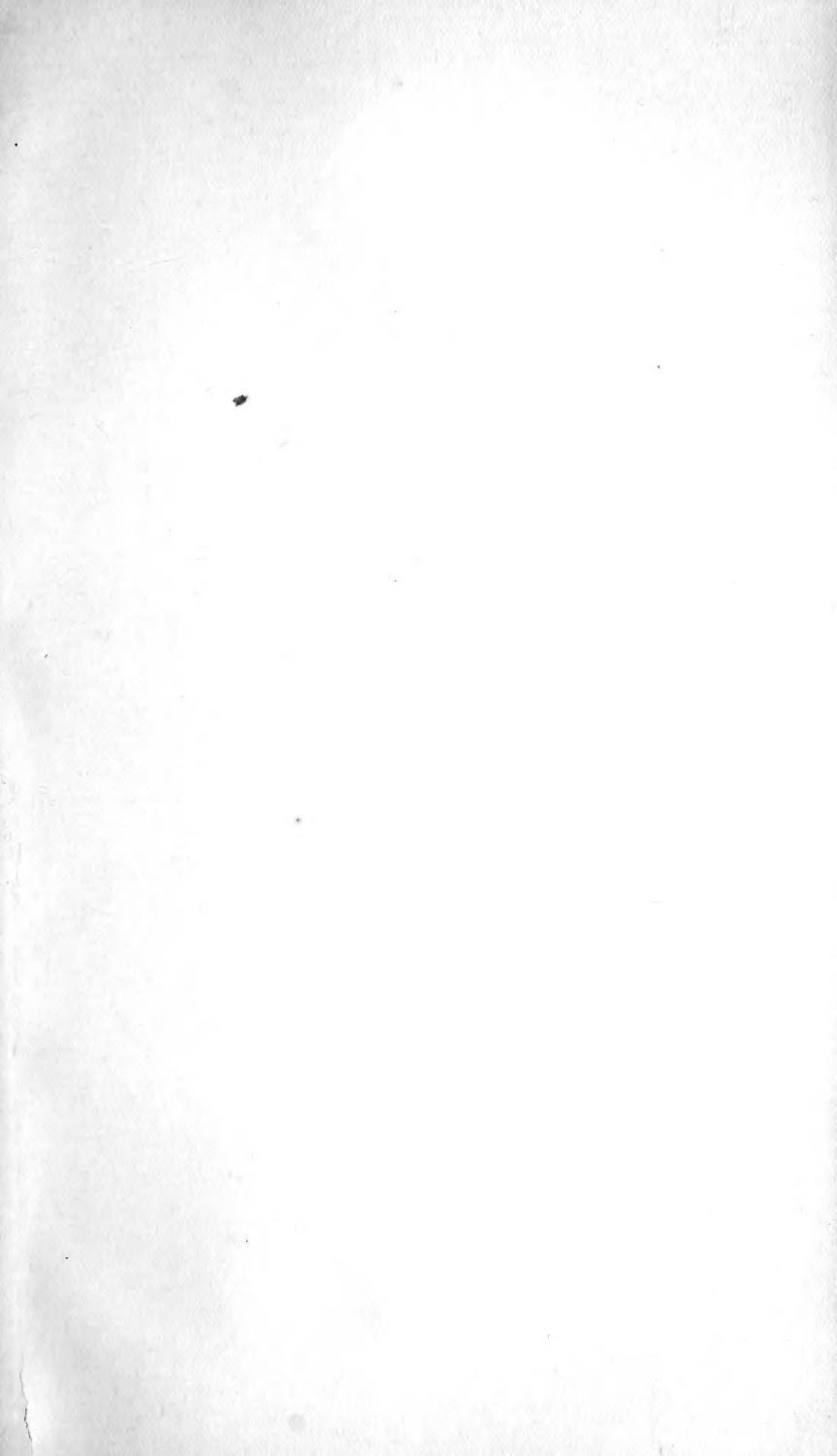
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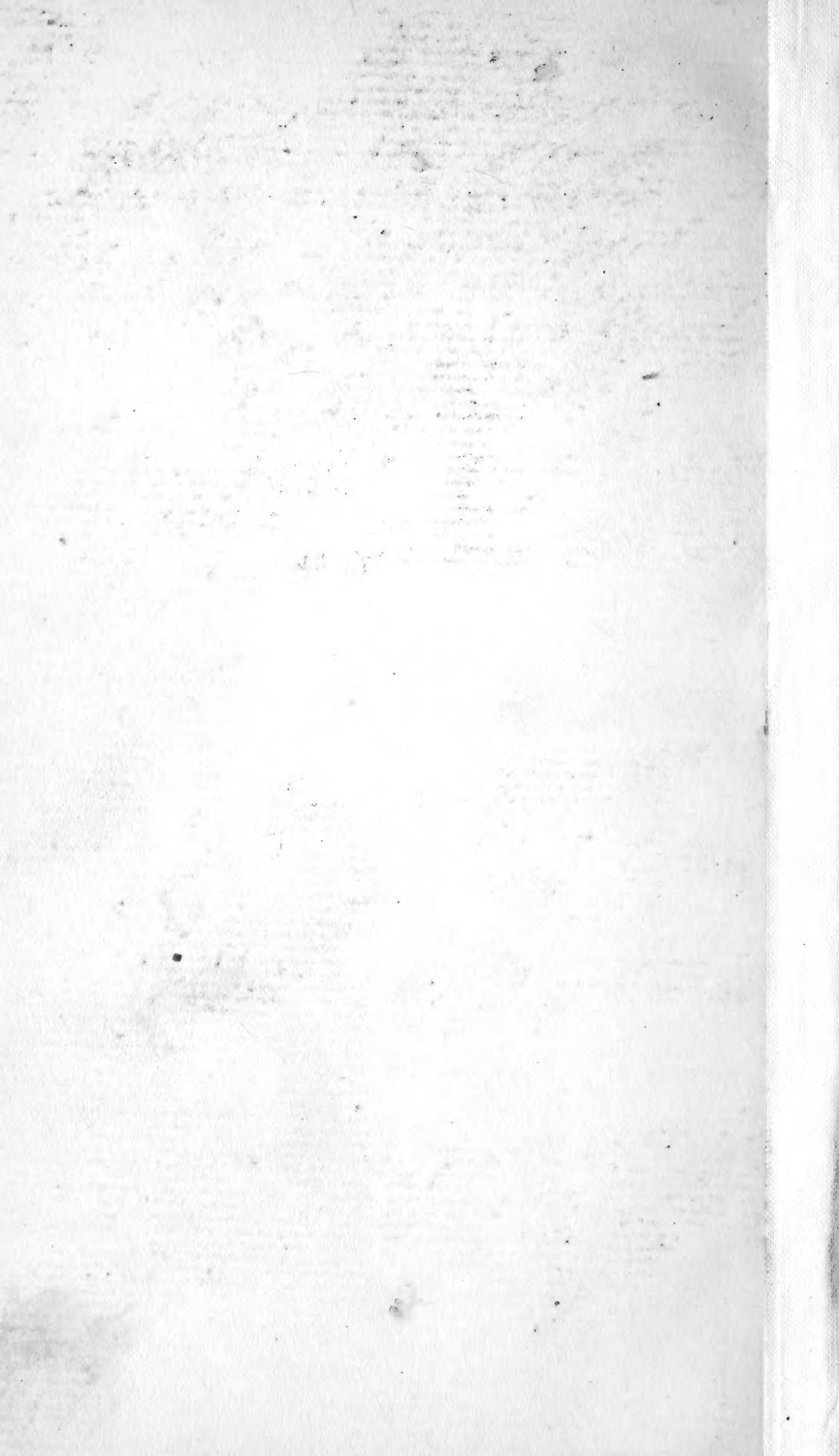
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