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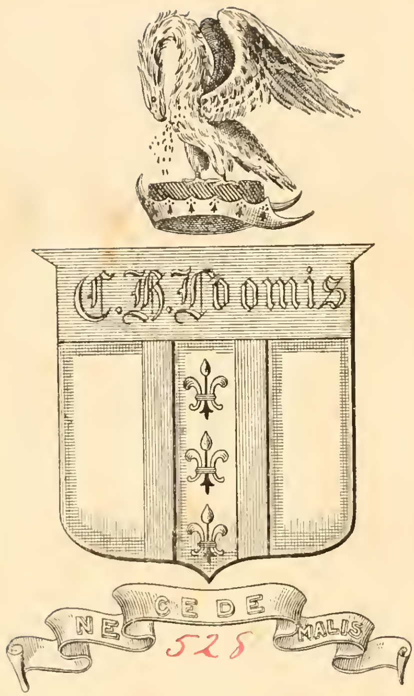
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HARDWICKE'S

SCIENCE-GOSSIP:

1880.

HARDWICKE'S

Science-Gossip:

AN ILLUSTRATED MEDIUM OF INTERCHANGE AND GOSSIP

FOR STUDENTS AND

LOVERS OF NATURE.

EDITED BY

J. E. TAYLOR, PH.D., F.L.S., F.G.S., F.R.G.S.I., &c.

VOLUME XVI.

London:

DAVID BOGUE,

3, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, W.C.

1880.

LONDON:
PRINTED BY WILLIAM CLOWES AND SONS, Limited,
STAMFORD STREET AND CHARING CROSS.

PREFACE.

THE Sixteenth time has come round for the Editor to say a few words of Annual Greeting to the readers and contributors of SCIENCE-GOSSIP. Comprehending as they do every class and shade of class of English society, he cannot but feel that the influence of this journal may be one of those invisible and unconscious agents which tend to bind us more closely together, by interesting us in common pursuits. And perhaps there is no pursuit which unites men and women so enthusiastically as that of Natural History.

In spite of the pseudo-scientific priggism which frequently takes the place of the genuine love of Nature distinguishing all true naturalists there can be no question that all Natural History studies are spreading, and sweetening many toiling human lives by their refreshing contact. The pursuit of knowledge is the monopoly of no class of mankind, and its diffusion will always be one of the most intellectually enjoyable to those who truly feel that it is better to give than to receive.

The variety of subjects, many of them the result of original research and observation, which have been discussed in our pages during the past twelve months, and nearly all of which are contributed by amateurs, is a good indication of the mental activity of our time.

Our "Notes and Queries" columns, and those devoted to the special branches of Natural Science are equally crowded with proofs of an active spirit of enquiry and research, in one form or another. Science is rapidly becoming a power in civilised society, although not equal perhaps at present to that exercised by Politics or Theology.

Its speculations are profoundly affecting both philosophic and religious thought, and its discoveries are influencing human industry in almost every part of the world. To be completely ignorant of these theories and new-found facts is to forfeit our claim to be considered educated.

Our editorial purpose remains the same as heretofore—to allow all who want to say or hear any new thing, to use our pages. As far as possible every department of Natural Science will be equally and fairly represented, both in original articles and notes. Employing only such technical phraseology as is necessary to correct scientific description, we shall aim more particularly at bringing home to the multitude the Infinitude of wonders with which animated Nature has always abounded; confidently feeling that Modern Science is fulfilling a great mission to humanity by its vivid Revelations of the laws, objects, and phenomena of the world in which we find ourselves temporarily sojourning!

LIST OF ILLUSTRATIONS.

LIST OF "LOCAL FLORAS" OF THE BRITISH ISLES.

By BERNARD HOBSON.

THROUGH the suggestion, and with the assistance of Mr. R. Anslow, Parville, Wellington, Salop, I have compiled the following list of "Floras," interesting scientifically or archæologically. The published prices are given when known. The word "about" before a price, means "the approximate market price." A capital F standing alone, signifies "Flora;" "19th" means published between 1816 and 1851. The mention of any work is not to be taken as a recommendation of it. By informing me before the 9th inst., if possible, of the title, publisher, price, &c. (also whether "descriptive" or not), of any "Local Floras" omitted below, readers will oblige, as I wish to make the list as complete as possible. Names for insertion in our "List of Working Naturalists" will also be acceptable.

Tapton Elms, Sheffield.

Bedfordshire.

F. Bedfordiensis (*county*), Linn. system, col. plates, by C. Abbot, 1798, about 7*s.* 6*d.*, pub. at Bedford.

Cambridgeshire.

"Plantæ Cantabrigienses," by Thomas Martyn, 1763. London.

"F. Cantabrigiensis," with plates, by Richard Relhan, 3rd ed. 1820, 12*s.*; Whittaker.

"F. of," catalogue, references to former catalogues, localities of rarer species, with map, by C. C. Babington, 12mo. 1860, 7*s.*; Van Voorst.

Cambridge (town), "Catalogus [alphabetical] plantarum circa Cantabrigiam nascentium" (no descriptions), by John Ray (the Linnæus of England), 1660. "Methodus Plantarum circa Cantabrigiam nascentium," by John Martyn, 1727. London.

Cornwall, *see* Devon.

Devon.

"Botanical Tour in, and Cornwall," by Jones (before 1830). "F. Devoniensis" (descriptive catalogue, Linn. and Natural systems), by J. P. Jones and J. F. Kingston, 1829, 16*s.*; Longmans.

Sidmouth, Catalogue of plants of, by W. H. Cullen, 2*s.*; Simpkin.

Dorsetshire.

Catalogues of Birds, Shells, and *rarer plants* of, by Richard Pulteney, folio, 1799, London. "F. of," by J. C. Mansell-Pleydell, 1874, about 8*s.* 6*d.*

Durham, *see* Northumberland.

Essex.

"F. of," map and col. plates, by G. S. Gibson, 1862, about 7*s.* 6*d.*

Woodford, "Catalogue," &c., by R. Warner, privately printed 1771, about 5*s.* 6*d.*

Gloucestershire.

Bristol. "F. Bristoliensis," map and 2 plates, by E. H. Swete, 1854, about 3*s.*

Hampshire.

Channel Islands. "F. of," by C. C. Babington, 4*s.* Longmans. *Isle of Wight.* "Flora Vectensis," by Dr. W. A. Bromfield, 1856, 21*s.*; Pamplin.

Herefordshire.

Botany of the Ross and Wye, by Henry Southall. (Transactions of Severn Valley Field Club.) See also Worcestershire, Malvern.

Hertfordshire.

"F. Hertfordiensis," by Rev. H. R. Webb and Rev. W. H. Coleman, with supplements, 1840, 12*s.*; Pamplin.

Kent.

"Kentish Botany 240 years ago. Thomæ Johnsoni Descriptio Itineris Plantarum Investigationis ergo suscepti, in Agrum Cantianum anno Dom. 1632," reprint, edited by T. S. Ralph 1849, about 7*s.* 6*d.* London. "Plants of South Kent," by G. E. Smith, before 1830. *Dover.* Catalogue of more rare plants, &c., of, by L. W. Dillwyn, Trans. Linn. Soc. 1802, vol. vi. pp. 177. *Faversham.* "Plantæ Favershamienses," by E. Jacob, 1777, about 4*s.* 6*d.*

Tunbridge Wells, see Sussex.

Lancashire.

"*Liverpool*, F. of," by F. B. Hall, edition by Armistead, 19th, 6*s.*, Whittaker. "*Liverpool*, F. and Physical Geography of," including Musci and Hepaticæ, by Dr. J. Dickinson, 1851–5, 7*s.* "*Liverpool*, F. of," by Liv. Nat. Field Club, 1872–6, about 4*s.* 6*d.* "*Manchester*, Guide to flowering plants near," by Richard Buxton, 19th, 6*s.*, Longmans. "*Manchester*, F. of, within 18 miles," by Leo H. Grindon, 1859, 12*s.* 6*d.*; White.

Leicestershire.

"F. of," by Mary Kirby, 6*s.* 6*d.*; Hamilton.

Middlesex.

"F. of," Topographical and Historical, Physical Geography and Climate," by H. Trimen, F.L.S., and W. T. Dyer, with map, 1877, 12*s.* 6*d.*; Bogue. *London*, "F. Londinensis," by William Curtis, 70 parts, 1777–99, 5 vols. folio, 400 col. plates, natural size, about £9 9*s.* The second edition, edited by W. J. Hooker, in 109 parts, with 647 col. plates, natural size, 1815, &c., published at £87 4*s.*! *London*, "F. Metropolitana," or rambles within 30 miles of London, by D. Cooper, 1836, about 3*s.* "*London*, a new F." by E. C. De Crespigny, M.D. Part i. List of phanerogams and cryptogams round London. Part ii. List of 75 localities with plants found there, 1877, 5*s.*; Bogue.

Monmouthshire, *see* Worcestershire, Malvern Hills.

Northumberland.

"Botanist's Guide through N. & Durham," by N. J. Winch. New F. of N. and Durham with map and sketches of climate, and physical geography, by T. G. Baker and G. R. Tate, 1868, about 7*s.* 6*d.* Newcastle. "*Berwick-on-Tweed*, Catalogue of plants of," 564 species, by J. V. Thompson, 8vo. 1809. "*Berwick-on-Tweed*, F. of," vol. i. Phanerogams, vol. ii. Cryptogams, by Dr. Johnston, before 1830; Longmans.

Notts.

Nottingham, "F. of," Ordoyno, 1807. "F. of," by Godfrey Howitt, 1839. "A Catalogue of plants &c., about N. and London," by Charles Deering, 1738.; Nottingham.

Oxfordshire.

"F. of, and its contiguous counties," 12 fine plates, 200 figs., by Richard Walker, F.L.S., 1833, 14*s.*; Longmans. *Oxford*, "F. Oxoniensis," by Dr. John Sibthorp, 1794, about 3*s.* 6*d.* Oxford.

Shropshire.

"F. of," by Rev. W. A. Leighton, F.L.S., 1841, £1 4*s.*; Van Voorst. "Ferns and Fern Allies of S.," by W. Phillips, F.L.S. "*Church Stretton*, Botany of," by G. H. Griffiths, M.D. "*Wrekin District*, Mosses of the," by R. Anslow, before mentioned.

Somerset.

Bath, "F. Bathoniensis," by C. C. Babington, 19th, 3*s.* 6*d.*; Longmans.

Bristol, see Gloucestershire.

"*Weston-super-Mare* and neighbourhood, F. of," by G. St. Brody, 1856, 3*s.*

Suffolk.

"F. of," by J. S. Henslow and E. Skepper, 1860, 5*s.*; Simpkin.

Surrey.

"F. of," Catalogue, localities of rarer species, with 2 maps, by J. A. Brewer, 7*s.* 6*d.*; Van Voorst.

"*Reigate*, A F. of," with map, by G. Luxford, A.L.S., 1838, 5*s.*; Van Voorst.

"*Reigate*, F. of," with map, by James Brewer, 1856, about 4*s.*

Sussex.

"*Eastbourne*, F. of," by F. C. S. Roper, F.L.S., F.G.S., with map, 1875, about 4*s.*

Tonbridge Wells, "F. Tonbrigensis," by T. F. Forster, F.L.S., 1816, 9*s.*; Arch.

Warwickshire.

"F. Varvicensis," by W. G. Perry, 1820.

Wiltshire.

"*Marlborough*, F. of," by Preston, 12mo. 3*s.* 6*d.*; Van Voorst.

Worcestershire.

"*Malvern Hills*, botany of," by Edwin Lees, F.L.S., F.G.S., 1868, 2*s.* 6*d.*; Bogue.

Yorkshire.

"F. of," by Henry Baines, 1849, 7*s.* 6*d.*; supplement to same, 5*s.*, both Pamplin.

"West Yorkshire," its Geology, Climatology and Botany, by J. W. Davis, F.L.S., and Arnold Lees, F.L.S. 1874 (?), 21*s.*; Reeve.

"*Castle Howard*," North Riding, Of the more rare plants of, by Robert Teesdale, Trans. Linn. Soc. 1792, vol. ii. pp. 103.

"*Settle*, A Catalogue of plants, &c. of," published with Curtis's "Flora Londinensis," 1782, folio. "*Wakefield*, materials for the F. of," by Gissing, 1860 (?), 1*s.* 6*d.*; Van Voorst. *York*, "Plantæ Eboracenses," by Robert Teesdale in Trans. Linn. Soc., 1792 (?), vol. ii. pp. 103; Supplement, 1798, vol. v. pp. 36.

Eastern Borders.

"Botany of the," by G. Johnston, 1853, 10*s.* 6*d.*; Van Voorst.

Midland Counties.

"Botanical description of Brit. plants of," including fungi, 34 col. plates, by T. Purton, 2 vols., 1817, £1. Stratford-upon-Avon. "Appendix to same with indexes," 2 vols., 1821, £1 10*s.* London, both Longmans.

WALES.

Anglesea, Catalogues of plants of, in Latin, English, and Welsh, with habitats of rarer species called "Welsh Botanology," by Hugh Davies, 1813, about 4*s.* 6*d.* London.

Swansea (where British Association meets, 1880), Material for a Fauna and Flora of, by L. W. Dillwyn, 1821, about 5*s.* *Tenby*, Contributions towards catalogue of plants of, 12mo., 2*s.*; Longmans.

SCOTLAND.

"F. Scotica" (on Linnæan method with sketch of Scotch zoology, by T. Pennant), with 37 plates, by John Lightfoot, 2nd ed. 2 vols. 1792, 10*s.*; "F. Scotica," by W. J. Hooker, 1830, 14*s.*; Hurst, London. "Scotch Cryptogamic Flora," by R. K. Greville, 6 vols. royal 8vo. 19th, £8 8*s.*; Bohn.

Aberdeenshire.

Aberdeen (town), "F. Aberdonensis," by G. Dickie, 1838, 2*s.* 6*d.*; Whittaker.

Edinburgh (city).

"Catalogue of Phanerogamic plants of," by James Woodforde, 1824. "F. Edinensis," by R. K. Greville, 1824, 16*s.*; Cadell. "F. of," by Professor J. H. Balfour, with map, 1875, 3*s.* 6*d.*; A. & C. Black.

Forfarshire.

"Plants of," by Don, F.L.S., before 1830. "F. of," by W. Gardiner, 19th, 7*s.* 6*d.*; Longmans.

Lanarkshire.

"Description of plants of," and glossary, by Patrick, before 1831, 6*s.*; Simpkin. *Glasgow*, "F. Glottiana," by Thomas Hopkirk, 1813, 7*s.* 6*d.*; Longmans.

Shetland Islands.

"F. of," by Thos. Edmondston, 19th, 2*s.* 6*d.*; Whittaker.

IRELAND.

"Plantæ Rariores in Hibernia inventæ," by Walter Wade, 1804. Dublin. "Catalogue of indigenous plants of I.," by J. T. Mackay, before 1830. "F. Hibernica," by the same, 16*s.*; Longmans. "Irish F." (anon.) 12mo., 5*s.*; Longmans. "Cybele Hibernica," by Moore & More, 10*s.* 6*d.*; Van Voorst.

Cork.

"Contributions towards a Fauna and F. of County," 19th, 3*s.* 6*d.*; Van Voorst.

Dublin (county).

"Catalogus Systematicus Plantarum Indigenarum in Comitatu Dubliniensi inventarum," by Walter Wade, 1794. Dublin.

THE FRESHWATER SPONGE.

IN January, 1879, my attention was drawn to a piece of freshwater sponge (*Spongilla fluviatilis*) growing in one of my glass vases. I remembered that at the end of 1877 I had placed a small portion of sponge in the vase, when it attached itself to a stone at the bottom, where it continued to grow for some time, and perfected the ovaries. It then died, and the ovaries were left in the vase. I did not in the least expect to see any growth from them, and was agreeably surprised to find that some of them had sprung into life. When first observed, the piece of sponge was about the size of a pea and was attached to a weed. This I fastened to the top of the glass, so as to bring the sponge near to the surface of the water, and so as to enable me to examine it with a pocket lens and watch its further growth. Thus it continued to grow and increase in size. I was enabled to see the incurrent enter into the pores, carrying small particles of floating matter with it on which the sponge feeds. The excurrent also through the oscula was most interesting, for, having fixed the sponge within half an inch of the surface of the water, the current discharged through the oscula, carrying with it the effete matter, was of sufficient force to cause an eddy, or vortex in the water, two inches in diameter, carrying with it the lighter weeds, such as duckweed, and small detached pieces of other weeds floating at the top. This current at times becomes slow, and appears as though the creature rested for a season; and then again for some time it would send forth a powerful stream, bearing the loose and floating particles with it. During these alternate acts of rest and activity, the oscula did not entirely close up, but about June 1, the large oscula gradually closed, and the excurrent ceased to flow. The sponge then became very pellucid, the ovaries of which were now seen in every part of it, and the spicula standing out in all directions. It had during the five months increased in size to a little more than an inch in diameter. From this time the sponge began to diminish in size, and became very offensive. I then removed it from the vase, and placed it in a small glass globe, so that I could preserve the ovaries as they became liberated. On August 18, I placed several of the detached ovaries in a glass cell with the view of witnessing the development and growth of new sponge therefrom—the development commenced in ten days; on August 28, I observed that the foramens of several of them were open and the gemmule or sarcode had issued out and was

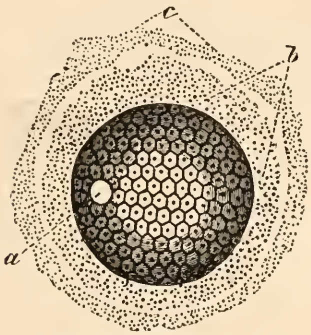

Fig. 1.—Ovarium of Fresh-water Sponge: *a*, the foramen; *b*, first growth of sponge; *c*, further extension of sponge.

spreading on the bottom of the cell to which it was firmly fixed. In fig. 1, is shown an ovarium with the open foramen (at *a*) out of which the sarcode had escaped and was spreading on the glass around the ovarium (*b*). At this stage there was no spicula visible, but a further extension of the sarcode or growing sponge was seen (*c*).

This new sponge is a very thin, gelatinous, semitransparent matter, which spreads on the bottom of the glass, in which at first no spicula are seen, nor are the pores rendered distinct, but in about seven days the sponge had increased (as at fig. 2), and the growing spicula become numerous and extended over the edge of the first formed part of the sponge (fig. 2, *e*). The sarcode is, as it were, festooned from point to point of the spicula, as though the growing spicula carried out with them the extending sarcode (fig. 2, *f*), also the oscula, or excurrent canal is now formed (fig. 2, *g*,) and the incurrent pores at *h*. I have seen small portions of the sarcode separated from the growing new sponge, and in an amœboid fashion and form move slowly away from it, and settling down at a distance from the ovarium, out of which no doubt they originally came, and have seen them growing as independent sponges, though very small with their oscula extended, from which the excurrent was seen to flow, as from the larger sponges. It is stated by Bowerbank, "that one of the few modes of the propagation of the spongiadæ is by spontaneous division of the sarcode." The current of water seen to enter the pores (at *h*), and the excurrent out through the oscula (*g*) is caused by vibratile cilia with which the sponge cells are lined. These cilia I believe have never been seen in operation *in situ*. They are impossible to be thus seen, as they require high power of the microscope to detect them, and that cannot be applied to the pores of the living sponge, as the mass of the sponge is too thick. With a view of detecting, if possible, the cilia in a living sponge,

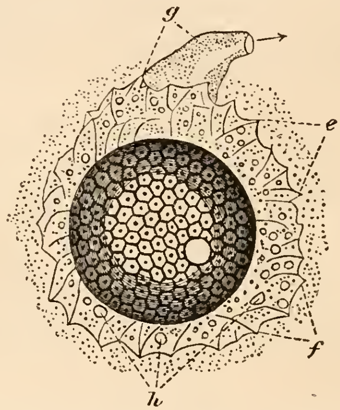

Fig. 2.—Ovarium; *e*, growth of spicula *f*, sarcode festooned on spicula; *g*, oscula, or excurrent canal; *h*, incurrent pores.

Mr. G. Gulliver, jun., B.A. Oxon, brought his microscope, with a high power objective, and took out one of the small growing sponges from the cell in which I kept them, but the cilia could not be seen until he tore the sponge to pieces with needles, thereby breaking open the sponge cells, when the cilia were plainly shown, lashing whiplike, and becoming slower in motion as the death of the sponge approached, when the cilia became both rigid and motionless (fig. 3, *j*). These openings, termed pores, are lined with sponge particles, each of which is provided with a vibratile cilium; and as these cilia work in one direction towards the excurrent canal, they sweep the water out in that direction, and its place is taken up by fresh water, which flows in through the small apertures. The currents of water carry along such matter as are appropriated by the sponge particles lining the passages. I have observed in close proximity to the new growing sponge, some very small bodies of sarcode, somewhat irregular in form, and throwing out spines similar to *Actinophrys*

Fig. 3.—Torn sponge, showing cilia at *j*.

sol, though I could not make out that they had any actual connection with the sponge, but most likely they have.

JAMES FULLAGAR.

THE "SCIENCE-GOSSIP" BOTANICAL EXCHANGE CLUB.

IT is a pleasure again to present our readers with a report of the SCIENCE-GOSSIP Botanical Exchange Club for 1879. Sixteen members joined our ranks for the season, most, we might say, sent in the usual parcel. We have collected plants for herbaria for well-nigh twenty-five years, yet, we confess, the past summer was the most disastrous we ever knew. After wandering many miles in search of rarities, then taking every care to dry them fit to be seen, we have wofully failed; many of our best specimens became mildewed whilst in the press, until at length, in despair, we gave up the attempt. This unfortunately is the experience of every collector we have conversed with: under these trying circumstances, no wonder so few members joined the club. Well, never mind, there is a bright side; they say every dark cloud has a silver lining. We heartily congratulate the members in having the best return parcel we have ever distributed; perhaps not quite so large as during previous years, but what it lacks in quantity is more than made up in quality. Some few of the selected specimens we never met with before; such as *Origanum prismaticum* (Gaud.) and *Euphrasia montana* (L.) will be welcome additions to all our local herbaria. Another matter deserves especial notice: the club is bringing forward several promising and talented young men who have expressed their gratitude for the aid thus afforded them in their work; it has a cheering influence to feel we have sympathising helpers.

Before mentioning a few localities from which specimens have been recently gathered, we give the explanations of some of the members. Mr. R. Turner states: "*Potamogetom nitens* (Weber). Bute is given in the text-books, as one of the few localities for this plant. Kennedy's 'Clydesdale Flora' gives Loch Ascog, as the station for the species in Bute. The plant found in that loch differs however from that which has been determined as true nitens in certain other cases. It grows abundantly in the loch, along with heterophyllus, from which it differs mainly in the absence of floating leaves." (We have sent this in all the parcels. It differs widely from nitens collected in river Tay. We hope to have the opinions of some of our members.) "*Symphytum tuberosum* is abundant in various localities within a few miles of the city of Glasgow, and is not uncommon over the whole of the Clyde district. *Salix Helix* (L.) grows along the banks of Clyde in many places above Rutherglen. The female flowers seem to be typical, or nearly so, but the flowers of what is usually considered the male form of the same plant which grows in the same stations agree with descriptions of *S. rubra* rather than with that of *S. Helix*. *Vicia Bobartii* is very common in Bute."

Mrs. Edwards notes, "The inclosed species of *Daphne Laureola* is found in Needwood Forest, Staffordshire; the Mezereon is also stated to be met with in the same locality." We should be glad if Mrs. E. found the report of the Mezereon correct; it is very limited in its distribution in Britain.

Mr. Curnow states, "Mr. Ralfs and self have this autumn been hunting up the Euphrasias, and making them out from a French work. I fell in with one glandulose, the most distinct form, which we have decided as *E. montana;* of this I have sent a dozen specimens. We also believe there are three other forms, viz. *E. tetraquetra*, a coast species; *E. cuprea*, the heath plant, and *E. gracilis*, on hillsides. We have also met with another variety, which Newbould names *E. sylvatica:* it has large and long flowers. Another plant from Stroud we take to be *E. ericetorum*."

Mr. C. Bailey sends many specimens of the following, which will prove acceptable additions to the herbaria of our members. *Origanum prismaticum* (Gaud.), Folkestone, Kent; *Daucus gummifer* (Syme), Hastings, Sussex; *Scirpus compactus* (Kis.), Hastings; *Genista glabra*, Matlock. Mr. A. Bennett, *Senecio crassifolius* (Willd.), Cork; *Atriplex pedunculata* (L), Storrer, Kent; *Corynephorus canescens*, Caistor, Norfolk. The Rev. W. H. Painter forwards *Orobanche Rapum* (Th.), Bangor. Mr. Watkins, *Caltha Guerangerii*, Poulstone; *Thalictrum montanum*, Scawfell; *Carex montana*, Douard Hills. Mr. Jenner, *Rumex pratensis*, Lewes, Sussex; *Seseli Libanotis*, Seaford; and Mr. Curnow, *Iris tuberosa*, Treveneth Farm, Penzance.

We have not space to enumerate the whole of the rare species sent for distribution; the above are sufficient to show the value of the club in helping to build up good local collections.

HOW TO DOUBLE STAIN VEGETABLE TISSUES.

HAVING exchanged a great number of slides of double-stained vegetable sections through the medium of the "Exchange" column in this journal, and as my slides appear to give general satisfaction, some of the recipients going so far as to compliment me upon them and asking how they are prepared, I think it will be a convenience to all parties interested, and to your readers also, if you will give me an opportunity of making known by means of this paper my method of double-staining vegetable tissue.

In several papers I have seen on this subject a plan of using two aniline dyes (either together or separately) is given, but this method I cannot recommend, as, after some little experience, I find that all aniline dyes are more or less fugitive when used with vegetable tissue, and that consequently double-staining by this method resolves itself into using two dyes of as opposite colours as possible, one to be as little fugitive as can be obtained, and the other of an exactly contrary character. If any vegetable section containing hard and soft tissue be dyed in such colours, either together or separately, and afterwards washed to a certain extent, it will be found that the more fugitive dye still lingers in the harder tissue, which gives it up less readily than the softer parts; these latter still retaining the permanent dye, which usually is not so penetrating as the other dye, and is therefore overpowered by the same in the harder tissue. Were the section washed long enough, every trace of colour could be removed from all parts of the same.

To be at all successful in double-staining by this method requires constant practice, so as to know exactly at what stage to discontinue washing the stained sections; it is therefore not surprising if amateur mounters are not invariably successful when they try their hand at double-staining vegetable sections.

Such being the case has led me to think whether it would not be much better to employ one permanent dye and one fugitive dye, using the former first, and the fugitive dye afterwards, this last being washed out again to any degree required.

I now double-stain vegetable sections by means of carmine and aniline green, the former being a perfectly "fast" dye, whereas the latter is extremely fugitive, more so than I wish, but is the only colour I know of at present which will answer the purpose required.

Before commencing staining the sections they require to be decoloured; this is important. The bleaching can be done by means of alcohol when the whole of the tissue and contents will be preserved, but slides prepared in this way will not be so effective as if the sections had been decoloured in a solution of chlorinated soda which is prepared as follows: Take two ounces fresh chloride of lime and dissolve same in one pint of distilled or clean rain water, shake well and allow it to settle, when somewhat clear add to it by degrees a strong solution of common washing soda until no precipitation takes place; when the whole has thoroughly settled the clear supernatant liquor can be siphoned off and, if necessary, filtered. Preserve in well-corked bottles and in the dark, otherwise the solution will soon become useless.

For the carmine dye, take—carmine 10 grains; strong ammonia 10 or 15 grains; and dissolve in a test tube with a little heat; when the carmine is dissolved add distilled water 200 grains. Filter and preserve in a well-stoppered bottle.

For ordinary use portions of this dye will have to be diluted with four or five times its bulk of distilled water, but occasionally sections will be met with which require stronger solutions.

The carmine dye for vegetable sections requires a "mordant," prepared as follows: (A) sulphate of alumina 10 grains; dissolved in distilled water 200 grains. (B) Acetate of lead (sugar of lead) 30 grains; dissolved in distilled water 600 grains. Add B to A till no precipitation takes place, then allow the whole to settle and siphon off the clean liquor which must be filtered and kept in a clean stoppered bottle. When required for use, dilute a portion with four or five additional equivalents of distilled water and filter afresh. Stronger solutions may occasionally be required, as in the case of the carmine dye.

The aniline dye is prepared by simply taking—3 grains of crystals of green aniline (the brand I use being "Iodine Green," prepared by Messrs. Brookes, Simpson, & Spiller, of London), crushing the same well in a mortar and dissolving in one ounce of absolute alcohol; filter the solution and preserve in a stoppered bottle.

The double staining of vegetable sections is divided into three distinct stages, viz.:—

1. Bleaching the sections;
2. Staining in carmine; and
3. Staining in green aniline and mounting.

Any interval of time, days, weeks, or months, can take place between the first and second stage or the second and third.

I will now describe these stages in succession.

Bleaching the Sections.—An ounce or so of the chlorinated soda solution having been poured into a glass or wide-mouthed bottle and covered or corked, the sections are placed therein, but not too many, otherwise they will cling together and prevent the solution acting so quickly upon them; when the sections are thoroughly bleached, which will generally be in from six to twelve hours, they must be taken out, lest they become disintegrated, and well-washed by being soaked in several changes of boiled water yet lukewarm, say, about five changes of water in the twenty-four hours, at the end of which time the sections must be placed in a solution of equal parts of alcohol and water, and kept there until wanted.

Staining in Carmine.—Transfer the required sections from the alcohol and water into the "mordant" diluted as directed, and leave them there overnight; in the morning re-transfer them into the diluted carmine dye, leaving them there say an hour or so, when they must be well washed, first in clean distilled water acidulated with thirty drops of nitric acid to the pint, and secondly in clean distilled water only, and finally preserved in alcohol for a couple of hours or until wanted.

Staining in Green Aniline, and Mounting.—Take the carmine-dyed sections and place them in the green aniline dye, leaving them there at least twelve hours, after which they must be taken out one by one as each will have to be mounted as rapidly as possible: as each section is taken out place it for a few seconds only in clean absolute alcohol, washing very little of the green dye out as it is very fugitive, after this, transfer it into oil of cloves for such time only as will render the section translucent. By this time more of the green will have washed out, then take the section out, place it on a glass slip with the least possible quantity of the oil of cloves, as this evaporates most slowly; add balsam dissolved in benzole and cover with a thin glass circle or square as preferred. Leave the slides for a day or so, by which time a large proportion of the benzole will have evaporated, when the slides can be dried off by placing them, as I do, on the top of a hot-water cistern with pieces of wood under them to moderate the heat if too hot, and leaving them there for a week or more as may be found requisite. By adopting this plan all risk of bubbles is avoided, and the balsam can be hardened to any degree, even until it becomes hard and brittle, allowing the cover to flake off on the least jar.

To still further assist your readers in preparing good specimens of double-stained vegetable sections, I will add the following hints.

The sections if possible should be cut while still moist and never be allowed to dry, as drying will in many instances quite spoil the tissue; pith, for instance, will often crack and spoil all sections taken from it; moreover it is much easier to cut clean good sections when the material is moist than if the same be dry.

In transferring sections from one solution to another, I never use forceps, as it would be impossible to do so without very often spoiling the specimens, however light a hand I might have; I use instead a flat spoon or ladle, made by beating out the end of a piece of one-eighth inch brass wire and well smoothing the edges. Platinum would be preferable for use with the acidulated water but is expensive; in this case I use a glass stirring rod, but this is awkward to manage; a camel-hair pencil can be employed if preferred.

Care must be taken to have all the solutions thoroughly clean; they must be well filtered every now and then; this rule does not apply so stringently with the solution of chlorinated soda, as this gets dirty by being used, besides which the sections get well washed when taken out of it.

Occasionally the carmine dye and mordant will be found too weak if used diluted in the proportion as directed, as some sections take the dye very much better than others; in such cases it will be necessary to increase the strength of both the mordant and the dye; it is no use increasing the strength of the dye only, as the excess colour will not be permanent but will wash out immediately the section is placed in the water; the fixing of the dye is entirely dependent upon the strength of the mordant employed. Carmine requires a mordant when employed with vegetable, but not with animal tissue.

I have not properly tried it, but I have no doubt that a one per cent. solution of alum would answer as a mordant in place of the kind I employ, which is really nothing more or less than a solution of acetate of alumina, but I am not quite sure where I could obtain this chemical ready prepared.

In conclusion I may say I think that if any of your readers will give this plan of double-staining a fair trial, they will find themselves able to prepare slides of double-stained vegetable sections which will give them every satisfaction; they must however bear in mind that some preparations will be found much more effective than others, though the process employed be exactly the same in all cases. As a rule, when slides are prepared for sale, the more effective and showy preparations have naturally the preference.

H. M.

NOTES ON SOME OF OUR SMALLER FUNGI.

By G. E. Massee.

THE species of Trichia when young resemble minute globules of cream; afterwards they become dry and look like miniature puff-balls, sessile or stalked; the peridium is irregularly torn at the top, spores and threads usually saffron or bright yellow. The spiral threads at once mark the genus. *T. chrysosperma*, common on rotten wood, bark, &c., is most frequent, crowded, subsessile, more or less compressed, at first white, afterwards cinnamon yellow; spores and threads yellow, the latter short and with pointed ends; spiral markings strong. This genus belongs to the order Myxomycetes, the members of which are distinguished from all other plants by the absence of a cell-wall during their vegetative period; it is only on the formation of fruit that the protoplasm breaks up into pieces, each surrounded by a cell-wall. This exceptional gelatinous early condition has led to much difference of opinion as to their true position, and Professor de Bary at one time considered them as animals closely related to the Gregarines, but in the mature state their threads and spores so closely resemble those of the puff-balls that their vegetable nature cannot be doubted. Various species of Trichia, none larger than a pin's head, not unfrequently support a still smaller parasite, only just visible to the unaided eye, *Stilbum tomentosum.* In Stilbum there is a lengthened stem formed of long threads compacted together; at the top the threads are free and form a more or less round head, covered with small spores which are produced from the free ends of the threads forming the stem; the spores are mixed with mucus. *S. tomentosum* is pure white, and resembles minute pins stuck into the Trichia; the stems are connected by a byssoid mycelium. Another white species, *S. vulgare*, may be known by its habitat, decaying wood, the more globose head, and absence of mycelium connecting the stems. Stilbum, in common with a few other genera, offers an exception to the usual

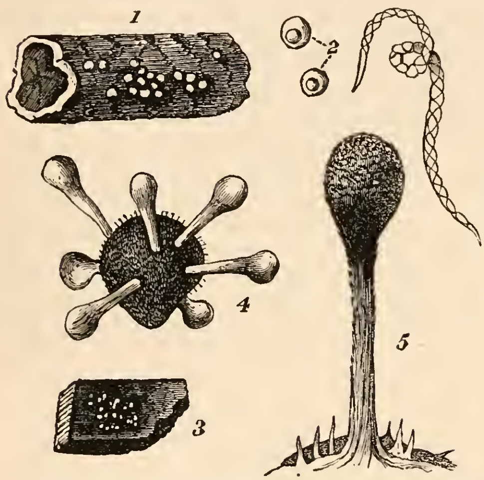

Fig. 4.—Illustrations of some of our smaller Fungi: 1, *Trichia chrysosperma*; 2, spores and threads; 3, *Stilbum tomentosum*, natural size; 4, *Stilbum tomentosum*, magnified, showing habit; 5, *Stilbum tomentosum*, more highly magnified.

characters of the family Hypomycetes in having the fertile threads more or less compacted to form a common stem; usually the fertile threads are free, and bear the spores at their tips; such forms are known by the name of moulds, black or white, depending on the colour of the threads. The black velvety patches common on old wood and decaying stems belong to Helminthosporium, one of the black moulds. The species are numerous, and recognised by the spreading mycelium of black or brown jointed threads, from which spring similar erect ones, paler upwards, and producing at the tip, rarely laterally, lengthened spores, divided by a varying number of septa; these are also usually some shade of brown. Another genus, equally common in similar situations, might easily be confounded with the preceding until examined under the microscope, when the structure is found to be very different; this is Torula, belonging to the family known as Coniomycetes, characterised by the predominance of the spores over the vegetative part of the plant, and almost entire absence of threads, which are the great feature in the preceding family. In Torula the general covering and threads are entirely absent, and the spores are produced in straight rows, looking like strings of beads. *T. herbarum* is common on dead umbelliferous stems, forming black velvety patches with a tinge of olive-green; the chains of spores are usually arranged in bundles, greenish by transmitted light, the constrictions slight. The term mould is too vague in its application to be of any use to the student, including forms belonging to the two primary divisions of fungi—those that have the spores growing from spicules and not contained in a sac of

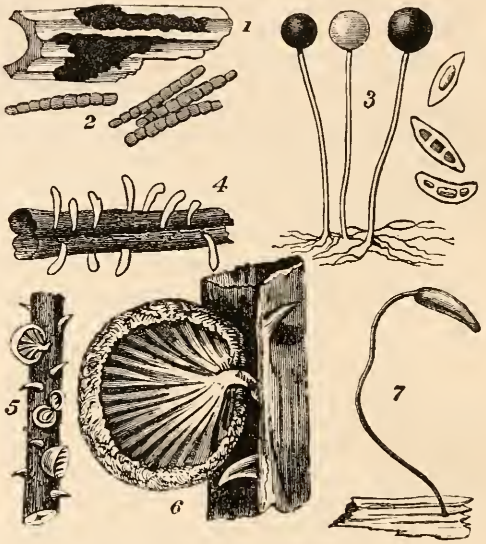

Fig. 5.—Illustrations of some of our smaller Fungi: 1, *Torula herbarum*, natural size; 2, spores, magnified; 3, *Mucor fusiger* and spores, both magnified; 4, *Pistillaria quisquilaris*, natural size; 5, *Agaricus (Pleurotus) septicus*, natural size; 6, *Agaricus (Pleurotus) septicus*, magnified; 7, *Typhula filiformis*, magnified.

which all the foregoing are examples, and those in which the spores are contained in a sac or ascus; the sage-green mould common on jam, bread, &c., illustrates the latter section. Another species is not uncommon on the gills of decaying mushrooms during autumn; the stem is very delicate, consisting o a single long undivided cell; the head globose, at first white, then black and containing an indefinite number of fusiform or spindle-shaped spores, which are large for the size of the plant: this is *Mucor fusiger*; the former, in which the spores are globose, *M. mucedo.* In Agaricus the species are generally large and often brilliantly coloured; nevertheless the subgenus Pleurotus includes some minute and very beautiful forms, recognised by the stem being lateral or absent, and the resupinate habit, that is, the plants are fixed by the cap to the matrix, and consequently the gills are uppermost. *Agaricus* (*Pleurotus*) *septicus* is common during the autumn on dead twigs and dung, white, three to four lines across, pileus or cap downy, margin incurved, gills rather distant with a yellowish tinge, stem thin, downy, sometimes absent. *A. applicatus*, similar in size and habit, is known by its ashy-grey colour and entire absence of stem. A white sub-gelatinous, more or less club-shaped fungus, three to four lines high, and sometimes slightly branched and compressed, is not unfrequent on dead fern-stems; this is *Pistillaria quisquilaris*. Typhula, an allied genus, is distinguished by the slender thread-like stem, which is distinct from the club-shaped head, bearing the hymenium or surface from which the spores originate. The species are all minute, and grow from dead stems or leaves; most have a tubercle at the base of the stem. *T. filiformis* is half an inch in length; stem very slender, decumbent, brown, without a tubercle, club-shaped, white. *T. erythropus*, somewhat similar in habit and appearance, is known by the tubercle at the base of the dark, nearly straight stem.

(*To be continued.*)

A VISIT TO VESUVIUS DURING AN ERUPTION.

By Dr. Johnston Lavis, F.G.S., &c.

AMONGST the many natural phenomena none perhaps are of more interest to the geologist than those of active volcanoes. These, although numerous, taken as a whole, are widely distributed, and many are situated in somewhat obscure and uncivilized parts of the world.

Of all the known active volcanoes, Etna and Vesuvius are the most celebrated by historic records of their various eruptions, especially the latter, which has destroyed whole towns, rendered desolate vast acres of cultivated land, and by which thousands have lost their lives. One would imagine that such examples as the destruction of Herculaneum and Pompeii, and in later years of Torre del Greco, would warn people from building in such close proximity. On the very lava stream that swept away Torre is now built the new town, and many feet above Herculaneum stands Resina, with its busy streets, shops, churches, under the dark, scowling brow of the huge fiery cone. Over lava streams not fifty years old are pretty villas, and fertile gardens. Who knows but that in a few hours all may be swept away by vast rivers of liquid fire?

On November 3, 1879, the mountain began to show slight signs of disquietude, which in the course of a day or two developed into a minor eruption; a condition most suitable for study. From Naples were seen to issue clouds of smoke and vapour, and at night could be seen the streak of reddish light which denoted the crater full and the lava running over the edge and pouring down the northern side. This condition continued until the evening of the thirteenth, when it was observable that masses of pumice and lava were being blown some hundred feet into the air, and looking at a distance like the falling sparks of an exploded rocket. We determined therefore to make our visit on the following day.

We started from Naples with a bright, sunny but cold morning, driving along the margin of that magnificent bay, and over the bridge of the Maddalena. Here stands the statue of St. Januarius, holding out his hand in a forbidding manner towards the mountain, over which he is accredited with some special power. Then on through Portici to Resina, built upon the mud produced by the ashes swept down by the rain derived from the condensed vapour of the great eruption, eighteen centuries ago last August. At Resina we added to our party the celebrated guide known as Andrea Maccaroni, who knows as much of Vesuvian minerals as he does of his own relations. We now, by the aid of three horses, commenced the first part of the ascent, that is up to the observatory. The road winds over the lava streams of 1767, 1839, 1858, 1860. In the course of two hours we arrived at our first stopping-place, having alighted at various roadside sections to break open some old rejected blocks. The observatory is well presided over by Professor Palmieri, who, although not present in person, was able to offer us his hospitality by means of a Morse telegraphic instrument in connection with the Professor's laboratory in the University of Naples.

The observatory is a solidly constructed building of three stories in height; it contains instruments especially for the study of Vesuvius. It is built upon a ridge probably part of the edge of the ancient Monte di Somma, the ancestor of the modern mountain. Within the building is a small local museum, laboratory, private apartments, and the rooms for the various meteorological instruments, the most interesting among the latter being the seismographs for the graphical registration of both the vertical and horizontal movements of the subjacent land. They are so arranged that they ring an alarm bell and stop a clock at the exact moment of the very faintest earthquake. There are also the aerial electrometer, pluviometer and pluviograph, anemograph, barometers, and the various other necessary instruments, together with some for experiments on hot lava. The microphone has also been employed by Professor Palmieri, but I believe, with little advantage, using it to detect subterranean sounds.

Having made this interesting examination of the observatory and its contents, and also fortified the inner man, we commenced our second but by far the most difficult part of the journey, on foot.

Imagine a cone some 1000 feet high, composed chiefly of loose ashes, with sides of an inclination between 36° and 50°. The guide generally conducts visitors over this loose and unstable foothold, so that as fast as one proceeds one returns half the distance. This fact we soon saw; we therefore forsook the regular track for an old lava stream, which, although very rough and uneven, afforded a better foothold than the loose ejecta we had left. In the course of an hour and a half our path lay through vast clouds of steam issuing beneath our feet, produced by the subterranean heat evaporating the moisture that had fallen in the night. Mounting at last the edge of the crater, there was presented to our eyes a scene, so fierce, so wild, that a mind could hardly conceive the existence of such without seeing it in reality.

Here was an amphitheatre-like cavity filled by recent lava, which had overflowed the northern edge and swept down the side of Vesuvius, towards the Atrio del Cavallo. In the centre of the fiery lake rose a cone of about 30 feet in height, built up of fragments of pumice and lava, that on an average of half a minute, were blown (white hot) a hundred feet or so into the air, accompanied by vast columns of acid vapours and gases, and loud rattling explosions, such as are produced by a line of musketry. This was followed by the rattle of the falling pieces on the side of this cone, thereby adding to its size. This cone bears somewhat the same relation to the crater of Vesuvius as the latter mountain does to the pre-historic crater of Monte di Somma. Around it in process of construction and activity were scattered three or four fumeroles, which resemble gigantic sugar-loaves, being covered by incrustations of common salt, sulphide of potash and other sublimates, and from whose summits issued in a rhythmical manner aqueous vapour, and, apparently by the smell, hydrochloric acid.

We carefully descended the sides of the crater on to the cooled crust of lava. This in many places was cracked and fissured, and looking down one of these cracks we could see the red-hot liquid trachytic sea, upon which we were really floating, producing a feeling of the advantages of life assurance companies. Now with caution we direct our path to one of the fumeroles, on which could be obtained some beautiful sublimates. Here, really floating on a lake of liquid fire, standing in vast clouds of almost suffocating vapour, not ten yards from the gigantic chimney of an active volcano belching forth showers of hot stones which it was necessary to evade, hearing loud rolling-like thunder beneath our feet, we recalled to our minds the imaginary visit of Dante to Hades under the guidance of Virgil. The scene fascinated our imagination, and produced a profound feeling of awe of man's feebleness compared with the gigantic efforts of nature, and of his greatness in comparison with his ancestors, who, unable to comprehend the scientific explanation and laws under which such effects were and are produced, were obliged to create deities of but slight superhuman power to account for phenomena which we now understand.

The lava as it flows appears to all intents and purposes like liquid asphalte, in the condition it is poured from the caldrons in process of paving our streets, except that it is incandescent. As it flows, it cools on the surface, leaving a crust of sponge-like rock, generally known as scoriæ, or it forms for itself an arched channel through which it flows as in a tube.

The guide shows some interesting experiments; first he forces his stick into the stream and pinches off a piece of the hot pasty mass. Into this he squeezes a coin and laps over the edges as if it were dough (*i.e.* not with his fingers); it is allowed to cool and then broken open to show the imbedded coin much oxidised. Tongs with their opposed surfaces engraved are made to pinch a piece of pasty rock and so form a medallion. This last flow from Vesuvius is of exceeding vitreous texture, and contains an enormous number of crystals of leucite, which crystallize out before the lava is solid, and thus give to its cooled surface the appearance of dough full of currants. This obsidian-like variety, I believe, is an uncommon product for this volcano.

We well filled our bags with specimens; in a quarter of an hour we had descended and were at the observatory; here we took to our horses and carriages, very tired, but well pleased to return to Naples, having enjoyed a delightful day. Of the minerals, and something about them, more anon.

CELESTIAL PHOTOMETRY.

By John J. Plummer, M.A., F.R.A.S.

THE measurement of the distance of the sun from the earth, perhaps the most troublesome problem of practical astronomy, is difficult, not from any inherent intricacy in itself, but merely from the fact that a very wide gap has to be passed, that the knowledge of the length of a comparatively short line is the only available datum from which we must infer that of a very long one. It is precisely similar in the matter of the brilliancy of the sun. There would be no difficulty in comparing its light with a terrestrial standard, but it so greatly transcends any artificial light that we may employ that our ingenuity is sorely tested in effecting a measurement or comparison. On the other hand, the light of the stars falls so much short of that of our usual standards of photometric measurement that a difficulty of like character has again to be encountered. The moon, alone of heavenly bodies, is easily comparable with artificial lights, and may therefore fairly engage our attention first.

There is no more convenient artificial light with which to compare the moon than the sperm candle, made to burn 120 grains of wax per hour, which has long been in use for photometric purposes. The light of the full moon has been found to be equal to that of a candle at a distance of rather more than 8 feet, or in other words it would require 70 full moons to afford as much light as the sperm candle does at the distance of one foot from the eye. The law by which the amount of lunar light increases or diminishes with her changing phase is a somewhat complicated one, nor can it be said to have yet met with an exact mathematical expression, though more than one close approximation has been made. That which best satisfies the case is attributable to the German mathematician Lambert, but it is based on an assumption that the moon, like the planet Jupiter, or the sun itself, is brighter at the centre of the disk than round the periphery. Owing either to the material constituents of the moon, or more probably to the configuration of the surface, this is not the case, and hence the want of exact correspondence between theory and fact. It will serve, however, to give us a pretty accurate idea of the amount of light derived from the moon at her principal phases. Thus, when horned, i.e., midway between the new moon and the quarters, the total illuminating power is barely one-twentieth of its brilliancy at full ; at the quarters, when one-half of the illuminated side of the moon is turned towards us it has increased to very nearly one-third ; and when gibbous, or half-way between the quarters and the full moon, fully three-quarters of its maximum light reaches the earth. It is during the two or three days after the first quarter and before the last quarter that the change in the moon's brilliancy is most rapid, and near the new and full that the variation is the least.

If the moon reflected all the light which she receives from the sun there would still be a great disparity between these luminaries, and it would require as many as 45,193 moons to equal the sun's light, but in fact she is much less generous to us and the disparity is very considerably greater. The earlier attempts at a comparison of their respective lustres made by Bouguer and Wollaston by no means confirm each other, and even the modern measurements of Zollner and Bond are less accordant than we could wish. If we assume that Bond's results are most to be trusted, the sun is no less than 470,980 times brighter than the moon, from which it will be at once inferred that the latter returns to us less than a tithe of what she receives, absorbing fully nine-tenths for her own benefit. Bond has shown, however, that in reflecting the actinic rays she is proportionally more generous, returning to us nearly a seventh. It is this selective power of reflection which causes the difference of colour in the light of the two bodies, the excess of violet and ultra-violet rays which she reflects converting the yellow tinged solar light into that of the silvery moon. Moreover it seems possible that while sending us an excess of the more refrangible rays, the less refrangible or heat rays are in defect, for it is well known that we derive no heat from the moon whatever or the most infinitesimal quantity. It has been suggested that the upper regions of our own atmosphere would absorb all the heat reflected to us by the moon, still the analogy would point to this not being the only cause of its entire absence at the earth's surface.

The brilliancy of the sun follows from the foregoing remarks to be equivalent to 6683 sperm candles at the distance of one foot from the eye, a number more than 1000 greater than what is usually given upon the authority of Wollaston ; but there is some difficulty in reconciling this philosopher's results with one another, and it is a clear indication of the slight extent to which this obscure page of science has been read that his authority should still be so frequently quoted.

We will now turn to the lesser lights of the firmament and learn how much less bright these are than the moon, which will thus serve as a connecting link between them and the great light-giver of the solar system. Until recent years it had been found impossible to compare these minute points of light either with one another or with any standard source of light, artificial or natural, and consequently rough estimates were made, throwing the stars into classes or magnitudes according to their relative brightness as judged by the unaided eye. As time went on these rough estimates began to define themselves more and more sharply and to be subdivided, until the system was perfected and stereotyped as it were, so that what required to be done was merely to compare instrumentally the photometric intensity of these arbitrarily assumed magnitudes. It is now found (by the aid of Zollner's photometer, which taking advantage of the properties of polarized light, has rendered the comparison possible) that a star in one of these classes possesses almost exactly two and a half times the amount of light of a star in the class next below it, and consequently a star of the sixth magnitude, which is the faintest that can be seen by the naked eye, is equivalent to $\frac{1}{100}$ part of the light of an average first magnitude star, or $\frac{1}{3892}$ part of the light of Venus at her greatest brilliancy, or $\frac{1}{3358000}$ part of the light of the full moon. There is further reason to believe that the whole of the stars visible upon a fine night, collectively afford as much as $\frac{1}{100}$ part of the light of the full moon, an amount which, I believe, they have seldom had the credit of supplying to the service of man.

MISTLETOE.—Before your list of the various habitats of the mistletoe is closed, I would record an instance of its growing on the horse-chestnut, which for several years past I have observed in Herefordshire. It is on a young tree in the garden of a labourer's cottage situate at Southfield, about two miles below Bosbury, on the east side of the river Leadon.—*Vincent S. Lean.*

OUR COMMON BRITISH FOSSILS, AND WHERE TO FIND THEM.

By J. E. Taylor, F.G.S., &c.

No. X.

A FOURTH division of those well-known stony objects called corals, is that termed Perforata. These are the familiar twig-like branched corals, whose surface breaks out here and there into flower-like calyces, and whose tips usually terminate in the same sort of objects. The entire structure is distinguished by its light and porous

Fig. 6.—Recent Arborescent Coral *(Oculina axillaris).*

character, whence the name of the group. In spite of their apparent fragility, we find them living amid the most violent of seas, for their rapidity of growth enables them to withstand the destructive effects which would otherwise break them up. The division Aporosa did not make its appearance in the primeval seas, but is first observed in those of the secondary period, although its species are most abundant in the present epoch. The Perforata, however, are represented among primary fossils by both Silurian and Devonian genera, such as Protarea and Pleurodictyum. Perhaps the Perforata are better known by their common name of Madrepores.

The intervening spaces in the branched or arborescent corals, between where one flower-like calyx is seen and another, is called the Cœnenchyma. They are the equivalents of the "inter-nodal spaces" or the distances which separate leaves from one another in the branches of a tree. It is the rapid porous growth of this part which enables such compound corals to stand against a good deal of marine wear-and-tear. It is this part, also, which binds the various corallites together into one colony. In deep-sea corals this Cœnenchyma rarely, and perhaps

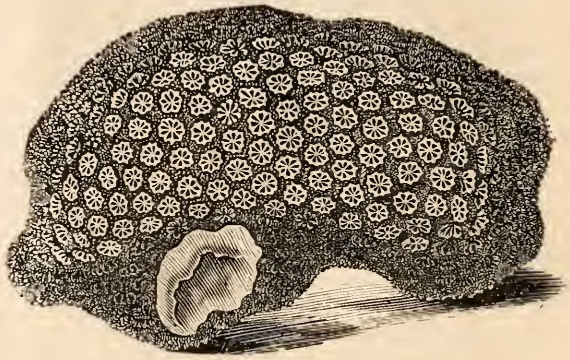

Fig. 7.—*Astræa rotulosa,* a recent West Indian Coral.

Fig. 8.—*Astræa favosa,* a recent East Indian Coral.

Fig. 9.—*Astræa ananas,* a fossil Coral, common in the upper Silurian and Devonian Limestones.

never exists, as a means of rendering them compound, but a different method of "compounding" takes place. Oculina (fig. 6) is said by Professor Owen to be the only large coral now found in the north, although our British rocks, especially the Carboniferous limestone, are in places almost entirely composed of corals, both reef-building, deep-sea, and shore-loving species.

There is often a difficulty in at once saying which of the fossil corals were "reef-builders," and which were not. For it does not follow that because the fossil corals are of a compound character they were therefore engaged in the work of reef-building. Perhaps the safest plan is to trace the existing genera of

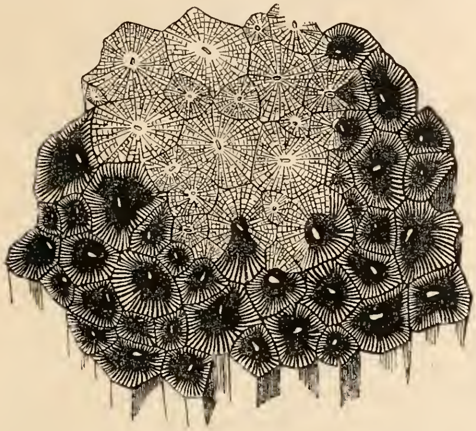

Fig. 10.—*Lithostrotion basaltiforme*, an abundant compound rugose Coral in the Carboniferous limestone.—The *lighter* parts show the transverse structure, as seen when the coral is cut for sections.

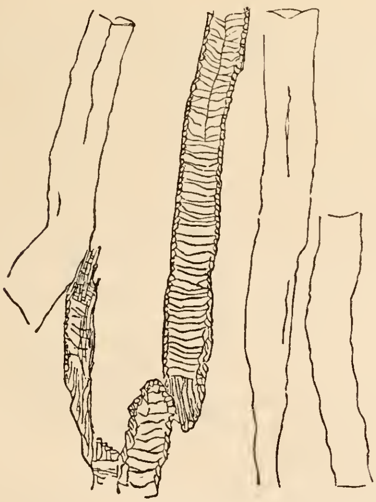

Fig. 11.—Vertical section of *Lithostrotion Phillipsii*, showing structure.

reef-builders, as far back in geological time as we can, or at any rate to compare the fossil kinds with their nearest living representatives. Few genera are more distinctively "reef-builders" than the Astræa, whose characteristic star-like arrangement of polypes or corallites (the latter often so close together that they press each other into oval or polygonal shapes), has given to this genus its distinctive name. The wide-spread geographical distribution of the genus Astræa, and the fact that it is engaged in areas separated by such enormous distances in reef-building, would be an incidental proof to a geologist of its geological antiquity, even if this genus were not found in our upper Silurian and Devonian limestones. Thus *Astræa rotulosa* (fig. 7) is a living species of this interesting

Fig. 12.—Clisiophyllum, a single coral, characteristic of the Carboniferous limestone formation.

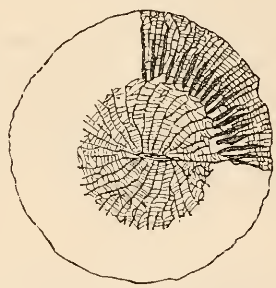

Fig. 13.—Transverse section of Clisiophyllum, showing (in part) details of structure.

genus of corals found abundantly in West Indian seas, where it is both met with in coral-reefs, and masking and adhering to natural rocks. *Astræa favosa* (fig. 8), on the other hand, is peculiar to the East Indian seas, where it is hardly less abundant. And *Astræa ananas* (fig. 9) is a common fossil in the Silurian limestone at the Wren's Nest, Dudley, in the formation of which we can hardly doubt that it and its compeers took a considerable part. For Professor Owen tells us that the Wenlock Edge, in Shropshire, composed of the same formation of rock, is nothing more or less than an ancient coral-reef thirty miles in length! The Plymouth limestone belongs to the Devonian period, and in it we find this and other genera of reef-building corals, and many of our best palæontologists are of the opinion that this limestone is nothing more than a Devonian coral-reef skirting the older regions of Cambrian and Silurian rocks.

(*To be continued.*)

ADDITIONS TO OUR LIST OF ASSISTING NATURALISTS.

[*Continued from page* 270, *vol. xv.* 1879. *Additional names received up to the 9th u'timo.*]

CHESHIRE.

Birkenhead. A. E. Lomax, 41 Church Road, Tranmere. *Phanerogamic Botany.*

CORNWALL.

Penzance. Ernest D. Marquand, Hea, Madron. *Botany* (Phanerogams, Mosses, Hepaticæ, Lichens, Diatoms), *Entomology*, Land and Freshwater *Mollusca.*

ESSEX.

Colchester. J. C. Shenstone, 13 High Street. Local *Flowering Plants.*

GLOUCESTERSHIRE.

Bristol. W. Barrett Roué, 165 White Ladies Road. *Ornithology* and *Oology.*

KENT.

Hadlow. Fred. W. E. Shrivell. Flowering Plants.
New Brompton. Dr. Henry J. Morton, The Lindens, Pres. Rochester Nat. Soc. British Flora, especially Phanerogams, Microscopy, General Natural Hist.
Rochester. J. Hepworth, Vice Pres. Rochester Nat. Soc. 2 Union Street. Botany, including Cryptogams, Mycology, Geology.

LANCASHIRE.

Manchester. R. E. Holding, 130 Sowerby Street, Moss Side. Skulls, general *Osteology*, British and Foreign *Ornithology* and *Mammals.*

NOTTINGHAMSHIRE.

Nottingham. E. Wilson, F.G.S., 18 Low Pavement. *Geology:* especially Carboniferous, Permian, Trias, Rhætic and Lias. The Yorkshire Coalfield; and information as to deep borings and sinkings for coal, water, &c.

RUTLAND.

Uppingham. W. H. Jones. *British Flowering Plants.*

IRELAND.

Co. Down, Holywood. P. Quin Keegan, LL.D. *Seaside Fauna.*

HINTS FOR A MARINE AQUARIUM.

By CHARLES H. DYMOND.

WHAT can be more exhilarating: what more instructive than a ramble by the sea? The heavy dull roar of the waves, the whirling flights and discordant cries of the sea-birds, with their white wings glistening in the sunshine, the towering cliffs and jagged tempest-beaten shore. This is the field to contemplate and study the wonders of the mighty deep, and to gain knowledge concerning some of those beings which inhabit it.

As we walk along at low water, and see numerous pools left by the tide, teeming not only with life but with luxuriant vegetation which affords good shelter for the small fish which dart away at our approach, the thought comes over us, that we should like to have something of the sort at home, where we could study the habits of Goby, Blenny, and Prawn at leisure.

This, of course, is attended with some difficulty, especially if we live far inland, but is quite practical if care and trouble be exercised. It must not be expected that a few fish, or whatever you may find, put into a jar of salt water, will live on without any further attention being paid them, for the oxygen contained in the water would soon become exhausted, and the water become unfit to support animal life. It is my intention, therefore, in this short paper, to give a few practical hints to those who would like to get up a small marine aquarium.

The most economical vessel is a bell-shape glass with a knob at the top, and may be purchased at any glass warehouse for a few shillings; this can be fitted into a wooden stand, and you will at once have it ready to receive anything you may deem proper to put into it.

A layer of sand and small stones which may vary in depth from one to three inches, should be placed in the bottom; sand from a sea beach being most suitable. On this a few shells may be placed with advantage.

The next step is the introduction of various sorts of Algæ, for on their growth depends the success of the undertaking.

Chlorosperms, or green-seeded Algæ, are to my mind the most useful, for they pour out oxygen in very large quantities when in a healthy state, and are acted on by light; not only do they give out oxygen, but consume the carbonic acid gas which is perhaps the greatest enemy to the aquarium.

Sea-weeds, however, must be obtained growing on a stone or shell, for if once removed, they will never attach themselves again.

The best sorts are *Bryopsis plumosa*, *Cladophora arcta*, the common sea-grass (*Enteromorpha compressa*), and the green laver (*Ulva latissima*), and may all be found fringing the beautiful pools at low water.

Regarding the inhabitants of the aquarium, great care must be taken only to choose those which will agree well together, or it will become the scene of many battles, and the home of many slain.

The great question then arises, What are the animals most hardy and suitable, and how many are we to introduce into a small aquarium? I will suppose that the various Algæ have been placed together with the sea-water in the vessel which is now ready to receive the animals we have collected.

The common periwinkle will be found a very pleasing inhabitant, and being exclusively a vegetable eater tends in a great measure to keep the sides clear from that green scurf which constantly accumulates and soon conceals the contents of the vessel from distinct observation. I should not recommend, however, the use of more than five or six.

One or two limpets (*Patella vulgata*) will also be of interest, and are useful when a quantity of the common laver (*Ulva latissima*) is growing on the shell. Perhaps the most beautiful objects in the aquarium are sea-anemones, and these may be easily found, greatly differing in size and colour, on the rocks at low water. Great care, however, is necessary to detach them, for if the base be injured, death often ensues.

The most common is the smooth anemone (*Actinia mesembryanthemum*). There are many others; but two or three will be enough, and they should be chosen of moderate size. Anemones may be fed every two or three weeks with small pieces of raw beef.

Two or three fish, either the smooth blenny (*Blennius pholis*), or the one-spotted goby (*Gobius unipunctatus*), give a lively appearance to the water. A few prawns are interesting, and are also useful scavengers.

If a constant supply of salt water cannot be obtained, a little fresh water must be added from time to time, to make up that which is lost by evaporation. These few hints are only intended for those who keep, or mean to keep, small establishments. Those who intend going in for large aquaria should study "The Aquarium," by J. E. Taylor, F.L.S.

A few rules in conclusion: Keep the vessel in a light, airy situation: do not overstock it: be careful to remove any dead animals at once: and try to imitate nature as closely as possible.

THE "ROSE OF JERICHO"—*ANASTATICA HIEROCHUNTICA.*

AMONG the seventeen hundred species comprised in the important natural order Cruciferæ, one of the most remarkable is the "Rose of Jericho," of which the lengthy and by no means euphonious botanical name is given above. This plant does not present any marked deviation from the prevailing morphological characters of the order, and, therefore, is in this respect less interesting than the tetracotyledonous Schizopetalon, *Pringlea antiscorbutica* (the Kerguelen Island cabbage), and others; but it is the peculiar hygrometric properties of the stem and branches that have rendered it famous. The species under consideration is the only one of the genus, and forms, according to some authorities, the type of a distinct tribe, Anastaticeæ; it is a native of the dry sandy tracts of land that extend from Syria to Algeria, being especially abundant in the neighbourhood of Suez and Jericho. To the latter place it owes its specific title, for hierochuntica (or hierochuntina) is an adjectival form of the old name of that city; how the popular term Rose came to be applied to it is not very clear, for there is not the remotest resemblance to the queen of flowers, unless the dried-up ball may be considered suggestive of its outline.

The plant has recently been correctly and graphically described by the veteran botanist, Mr. J. Smith, ex-curator of the Royal Gardens, Kew, in his excellent little work entitled "A History of Bible Plants." * After detailing certain passages of the Scriptures which are supposed to refer to the Rose of Jericho, he proceeds as follows:—"It is an annual, having a tap-root from which numerous branches are produced, forming a circular disc about a foot in diameter, at first lying nearly flat on the ground. It has small leaves, and small white flowers at their axis. When the seeds are perfected, the stems become dry, hardened, and incurved, their points meeting and forming a skeleton hollow ball, which in time (by the power of the wind) loses hold of the ground, and, being blown about, rolls and turns like a wheel."

This description conveys a very good idea of the plant, and we need only add that the fruit is a small roundish silicula with two woody valves, each of which terminates at its apex in an acute point. In a botanical work of considerable note, these siliculæ have been strangely confounded with the flowers. During the dry season these plant-balls are scattered far and wide by the winds, and on the return of the rains the branches spread out, the diminutive siliculæ burst and release the seeds which speedily germinate in the damp, warm soil. This alternative inclosing and expanding of the branches continues for many years, thus forming a most admirable and astonishing means of effectively dispersing the seeds. Concerning the strange manner in which these plants are scattered,

* Published by Mr. David Bogue.

the traveller, Dr. Thompson, has written as follows: "When ripe and dry in autumn, the branches become rigid and light as a feather, the parent stem breaks off at the ground, and the wind carries these vegetable globes whithersoever it pleaseth. At the proper season thousands of them come scudding over the plain, rolling, leaping, and bounding, to the dismay both of the horse and his rider. Once in the plain north of Hamath my horse became quite unmanageable among them."

Nearly forty years ago an individual whose scientific knowledge was extremely limited, caused considerable amusement by writing a pamphlet containing a most extraordinary and absurd account of this plant. He became, it appears, possessed of a dried specimen to which innumerable imaginary and miraculous qualities were assigned, and it was stated to have been exhibited before the chief botanists of the day, all of whom declared it to be a veritable vegetable monstrosity that was quite new to them. The absurdity of these statements was most amusingly exposed by one of the horticultural papers, doubtlessly much to the astonishment of the author, who found that his wonderful plant had been known for hundreds of years. Dry specimens are now frequently sold in London as curiosities, and I recently saw numbers of them on some stalls in the Crystal Palace, Sydenham, where they are described by the vendors (who appear to emulate the writer already mentioned) as possessing several purely imaginary qualities, one being that they produce enormous brilliantly-coloured flowers after being immersed in water for twenty-four hours. I have examined many of these with the object of obtaining some seeds, but they must be very old, for the little capsules are entirely empty. A few months ago, however, I was fortunate enough to procure some seeds from which living plants were raised that, as far as I have been able to ascertain, are the only ones in the country. A friend returning from India, *viâ* Suez, purchased several specimens at the latter place, and after his arrival in England presented them to me. These botanical treasures were at once placed in water, and great was my pleasure to observe the tiny siliculæ open and reveal the yellowish minute seeds. After being in water a few days the seeds commenced to germinate, and the branches were soon covered with small bright green cotyledons. The diminutive plants were carefully separated from the parent stem and placed in pans of sandy soil in a glass-house where a temperature of 60° Fahrenheit was maintained. Here they grew rapidly and to afford them mere space for development were ultimately placed singly in small pots. In June, the small white flowers were produced and a succession of flowers has continued until the present time (October), but although apparently vigorous and healthy, I fear they will not mature any seeds.

LEWIS CASTLE.

MICROSCOPY.

LIVE-BOX AND COMPRESSORIUM.—I have made an apparatus for use with the microscope—a kind of live-box and compressorium combined—which I find to answer its purpose extremely well, and as it is very simple and can be easily made, perhaps it might be useful to some of your readers. I enclose a plan and sectional elevation of the same drawn to two-thirds scale, and the following is a general description:

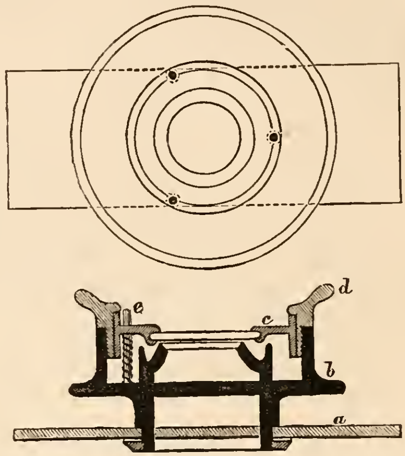

Fig. 14.—Plan and section elevations of combined live-box and compressorium.

A is a piece of brass plate 3 × 1 with a hole in the centre to receive the piece *b*, which revolves in it and is kept in its place by a thin nut and washer, as shown. *b* is of one piece, and carries on the top a circle of glass, around which a groove is turned to receive the superfluous water, and in its base are screwed three pieces of steel wire. *c* carries another circle of glass; it has three holes drilled to fit the pieces of wire, sliding freely upon them, and preventing it from turning. The glass surfaces are kept asunder by three coil springs placed on the wires underneath the piece *c*, and are brought into contact with each other by screwing the piece *d* into *b*, which is screwed with a fine thread to fit it. By this means, the liveliest object can be compressed without damage by holding the milled edge of *b*, while *d* is gently screwed down till the object is secured between the two glass circles. The whole can then be revolved during examination. The drawings are two-thirds full size.—*Thos. Richardson.*

MICROSCOPICAL SOCIETY OF LIVERPOOL.—The ninth ordinary meeting of the eleventh session of this society was held at the Royal Institution, on Friday evening the 5th ult.; Rev. W. H. Dallinger, President, in the chair. The paper of the evening was read by Frank T. Paul, Esq. F.R.C.S., entitled "The

Structure and Development of the Teeth." The paper formed a concise résumé of the present state of our knowledge of the structure and development of the teeth. It was freely illustrated by microscopic specimens and diagrams; many of them refer to the earliest condition of the teeth. Mr. Paul called attention to the value of studying the embryonic condition of the tissue, and showed the developmental relations between hair, feathers, horns, hoofs and teeth. He then traced up the growth of the necessary and permanent teeth from the first appearance of the enamel germ of the sixth week to the mature state, a discussion of the structure of which occupied the concluding portion of the paper. The President accorded the thanks of the Society to Mr. Paul for his most instructive and well-illustrated paper. A discussion followed in which the President, Rev. W. Banister, G. F. Chantrell, Esq., Dr. Nevins, and others took part. The meeting concluded with the usual conversazione and microscopical exhibition.

POLARISCOPES.—It has struck me that some of our economical microscopists, who have wished for a polariscope, but have been unable to obtain one on account of the expense, may have invented a makeshift one for that purpose, and as I am wishing very much for one, I should be glad to know if anybody has ever made such an one, and if so, how he made it, worked it, and kept it?—*Economy.*

THE QUEKETT MICROSCOPICAL CLUB.—We have received No. 41 of the "Journal" of this popular and ever-green society. It contains the following papers:—"On a Method of Resolving Diatom Tests," by Adolf Schulze; "On the Anatomy of *Actinia mesembryanthemum*," by F. A. Bedwell; "On the Reproductive System of some of the Acarina," by A. D. Michael; "On Staining Sections of Animal Tissues," by J. W. Groves; "On some Improvements in Microscopical Turn-tables," by C. Spencer Rolfe, and lastly (but not leastly, for the discourse, if short, is most pithy and suggestive), we have the address of the President of the Club, Professor Huxley.

ZOOLOGY.

DAPHNIA VETULA.—Whilst examining one of these water-fleas, I noticed a small one inclosed in the body of the larger, which was of course living (the larger one). The smaller one had no apparent motion of life to me. I transferred it to filtered water to clean the intestine as recommended by Davies, and examined it before putting it to soak in dilute alcohol and glycerine, but did not see the small one. Do water-fleas bring forth their young alive, as in the plates I have seen of them I can only see what appear to be eggs, in the body where I saw the young one?—*J. M.*

PHOSPHORESCENCE OF EARTH-WORMS.—Is it generally known that the earth-worm (*Lumbricus terrestris*) is sometimes highly phosphorescent? Professor Paley does not mention this in his able and exhaustive article. I disturbed one the other night; it became very luminous and left a trail of light behind it as it passed along the ground.—*F. W. E. Shrivell.*

MISTAKEN INSTINCT.—In the April part of SCIENCE-GOSSIP there is a short note on mistaken instinct. The following may perhaps prove interesting to some readers. In July last, one fine afternoon, as we were watching my bees carrying in pollen, one of them separating from the others alighted on some pretty blue artificial flowers in the bonnet of a lady who was looking at them; tried each flower carefully for honey, and, of course, finding none, flew away, no doubt much disgusted. The bee must have been attracted by form and colour; the flowers were not at all natural, but gaudy red anthers and blue stamens.—*Fred. W. E. Shrivell.*

MISTAKES MADE BY INSTINCT.—In the July number of SCIENCE-GOSSIP, I communicated the case of an egg of *Anthocharis Cardamines* being laid on the caducous sepal, instead of the pedicel, of the flower of the food plant by the insect in captivity. I subsequently met with several instances of the same thing occurring under natural conditions. Errors in instinct through the laying, or mis-laying, of their eggs by insects at wrong times or in wrong places were well known to the older entomologists, as the following interesting passage from Degeer abundantly proves. I quote from the German translation of Götze (Abhandlungen zur Geschichte, &c., vol. ii. part 2, page 241, plate 35, figs. 12 and 13). He has been describing a saw-fly which spins a double cocoon. Inside one of these double cocoons, with its head sticking out of its own coarctate pupa-case, he found a dead dipterous parasite of the saw-fly; and he ascribes its death to a mistake of the parent fly in laying her egg on the false caterpillar of the saw-fly when the latter was too advanced in its growth. "Its fate," he says, "was a consequence of the mother's oversight, which seems to have laid her egg too late on the false caterpillar, so that the larva proceeding from it could not attain to its full size before the saw-fly caterpillar must prepare for its transformation, and consequently, unwittingly let itself be shut up in an everlasting prison. It had indeed gone on to devour the caterpillar. It had changed to a nymph within the red cocoon; but when it became a fly it could not make its way through the double cocoon of the saw-fly, and must consequently perish. Thus the mother fly had erred in laying her egg, a thing that is not usual among insects, which on every occasion, and especially in the propagation of their species, display always so much diligence and foresight." To this, however, the translator adds in a note: "Nevertheless, examples and instances occur in more than one species, that insects, whether in respect of time or place, are frequently wont to err in oviposition. I could wish that people would collect and compare more examples of the like kind. Perhaps we might thereby discover many a secret in the economy of insects that still remains hidden from us."—*J. A. Osborne, M.D., Milford, Letterkenny.*

THE GREAT BUSTARD IN JERSEY.—It may interest some of your readers to know that two fine specimens of the Great Bustard were shot in this island (Jersey) on the 8th of December.—*J. Sinel.*

BULWER'S PETREL (*Thalassidroma Bulwerii*).—A specimen of this very rare bird was recently discovered about two miles from Ipswich, where it was intended to do duty as a "crow" in the used-up attempt to "scarecrow" other birds. The specimen has been secured for the Ipswich Museum.—*J. E. Taylor.*

THE "PAINTED LADY" IN HAWAII.—The Rev. T. Blackburn mentioned, in the "Entomologists' Monthly Magazine" for December, the occurrence of the "Painted Lady" (*Vanessa Cardui*) in considerable abundance in various parts of the Hawaiian Archipelago last summer.

BOTANY.

WATSON'S PROVINCE NO. IV.—This botanical province comprises Suffolk, Norfolk, Cambridgeshire, Bedfordshire, Huntingdonshire, and Northamptonshire. As little is known about the distribution of mosses in this province, and as information is wanted for topographical purposes, I shall be very pleased to name any mosses sent to me from this province, the mosses to be fair specimens, labelled with full particulars as to habitat, date, and altitude in all possible cases. Any doubtful specimens will be submitted to the highest authorities.—*Wm. West*, 15 *Horton Lane, Bradford.*

"JOURNAL OF BOTANY."—We understand that Mr. James Britten, F.L.S., succeeds Dr. Trimen in the editorship of this important and well-known journal.

ALBINO FOLIAGE.—Professor Church has recently read another paper before the Chemical Society of London, in which he has shown that white foliage does not possess the power, even in sunshine, of decomposing carbonic acid in the air. Experiments were made with leaves of maple, holly, ivy, and alocasia.

KALMIA LATIFOLIA (see query p. 282, col. 2), is certainly a poisonous plant. In Rees's Cyclopædia (1819) it is stated that "The value of the first sort, (latifolia) is much lessened by its noxious properties." Don's "Dictionary of Dichlamydeous Plants," 1834, has, "This genus is considered poisonous and is often fatal to cattle." Lindley, in his "Vegetable Kingdom," (1853) p. 454, quotes from Burnett: "The flowers exude a sweet honey-like juice, which is said when swallowed to bring on intoxication of a phrenitic kind, which is not only formidable in its symptoms but very lengthened in its duration." In vol. ii. of Supplement to the Penny Cyclopædia (1851) is information to the same effect. On p. 517 of Mrs. Hooker's translation of Le Maout and Decaisne's "General System of Botany" (1873) I read, "The genera Rhododendron, Sedum, Kalmia and Azalea are narcotic; the honey extracted from their flower is extremely poisonous." In Miss Edgeworth's "To-morrow" (Tales and Novels, 1832, vol. v. p. 341), a story for those who are fond of "sweet procrastination," the hero says, "I observed in the crop of one of the pheasants some bright green leaves and some buds, which I suspected to be the leaves and buds of the *Kalmia latifolia*, a poisonous shrub," &c. &c.

Tapton Elms, Sheffield. BERNARD HOBSON.

GEOLOGY.

THE FISH REMAINS FOUND IN THE CANNEL COAL IN THE MIDDLE COAL-MEASURES OF THE WEST RIDING OF YORKSHIRE.—Mr. James W. Davis, F.G.S., has recently read a paper on this subject before the Geological Society. The remains described by the author were from a bed of cannel coal about 400 feet above the base of the middle coal-measures, and were chiefly obtained from this bed at the Tingley Colliery. At Tingley the fish remains were stated to occur in greatest abundance between the cannel coal and the "hubb;" but they are also found in both those portions of the deposit. Of known species Mr. Davis has identified :—*Cœlacanthus lepturus*, *Ctenodus elegans*, *Megalichthys Hibberti*, *Rhizodopsis* (sp.), *Palæoniscus* (sp.), *Gyracanthus formosus*, *Ctenacanthus horridus*, *Diplodus gibbosus*, *Ctenoptychius pectinatus*, *Helodus simplex*, teeth of Cladodus and Petalodus, scales of Rhizodus, ribs and bones of Ctenodus, *Pleuracanthus lævissimus*, and six other species, and the following which are described as new forms :—(1) *Compsacanthus triangularis*, (2) *C. major*, and (3) *Ostracacanthus dilatatus*, the type of a new genus resembling Byssacanthus (Agass.). The teeth of Cœlacanthus were said to be small and sharply pointed; they have not been found attached to the jaw, but in certain specimens of the latter the alveolar spaces are well shown, extending in a single row along the rami. The air-bladder of this genus is also said to be preserved, and to present some resemblance to the bony air-bladders of Siluroid fish inhabiting the fresh waters of Northern India; and in general the author dwelt at considerable length upon the possible relationships existing between the fishes whose remains he described and the Teleostean Siluroids and Ostracean.

The Probable Temperature of the Primordial Ocean of our Globe.—At a recent meeting of the Geological Society a paper on this subject was read by Robert Mallet, F.R.S., in which he stated that according to the latest hypotheses as to the quantity of water on the globe, its pressure, if evenly distributed, would be equal to a barometric pressure of 204·74 atmospheres. Accordingly water, when first it began to condense on the surface of the globe would condense at a much higher temperature than the present boiling-point, under ordinary circumstances. The first drops of water formed on the cooling surface of the globe may not impossibly have been at the temperature of molten iron. As the water was precipitated, condensation of the remaining vapour took place at a lower temperature. The primordial atmosphere would be more oblate and less penetrable by solar heat than the present, and the difference of temperature between polar and equatorial regions would be greater; so that, in the later geological times, ice may have formed in the one, while the other was too hot for animal or vegetable life. Thus, formerly the ocean would be a more powerful disintegrant and solvent of rocks, mineral changes would be more rapid, and meteoric agencies would produce greater effects in a given time.

Diatoms in London Clay.—Mr. W. H. Shrubsole has announced his opinion that he has found several distinct species of Antidiscus in the London clay formation.

The "Patches" in Granite.—Mr. J. A. Phillips has read a very important paper before the Geological Society on this subject, in which he states that patches resembling fragments of other rocks frequently occur in granite, sometimes angular, sometimes rounded, sometimes with clearly defined boundaries, sometimes melting away into the surrounding mass, generally finer in grain than the latter. After a sketch of the literature of the subject, the author described the results of chemical and microscopic investigations of these patches in the granites of Cornwall, Shap Fell, Aberdeen, Peterhead, Fort William and North-eastern Ireland. There are two classes of inclusions: (1) the result of the abnormal aggregation of the minerals constituting the granite itself, containing generally more plagioclastic felspar, mica, or hornblende than it, with some other distinctions: most probably concretions formed contemporaneously with the solidification of the mass; (2) fragments of included schistose or slaty rock, often not very highly altered, caught up from the rock-masses through which the granite has forced its way.

The Geology of Natal, &c.—A communication on this subject has just been made by the Rev. H. Griffiths to the Geological Society of London, in which the writer states that shales and sandstones are the prevalent rocks from the coast for about twenty-four miles inland. Here is a protrusion of granite; beyond the sandstones come ferruginous shales, with scattered boulders of trap on the surface. The northern third of Natal is white sandstone, formed into hills and ridges by denudation, with a long trap-capped plateau near Helpmakaar. Coal-seams occur in the sandstones. There are frequent vertical pipes in these sandstones which, the author thinks, mark the site of trunks of trees, round which the sand-beds had accumulated. Rorke's House and Isandhlwana are near the above plateau. Near the former is an extinct mud volcano. A remarkable "vitreous shale" is found near the Buffalo; isolated pinnacles of it occur at the spot where the few survivors of the fight crossed that river. A range of mountains, with mural escarpments, remnants of an ancient plateau, rising to a height of some 2000 feet above another plateau which is 5000 to 6000 feet above the sea, extends for about 500 miles from the north of Natal to near Cradock in the Cape Colony; they are sandstone horizontally stratified, capped by trap. Some other geological features are described. The Transvaal consists of undulating hills of soft limestone, a sandstone range, and a country rich in metals,—iron-ore, cobalt, nickel, copper and gold occur, as well as plumbago.

A New Geological Section.—We strongly recommend all our readers, geological science teachers, &c., to procure Mr. J. B. Jordan's newly issued "Geological Section," showing the superposition and approximate maximum thickness of sediment and strata in the British Islands." (London: E. Stanford & Co.) It is the best of the kind yet issued.

The Geology of Leighton Buzzard.—We have received a copy of some published lectures on the above subject by Edward W. Lewis, F.R.G.S., published by A. C. Muddiman (Leighton Buzzard). In these lectures, which were delivered, we believe, to working men, the lecturer has endeavoured, and with much success, to convey the general truths with as many local illustrations of them as come to his hand. We congratulate Mr. Lewis on his success, and heartily wish he had a representative in every geologically representative district in Great Britain.

Fossil Insects.—Few papers, among the many which reach us, have impressed us with evidence of harder or more zealous scientific work than those which Mr. H. Goss, F.L.S., has contributed to the Proceedings of the Geologists' Association. We have just received part ii., on "The Insect Fauna of the Secondary or Mesozoic Period." It is a most exhaustive work, calculated to save a lifetime to the man who follows Mr. Goss in this hard-worked field of research. To Mr. Goss belongs more credit than to any one we know who has devoted himself specially to fossil entomology.

Cement for Fossils.—I have some very fragile fossil remains of which I desire to make sections. Will some reader kindly inform me if there be any transparent cement with which I can saturate them, fluid when hot, but perfectly hard when cold. Neither gelatine nor plaster of Paris, &c., will do, since the fossils must be ground down with water, and the plaster is too opaque.—*R. F. L.*

Siphonias.—There is a group of sponges known as Siphonias. Will some one inform me if they are confined to the Greensand, or if any members of the group are found in the upper or lower chalk?—*K. F. L.*

NOTES AND QUERIES.

A Curious Calculation about Sparrows and Sparrowhawks. — In Science-Gossip for November, 1879, I see Mr. Dealy has been "interesting our readers with a curious calculation" about sparrows and sparrowhawks. I was much interested in his "curious calculation," as a curious example of how easily some people can prove that to be truth which they wish to be true. I will take for granted as true the groundwork of his calculation, and endeavour to lessen the contrast he has drawn between the sparrow and the sparrowhawk to the discredit of the former. Indeed, at the outset, I will presume the whole of his "curious calculations" to be as correct as a naturalist's figures ought to be. What then? Is Mr. Dealy one of those men who think that man and his wants are the only things in creation worth a moment's thought or consideration? One pair of sparrowhawks in 20 square miles; 3 sparrows per day to each bird, makes 2190 per year; 100 grains of wheat to each sparrow, makes 219,000 as the number of grains of wheat which the sparrow would consume, or rather which the sparrowhawks would save in one year in 20 square miles. And as there are 12,800 acres in 20 square miles, of which we may suppose one-fifth to be under cultivation (I do not know if this is exact, but it is sufficiently so for my present purpose), leaves 2563 acres of cultivated land. This divided into 219,000 gives the tremendous result of 85 grains of wheat to be saved per acre of cultivated land by cultivating the acquaintance of sparrowhawks! Does Mr. Dealy still begrudge the sparrow his food? But I find on looking at the preceding part of Mr. Dealy's essay, that our calculation is much too large. I have been presuming, or rather Mr. Dealy has for me, that *all* the food of the sparrowhawk consists of sparrows, whereas the four birds he himself opened, show that one-fourth only can be reckoned as such. What then is the amount of damage to be saved to the people of the British Isles by the destruction of 185½ tons of sparrows yearly? Just 16¼ loads. Value at retail price of 2*d*. per lb. = nearly £400; or about 1 pipe of tobacco for each of the smoking population in 15 years! "Farmers, agriculturists, cannot you see?" Now look at the other side of the question. Would 1 bird in 40 eaten by the sparrowhawk, as taken from the farm-yard or game-preserve be too much for his thieving propensities? And would 6*d*. each be too much at which to value the bird? If not, then over £8000 would be the price to be paid for a saving of nearly £400. At least one-half the food of the sparrowhawk seems to be insect-eating birds. So I shall be much within the mark if I say that one-half the food consumed by the birds which form the food of sparrowhawks is insects. And I think I shall be very much within the mark if I say that each bird consumes 4 times its own weight of food in one year (without reckoning the insects taken to feed their young, for which purpose sparrows, according to some naturalists, catch a great number). We have thus 13,304,250 birds, each consuming 8 oz. of food (reckoning 2 oz. to a bird with Mr. Dealy), of which 4 oz. will be insects, making 3,326,062 lbs. of insects. Now 6 times its own weight of food would be a very small amount for insects to destroy in one year. We thus get 19,956,372 lbs. of food destroyed yearly by insects which would be eaten by birds which form the food of sparrowhawks. 19,956,372 lbs. at 1*d*. per lb. (I have credited the sparrows with food at 2*d*. per lb.) gives over £83,000. This added to the £8000 worth of poultry and game, makes £91,000 at a low estimate, as the price which must be paid to prevent damage which at a high estimate cannot be more than £400; and which damage, if done, is I believe immensely compensated for by the number of insects destroyed. Surely Mr. Dealy is joking when he would have us protect the sparrowhawk on the score of economy! I think such a style of writing cannot be too highly condemned, for it leads the ignorant into error, while the more educated but unscientific portion of the people are apt to class with it correct and carefully prepared statistics.—*S. Woolley.*

Daucus Carota.—In December number, p. 278, right-hand column, line four, for the words "of the side of" read "similar to."

Work on Falconry.—What is the latest and the best work on Falconry? Can any of your readers tell me where to get the hood, jesses, and complete furniture of a falcon? If not, can they tell me the best manner to fasten the jesses on?—*P. M. K.*

Zoological Nomenclature.—Is there any work giving the origin and the meaning of the specific and generic nomenclature in zoology, but especially in ornithology? If not, I should think such a work would be extremely interesting.—*P. M. K.*

Frozen-over Fish-ponds.—The lines quoted by Mr. Lloyd in his article last month on the above subject are from the eighth canto of the first epistle of Pope's "Essay on Man."—*Wm. West*, 15 *Horton Lane, Bradford.*

Unripened Figs.—"Penny Cyclopædia" says, "The fig-tree is very apt to throw off its fruit before it ripens, and various methods have been suggested to prevent this. In the Levant to insure a crop, a process termed caprification is resorted to, which consists in placing among the cultivated figs branches of the wild figs, in which a kind of Cynips abounds. The insect issuing from the wild fruit enters the others, brushing about the pollen in the inside, and so fertilising the fruit. Or those that drop prematurely and are chiefly filled with male flowers are preserved and introduced among the green growing figs with a view to their pollen being carried by insects to the flowers where it is wanted. Nothing is done in England except ringing the shoots."—*Bernard Hobson, Sheffield.*

FLEAS IN RABBIT.—Some time ago I shot a three parts grown rabbit, the upper part of the head and ears of which were so thickly coated with fleas, that the fur on the former and skin on the latter were completely hidden. The fleas did not run up to these parts after the animal was dead (as might be conjectured), for I went up to it while still alive and kicking, and there were the fleas—all alive, but motionless—forming a shining beady covering on the head and ears. A more disgusting sight I have seldom witnessed. How is it to be accounted for?—*A. Malan.*

MORTALITY OF SHREWMICE.—Will some learned correspondent inform me why it is that shrewmice are so frequently found dead, but unmangled, in garden paths, carriage-drives, &c., especially after a heavy rain? From what cause do they die, and why is it that cats, owls, and other nocturnal depredators do not eat them when in such conspicuous situations?—*A Malan.*

FLIGHT OF WOODCOCKS.—Is it not a curious fact that woodcocks, when leaving the covers at dusk, wide-awake and hungry, as a rule fly slowly, in a more or less lazy, careless "owly" manner; whereas, at dawn, when returning from the meadows, gorged and sleepy, their flight is most hurried, straight, and rapid—the birds then flying low, just clearing the hedge-rows, and showing every sign of being cautious and eager to avoid danger? This I have often noticed.—*A. Malan.*

THE LARGEST TREE IN THE WORLD.—There is at present on exhibition in New York a section of an immense tree which has been brought from California. The *New York Herald* says:—"This wonderful specimen of nature's handiwork was discovered in 1874. It was growing in a grove near Tule river, Prulare county, California, about seventy-five miles from Visalia. Its top had been broken off, probably at some remote period, and when discovered it was still 240ft. high. The body of the tree where it was broken was 12ft. in diameter, and had two limbs, measuring respectively 9ft. and 10ft. in diameter. The trunk measured below 111ft. This ancient monarch of the forest is called 'Old Moses,' after a mountain near which it stood. It is supposed to be 4840 years old, and it is the largest tree that has ever been discovered. The section on exhibition is 75ft. in circumference and 25ft. across. It is capable of holding 150 people in its interior. The interior, as it is now fitted up, is arranged like a drawing-room. A carpet has been laid down; there are a piano, sofa, tables, and chairs, with scenes from California hung around, and people move about quite freely."

ABUNDANCE OF VANESSA CARDUI IN 1879.—We may hope one result of this will be some more light on what is now obscure in the life-history of the species. The summer emergence was, in Kent, certainly heralded by a spring appearance of hybernated specimens; the more remarkable, considering the severity of the winter.—*J. R. S. C.*

INSECT SWARMS.—The northern part of Wales has been visited this year, not only by an unusual swarm of *V. cardui* and *P. gamma*, but also of the pretty little swift *Hepialus hectus*. In the woods along the coast line from Rhyl to Bangor this swarming was something miraculous, more especially about the Conway valleys. I noticed Hectus in the Park Lake Wood (Llanrwst), not in thousands, but in millions. At rest on the rocks, on blades of grass, flying about two or three feet from the ground, "found drowned" in the ditches, a dozen males paying their attentions to one female, some flying swiftly, others hovering about one spot, in quest perhaps of lodging for the night. I sat upon a stone watching them for nearly an hour (at dusk), when suddenly *H. hectus* became to the vision *non est.* I was delighted with my visitors and there and then swore eternal friendship. Butterflies, especially *T. rubi*, members of the family Satyrus, *P. brassicæ* and *P. rapæ* were conspicuous by their absence. *A. cardamines*, *A. selene*, and the usual Blues condescended to appear and that is all, whilst *V. io* and *V. cardui* were common. Some species of sawflies and ichneumons appeared abundantly.—*Ess Dee Bee, Huddersfield.*

SUPPOSED PIT DWELLINGS ON HAYES COMMON.—Some readers of Mr. Clinch's admirable article on the geology of the above place may feel, like myself, desirous of having more particulars concerning the "pit-dwellings" mentioned. Are they at all like those antique remains found in many parts of Kent and Essex, called "Dane holes" by some, and which are usually connected with underground chambers? According to one authority, these are borings made by the Romans for the purpose of obtaining chalk, but it has been conjectured they were primitive dwellings. As the "hole" is usually a shaft with smooth sides offering uncertain foothold, we can scarcely suppose that if these were habitations the shaft or well was the ordinary entrance, though it served to admit light and air to chambers or passages below, to which we may suppose access by some other opening that has been closed up in course of time. It has been supposed that these "Dane holes" might be retreats in time of peril, even if they were not dwellings, the mouth being then covered with leaves and twigs.—*J. R. S. C.*

AGES OF STAGS.—Can any of the readers of SCIENCE-GOSSIP tell me what is the greatest age to which a stag attains?—*E. C. T.*

TOMTIT'S NEST.—A gardener whose grounds are near the Stamford Hill Railway Station, told me that one day as he was leaning against a lamp-post on the platform waiting for a train, he observed a tomtit flying near him, and on looking up he found that just under the lamp in the fork at the top of the post a pair of tomtits had built a nest. As he frequently observed them afterwards he believes that the little birds brought up their family in safety.—*H. Budge.*

NATURAL HISTORY SOCIETY.—Would any of your correspondents kindly assist in starting a club or society in the south of London to promulgate the study of Natural History, and to meet the wants of amateurs by naming specimens, &c.? We have not, I believe, any institution of this description in either Southwark or Lambeth, although the population is far above that of many country towns that have a society of this kind. Certainly there is a South London Entomological Society, but this scarcely meets the want which exists. It would not require many to start such a society, and its ultimate success would depend more on the energy and perseverance of its members than on their number.—*Stuart Taylor.*

PHOSPHORESCENCE OF SHORE-SAND.—Can any one give me the latest information with regard to the tiny originators of specks of light which flew from under the foot every now and then, whilst I was walking recently on the sands at Whitby, under a beclouded moon? One light, larger and more permanent, I had the opportunity of examining, and found it to be apparently an oblong chamber, divided into two equal parts by a black line—the whole probably less than one-eighth of an inch long. I have observed similar phosphorescence, perhaps lasting a little longer, at home, while turning over the soil in my garden with a trowel, under a faint moonlight.—*J. Geo. T. Lee.*

Can Birds' Eggs be prevented from becoming Mouldy?—I shall be much obliged if any of your correspondents will inform me how to prevent eggs from getting mouldy and mildewed. A great many eggs in my collection are more or less covered on the outside of the shell with a kind of mould. The cabinet in which they are is between a fireplace and an outside, but dry wall.—*E. P.*

Late migratory Birds.—Notwithstanding the inclement weather which we have experienced this year, some of our migratory birds seem rather loth to leave us. I heard the chiffchaff singing during the first week in October, and noticed a housemartin busily hawking for flies on November 1st.—*John Hawkins, jun., Reading.*

What was the Fagus of the Latins.—Cæsar asserts that the fagus was not found in Britain, and there can be little doubt that the tree was not the beech. What then was it?—Pliny calls the acorn of the fagus "dulcissima omnium," alluding to the trees, natives of Italy, therefore excluding the Spanish chestnut which came originally from Lydia. The peasants of Catalonia and Valencia live the greater part of the year on acorns of the evergreen oaks, viz. *Quercus Ilex* and *Quercus Ballota.* The acorns are most abundant and nutritive. This then is most probably Cæsar's Fagus. See art. in Nat. Hist. Mag. vol. iv. p. 3, and Lib. Entertaining Knowledge, vol. ii. p. 4.—*S. A. Brenan, LL.B.*

Mr. Lloyd's Cat.—"Died suddenly on June 28th, 1879, Mim, the dearly-beloved black Angora cat belonging to Mr. W. A. Lloyd, of the Crystal Palace Aquarium. She was in her twentieth year, and she spent the greater part of her long and blameless life in London, Paris, Hamburg, and Sydenham, reclining on her master's study table, watching him writing about Aquaria, and experimenting on water, and plants, and animals, until at length she became as well acquainted with such matters as he is. Only, she could not write about them, and so she went to sleep on the table instead. She was the only known pussy who ever had an account of her own in a Post-Office Saving Bank, where she accumulated the sum of five guineas, which she earned in prizes for her beauty and other good qualities at various cat shows, and this money she spent in a full-sized photograph of herself, taken by Norris, and framed and glazed."—"*Animal World.*"

A Suggestion to Ornithologists.—Can nothing be done to prevent the meaningless slaughter and spoliation of our rare birds? At this time of the year, when many migrants are passing through, or casually visiting our land, scarcely a week passes without the daily papers recording some rarity as having been "procured." Would it not be possible to form a "Protective Society" in the interest of our feathered tribes? Such a society, backed up by a few gentlemen of influence, would form a nucleus around which many true bird-lovers would gather, and might be the means of averting the extermination now threatening many of the scarcer species of English birds. When we consider the strength and influence of unity and co-operation, the least sanguine might reasonably expect good practical results from such an association. The ruling object of the society should be "To discountenance on any occasion the superfluous killing and robbing of our British birds." Of course this rule would have to be modified, as in the case of game, &c. What I contend for is the restraint of the mere collector and exchanger, not of the true ornithologist, who is always desirous of promoting the welfare of our native birds. It is useless to repeat here the many arguments in favour of this course. None can be better than those of L. W. G., p. 43, Science-Gossip for 1878. Besides, we all know that the man who can tell us most of birds and their habits is he who diligently studies them in their native haunts, and not the closet maunderer over skin and egg-shells. Since the praiseworthy articles written in 1877 by Mr. J. T. Reed (p. 191), and Mr. Van Dyck (p. 213), contributors to Science-Gossip seem to have ignored the claims of our feathered favourites. I see Mr. Reed advocated at that time some kind of an organisation for protective purposes. Why should not the Union of Ornithologists he then recommends be started at once? If any gentlemen who are interested in the subject would send their suggestions, they would put the undertaking in a fair way to succeed.—*Major Lawson, Bridlington.*

Larvæ on Caterpillars.—Could any of your readers give the name of a certain hard black parasite (?) which I found in small numbers on a caterpillar of the puss moth this summer? I removed them with a pair of scissors, and the caterpillar lived and made his cocoon. It is perhaps worth mentioning that it was on a hickory tree that I found the larva, with many others of the same species, and some pupæ of the white satin moth, &c.—*J. E. K.*

Cuckoos denuded of Feathers.—In the "Zoologist" of April, 1866, I find an article by Mr. Peake, of Chepstow, bearing the above title. He says that Bewick in the Introduction to his "British Birds," mentions the circumstance of a "cuckoo having been discovered denuded of feathers, kept alive during winter and escaping in the spring." This would be about 100 years ago, in Northumberland. Mr. Peake tells us of two or three cases, said to have occurred some fifty years since in Monmouthshire. Shortly after reading this, I discovered by accident that there is, in the Isle of Man, a tradition that the cuckoo passes the winter in hollow trunks of trees (especially of the "Tramnan," or elder-tree), and that it becomes torpid and loses all its feathers! I am told of one instance that occurred about thirty years ago, which I give as follows. "A cottager going in the early spring to his peat stack, discovered in its midst a cuckoo without feathers—lying, however, in a bed of its cast-off feathers—torpid, and scarcely breathing." The bird was recognised by its beak. What became of it I could not discover. My informant, an intelligent farmer, himself believed the story, which he and others had frequently heard from the cottager's own lips. I have not met with anybody who tells the story as having occurred to himself, but, as I said, we have the tradition (now dying out, perhaps) that the cuckoos do so pass the winter with us. It is certain that stray cuckoos are sometimes found in the Isle of Man in the winter, and in the instances of which I have heard, they have been found in a torpid state, but have revived with a little warmth. What I am anxious to discover is, the origin and the extent of this tradition, and the amount of truth contained in it. There were some interesting articles in your magazine upon the cuckoo a year or two ago, but I do not remember to have seen any notice of this particular story. By accident, I came across it in the "Zoologist;" previous to this I had never read or heard of it. Was Bewick the first to publish the story? Is it to be found in any collection of "Vulgar Errors," or "Popular Superstitions"? I write this in the hope that some of your readers may be induced to inquire, and if possible to discover the origin and extent of this tradition.—*P. M. C., Kermode.*

Climbing powers of the Common Toad.—One day, about the middle of September last, I was witness to an exhibition of the climbing powers of a toad, which interested me greatly at the time and seemed to merit record. Happening to be in an out-building adjoining the house, I perceived a fine toad slowly clambering up the wall, in a corner which offered but scanty foothold for a rat or mouse, much less for a toad, the wall being both plastered and whitewashed, and therefore tolerably smooth. This did not prevent the toad from making a determined effort to ascend, which it slowly but surely did. Flattening its body into the angle of the wall, it grasped with the hind feet any slight projections that came in the way, and having secured a firm hold, raised itself slowly and carefully to the utmost stretch of its body; then again securing firm hold with first one forefoot and then the other, it drew itself up as far as possible. It was amusing to watch the cautious deliberation the creature used in feeling for fresh hold, whenever another movement was intended—strongly reminding one of the actions of a man ascending a steep and precipitous cliff. At first I was rather puzzled to account for such an unusual action on the part of the toad, but seeing a hole near the top of the wall, about six feet from the floor, it struck me at once that this was the destination of the little reptile, and so it proved, for after watching the slow and laborious progress of the persevering creature for over an hour, I had at last the satisfaction of seeing it draw itself into the hole and disappear from view, doubtless to enjoy a comfortable and well-earned nap, in safety until genial spring again returns. The *ascent* to the hole was slow enough, certainly, but how about the *descent?* for there is the prospect of a not very pleasant tumble before the toad when it desires to quit its winter quarters. I should very much like to be upon the spot when the creature emerges, for I can scarcely credit that it can crawl *down* the wall without falling. I have a strong conviction that it is not the first time the toad has scaled the wall, and used the same hole for the purpose of hibernation, and if so, a degree of instinct is indicated, one would scarcely expect to find in a creature so lowly placed in the scale of creation, and so generally despised—that "as stupid as a toad" is proverbial. From childhood I have taken great interest in toads, and paid considerable attention to their habits, and as I was early encouraged to bring them carefully home whenever met with during my walks, and place them in the garden, where they do good service in destroying many noxious insects, I have made the acquaintance of not a few, but never before met with one engaged in a feat of climbing, such as I have described.—*R. Standen, Goosnargh, Lancs.*

How to prepare a Satin surface for Painting.—I am painting some satin doyleys in water-colours, using a good deal of Chinese white as body colour. Is there any means of preparing the surface of the satin to take the paint more kindly, and is it possible to fix the painting when finished, with varnish or other medium, so as to prevent its getting rubbed or washed out?—*S. G. R.*

Noise made by Water-Snails.—I cannot find any notice of a peculiar chirping noise made by a water-snail in an aquarium in my possession. The noise is similar to that of a cricket, but there are no crickets in my house; and move the tank where I will, that singing at intervals during the gaslight continues; I should say the noise was produced outside the tank. But on applying the ear to the surface of the water it is more evident. For animal life, in the tank, I only have one large water-snail ? Helix, and numerous minute specimens of leeches, &c., and the developed spawn of the above singing individual. Will some one give me any experience he may have had in this direction? This is the only specimen that could (if possible) produce such a noise, and it can be heard distinctly, all being quiet, at least twelve feet away.—*C. J. P., Weymouth.*

The Urticating Properties of Hairs.—It is rather against the theory thrown out by Mr. Swinton, with regard to the irritating powers of the caterpillars of *L. auriflua*, that a box in which cocoons have been spun, and which has been left untouched for months, will, on being reopened, produce the urticating effect on a person whose skin is susceptible. There are those, of course, who can happily bid defiance to the hairs of the above, or any British species; but as I know for a fact, others are so sensitive as to suffer, in passing near a hedge where *L. chrysorrhœa* was numerous, merely from the floating hairs that were detached from the nests. As an urticator, I think the species just named is worse than its relative *L. auriflua.* The "tigers" are, most of them, hostile to our race in this respect, and various other larvæ of the Bombyces. Yet I have never found any special annoyance from those caterpillars of butterflies that are really armed with spines.—*J. R. C. S.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

To Anonymous Querists.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

W. Downes.—We have compared your correction, and find the note published strictly according to your own MS.

W. Gregson (Thirsk).—We cannot give the *price* of many of the "Transactions," &c., we acknowledge under the heading of "Books received," as no price is given. The best plan would be for you to write to the secretary of any of the societies, whose works are thus published, asking price, &c. You will find these secretaries most willing to give you all the information you desire.

A. S. W. (Maidenhead).—The fern will be *Dryopteris pedata*, a native of Brazil.

F. W. B.—It is a honeysuckle, we cannot detect any true malformation.

F. H. A. (Fishbourne).—The sedge you suppose to be *Carex divulsa*, has puzzled two or three of our best botanists, to whom we have submitted it; we do not pronounce with certainty until next month.

J. F. (Ottawa, Canada).—We have no work that can be recommended on the subject; however, we are happy to inform you of one shortly to be published by the Kew authorities.

ALPHA (Manchester).—It is one of the pondweeds (Potamogeton), we should not like to name it in its present state; a grass is also mingled with the specimen.

A. D. M. (North Malvern).—You have marked the list correctly; hope the parcel will please you.

J. P. T. (Portland, U. S. A.).—We are not aware of any *special* monograph; Sprengel gives a full list. In the first volume of SCIENCE-GOSSIP, a capital monograph is published of the British species; we should be glad at any time to help you.

F. H. A. (Fishbourne).—It is, we believe, the true *Atriplex Smithii* of Syme, although it is an intricate genus.

S. E. L. (Penrith).—The name of the wild flowers were as follows:—1. *Atriplex Babingtonii*; 2. *Carex flava*; 3. *Carex dioica*; 4. *Juncus squarrosus*; 5. *Lycopodium clavatum*; 6. *Juncus bufonius* (?); 7, *Carex arenaria*; 8. *Sclerochloa loliacea*. We wish all our correspondents would send us as good specimens as yours.

E. STRAKER.—"Les Mondes," published weekly, and "Feuille des Jeunes Naturalistes" (monthly), are French journals, with much of the same scope as SCIENCE-GOSSIP. The latter may be obtained from M. Dollfus, 55 Rue Pierre-Charron, Paris. The price is 4 francs a year, forwarded abroad.

J. R. Neve (Kingston).—The shell you refer to is one of the characteristic species of the red crag, and is called *Trophon* (or *Fusus*) *contrarius*. See Taylor's "Geological Stories," chapter on "The Crags." The "talc" is not that mineral, but Selenite washed out of the London clay.

GEORGE LINTON (Barrow).—The distinctive features between *Echinus sphæra* and *E. miliaris* are as follows: the former is, in the first place, much larger, more spherical (as its specific name imports), for it is nearly globose; whilst the latter has a very depressed shape of test, the rows of pores are not parallel, there are three pairs to each row, and the shiny, smooth spines are usually tipped with a plum-coloured tint at their ends.

QUÉTEUSE.—The object in the box is a millepede, called *Geophilus electricus*, not uncommon on damp hedge-banks, where it leaves a phosphorescent trail. You might purchase a platyscopic lens from Mr. Browning, optician, 63 Strand, London, about the price you name, which would answer all your requirements.

E. LOVETT and H. W.—Accept our best thanks for donation of slides.

EXCHANGES.

WANTED, *Galium ochroleucum*, *Valerianella mixta*, *Fumaria Vaillantii*, *Viola stagnina*, *Dianthus plumarius*, *Gentiana Germanica*, *Alisma natans*, *Drosera obovata*, for other rare and critical plants.—G. C. Druce, 118 High Street, Oxford.

A GOOD triple nose-piece, nearly new, in exchange for a good one inch objective.—J. S. Harrison, 32 South Street, Huddersfield.

A GOOD slide of *Gomphonema geminatum*, for any other good slide.—H. G., 2 Talfourd Place, Talfourd Road, Peckham.

DUPLICATES of about twenty species of marine shells from South Africa (mostly small). Wanted any land or freshwater shells.—A. H. Hinton, Walthamstow, Essex.

WANTED, to correspond with some one studying the fungi for the purpose of exchanging specimens, notes, and sketches.—G. Massee, Oak House, Oak Road, Falsgrave, Scarboro'.

GOOD specimens of *Euthora cristata*, *Callithamnion Americanum*, and many other American algæ, to exchange for British and other species of algæ. Would particularly like authentic specimens of different species of *Callithamnion ectocarpus*, and Cladophora.—Frank S. Collins, Malden, Massachusetts, United States of America.

FOR exchange or sale, an excellent lathe, with slide rest, adapted for hard wood or metal turning.—Address, T. C. Maggs, Yeovil.

BRITISH crustaceans in exchange for others.—G. Sherriff Tye, 62 Villa Road, Handsworth, Birmingham.

BRITISH plants, 500 or more duplicates, many rare and local, named, unmounted, offered in one or more lots, for British shells, birds' eggs, fossils, or minerals, or other offer.—William Jordan, Cockfield, Sudbury, Suffolk.

A FEW flint implements from East Yorkshire, in exchange for specimens from other localities, fossils or recent shells.—Rev. George Bailey, Seaham Harbour.

WANTED, Newman's "British Moths;" will give in exchange lepidoptera.—James Smith, 1 Belle Vue Terrace, Clifton Hill, Bristol.

EXOTIC butterflies and beetles; and well-mounted diatoms to exchange; desiderata, side-blown British birds' eggs, any sort, or any of the current numbers of Yarrel's "Birds" after No. 2.—R., 44 Blenheim Street, Newcastle-upon-Tyne.

WANTED, micro slides, B or C eye-pieces, or anything microscopic, for telephones, electrical machine, and electrical, galvanic, and chemical materials and reagents, and books.—Thomas G. Nicholson, Mere Street, Diss, Norfolk.

MERLIN, sparrowhawk, red grouse, oyster-catcher, curlew, lesser black-backed gull, and others, desiderata, British birds' eggs.—A. Stevenson, 5 Garthland Lane, Paisley.

LAST three volumes (commencing new series) of "Popular Science Review," well bound, half russia, offered for any six volumes (clean, unbound) of SCIENCE-GOSSIP.—Alfred Lockyer, Tavistock Road, Snaresbrook, Essex.

DESIDERATA—Good foreign land shells, varieties of British land shells, principally albida, or British land and fresh-water shells:—*Limnæus Burnetti*, ditto var. *lacustris*, *L. involuta*, *S. oblonga*, *Vertigo pusilla*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. angustior*; many of these species taken by self, and all can be well authenticated.—W. Sutton, Upper Claremond, Newcastle-upon-Tyne.

FOR six good specimens of *Cypræa Europæa* (John o' Groat's shells), send slide of sponge spicules, cocoliths or diatoms, to James Smith, 94 Dundas Street, Glasgow.—A large lot of *C. Europæa* on hand.

FOR marine soundings from West Indies, send micro slide. A few West Indian and Australian seaweeds, and zoophytes, also New Zealand mosses, for other seaweeds, zoophytes (British or foreign), or micro slides.—B. B. Scott, 24 Geldon Street, Kensington, Liverpool.

WANTED, Irish and Scotch plants, in exchange for 280, 331, 332, 368, 579, 666, 1036, 1261, and many other southern plants. Send lists to J. R. Neve, Market Place, Kingston-on-Thames.

L. C., offered, 97, 130c, 114, 141, 177, 330, 627, 696, 698, 821, 841b, 923, 1069, 1158, 1490, 1508, 1596, *Carex ornithopoda*, *Xanthium spinosum*, and others, in exchange for 11, 55, 68, 104, 173, 181, 195, 220, 258, 287, 295, 325, 326, 333, 381, 389, 622, 1276, 1278, &c.—Address, A. E. Lomax, 41 Church Road, Tranmere, Birkenhead.

FINE slides of platinocyanide of magnesium, for diatomaceous earth, rich guano, or portions of good gatherings.—H. W., 10 Evering Villas, Clapton, E.

SECTION of wood from ancient forest bed of the Thames Valley, mounted in balsam, to exchange for other slides. List to E. Lovett, Holly Mount, Croydon.

WANTED, cocoons of *Yama Mai*, *Attacus Atlas*, and others; also Colorado potato beetle, Brazilian diamond beetle, or tropical butterflies, in exchange for cocoons of *Attacus Cecropia*, *Cynthia Pernyi*.—J. Bates, 10 Orchard Terrace, Wellingborough.

"LONDON CATALOGUE" 7th edition, Nos. 12, 13, 13b, 14a, 14c, 14d, 15, 16, 17, 18c, 18d, 20, 23, 25, 1033, 1035, 1175, 1178, 1186, 1188a to 1188i, 1197, 1220, 1226, 1233, 1246, 1654, 1657, and many species of Chara, wanted in exchange for other British plants.—J. A. Wheldon, 26 Albion Street, Darlington.

WANTED, fleas from bat, squirrel, and mouse; liberal exchange in first-class mounted slides. Communicate before sending.—E. Wheeler, 48 Tollington Road, Holloway, N.

WANTED, good trilobites, or a set of mesozoic fossils, for Huxley's "Physiography," Ramsay's "Physical Geology and Geography of Great Britain," Dr. Page's "Chips and Chapters for Geologists," and ten of Macmillan's "Science Primers" (the whole are new); or send list of any fossils in exchange for books.—Stuart M. Birnie, Milton at Campsie, Glasgow.

BOOKS, ETC., RECEIVED.

"Erasmus Darwin." By E. Krause. Translated by W. S. Dallas. London: John Murray.

"The Great Frozen Sea." By Captain Markham, R.N. Fourth edition. London: C. Kegan Paul & Co.

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"American Naturalist." November.

"Journal of Forestry." November.

"Journal of Quekett Microscopical Club." November.

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—T. S.—T. B. W.—J. F.—G. C. D.—K. F. L.—T. R.—S. D. B.—P. M. K.—H. P.—H. G.—J. S. H.—A. H. H.—V. S. L.—J. M.—S. M. H.—J. D.—J. R. S. C.—D. S.—T. B. L.—Dr. H. J. J. L.—G. E. M.—E. C. T.—G. S. T.—H. B.—G. L.—W. J.—F. W. E. S.—J. C. M.—F. S. C.—S. T.—E. S.—W. K.—J. F. R.—J. R. N.—A. M.—J. E. K.—I. C. T.—G. B.—A. E. L.—R. W. C.—J. S.—W. B. R.—J. A. O.—B. H.—S. W.—M. L.—N. P.—G. B.—W. D.—B. B. S.—J. S.—P. Mc K.—G. C.—W. S.—A. S.—T. N.—G. H. B.—W. G. T. F. U.—A. L.—F. H. L.—W. W.—J. S.—E. W.—Col. H.—M. W. N.—J. B.—J. A. W.—S. M. B.—H. C. C.—W. K.—G. W. C.—&c.

SOME PROBABILITIES RESPECTING ORGANIC SPECIES.

By W. S. PALMER.

HOWEVER some people may decry Mr. Darwin's work, "The Origin of Species," as a theory, the performance cannot surely be denied the highest merit. It has been said that it is the greatest cyclopædia of science that has been produced since the times of Cuvier and Von Baer. It is certainly the greatest scientific work that we have had for many years. Principles that were only partially recognised, and facts that were scarcely known, are here clearly defined and definitely settled. Laws that were not understood to be laws have been shown to be such, and such is the law of variation. Variation has long been believed in as a mere freak of nature, often a monstrosity and nothing more. But Mr. Darwin, by the able and masterly way in which he has treated this subject, has shown that there is such a thing as a law of variation: that it is amongst the most important of nature's functions.

I suppose we are all familiar enough with what is commonly called the heart's-ease or pansy, which Linnæus has put under the genus Viola. This beautiful plant is propagated very largely by the dissemination of its pollen by the means of insects, especially the bee. It has been said that the more old maids there are in a village, the more plentiful will be this flower, the heart's-ease, and this extraordinary and seemingly absurd statement is well enough proved. For old maids are famous for their partiality to the feline species, and cats, I suppose everybody knows, are celebrated for their propensity for mice. Now the mice are well-known to make dreadful depredations in the bee-houses, and the bees, naturally enough, soon quit their uncomfortable lodgings. Hence the heart's-ease suffers greatly. But if the cats eat the mice, the bees are left alone and untormented, and gathering their honey from the flowers of the neart's-ease, flitting from flower to flower, the pollen is scattered and the safety of the species is secured. But this is by the way. Well, these busy little bees unconsciously are fulfilling a great office of nature. Whilst they sip the honey from each flower they are at the same time spreading the germs of future generations.

But not only this. The bee is not so particular in its choice, and a blue and yellow pansy will suit its purpose as well as one of purple colour only. Or a flower that is nearly entirely yellow is as useful for its purpose as any other. From flower to flower, then, on it goes, and stops at this purple heart's-ease, and with its body covered with the grains of pollen of a yellow flower, thus mixes that of the yellow with the purple variety. What will be the result? We cannot say; but when the seeds of the plant are sown and quickened, and spring into new plants, and bear flowers on their own account, then we find some beautiful variety, perhaps only in colour, perhaps something more, for the yellow heart's-ease, besides the colour, may have had some other peculiarity not common to both the purple flower and itself. Some irregularity we will say. This irregularity is increased in the next generation, or it is altered, or it is confirmed; it may be any of these, it may be the latter. We will say it is the latter. We have then a different colour from the mother plant, and we have an irregularity confirming; and, therefore, in this variety, no longer an irregularity, but a fixed peculiarity. But "specific differences take their rise from any circumstance wherein plants of the same genus are found to disagree." It is required of that circumstance that it be constant. We have supposed the original irregularity to be confirmed, and therefore surely a constant peculiarity. What have we here then? We have proceeding at first from a variety, changes so complete, irregularities though they be, that eventually become constant. This is all that is required to constitute a distinct species. Can we not then imagine the heart's-ease becoming gradually much smaller as regards the flower? Added to this, can we not imagine the colour of one variety settling down to a soft blue or purple? Nay, have we not this latter already very abundant? Can we not imagine the violet being what I may call a confirmed variety of the pansy, a heart's-ease?

There is a beautiful little yellow flower which everybody knows—I mean the cowslip. This belongs, according to Linnæus, to Primula. Everybody is aware of its beautiful orange colour. Suppose, in the propagation of this species of the genus Primula, something should cause the colour to vary; we will say from the darker yellow to a light pale colour. What then? you would say, you have frequently seen one cowslip of a paler yellow than another. But by this simple action, freak, if you will, of nature, we get a variety, the light or pale cowslip. This will be the colour of the primrose. But further, the cowslip has several flowers on one stalk. I suppose in one case it has eight flowers on one stalk; and in another, six. The mixture of these two varieties, what would it produce? It might be more than eight flowers to one stalk, it might be less than six. If it be less, this might be crossed with another containing but four flowers on one stalk. What would be the production? Thus this crossing system might continue until in some cases the number of flowers on a stalk should be reduced to one. What then? Still remembering the variety of colour which is now pale, we shall have a cowslip of a pale yellow colour, with but one flower to a stalk. But this is a primrose. May not a cowslip thus become a primrose?

I will not say that all species of plants have originally been produced from one common stock by this law of variation—I will not say that from a few species have sprung all the immense numbers of distinct species of plants that we know of, through this law—but I will say that the evidence tends to prove that this action of nature produces species. I will say it is a powerful agent of nature, causing some flowers to become so diverse in their character that we know not how to treat of them but as distinct species, and this to our knowledge. And I will further say that a future day will in all probability prove the mighty power of the action of a great law, which we have called the law of variation, and then shall be demonstrated, what at present may not be quite so obvious, that species, in their propagation, tend to produce other species like themselves, but through many causes varieties are often produced, whose differences from the original stock are ultimately confirmed in themselves, and hence arise new species.

THE PEBBLE-BED OF THE LOWER GREENSAND OF GODALMING.

NOW that the existence of a ridge of ancient rocks, so long believed by geologists to cross the south-east of England somewhere in the neighbourhood of London, has been fairly proved (thanks to Messrs. Meux & Co.'s boring in the Tottenham Court Road), it may not be altogether uninstructive to point out certain ancient submarine detrital beds, the wreck of older rocks which once covered the Devonian beds, the weathered surface of which was struck upon in the Tottenham Court Road, and which probably still flank the ancient crest to the north and south. These detrital beds, which abound in water-worn pebbles and fossils, both apparently derived from lower secondary rocks, occur around Godalming at the base of the Folkestone, or upper division of the lower greensand, and consequently between the Bargate stone beds and the upper sand beds of the middle division, sometimes alternating with the lower bands of Bargate. Passing over a few Brachiopoda, and two or three species of Pecten and Exogyra, which are in very much the same state as when first left by the sea: "The whole," says Mr. Meyer, "would appear to be extraneous (Oolitic and Liassic) fossils which had been drifted into the present position at the time of the deposition of the strata in which they now occur." * Unlike the proper fossils above mentioned, the extraneous ones are mostly of a rich brown colour, and frequently much water-worn, although examples may be often found in almost perfect condition. Among them we have the small pretty *Ammonites Lamberti* and *A. crenatus* of the Oxford clay, together with several other species, as likewise casts of small univalves and bivalves, which have not yet been identified, and also teeth and scales of saurians, and teeth of fishes; to these I shall refer again in the sequel. Speaking of these fossils Mr. Meyer says, "The fact of their occurring in any condition in the lower greensand of this district is of considerable interest. For if, as appears to be the case, they are really drifted fossils, it is clear that the rocks from whence they were derived cannot have been far distant from the places where these fossils are now found. And it must be remembered that teeth of the genus Saurichthys, of which two, if not three, specimens occur in the pebble-beds, are not known to occur elsewhere in England in beds younger than the Triassic bone bed of Aust cliff and Axmouth." There is one fact in connection with the pebble-beds which I think is worthy of note. I am willing to admit, however, that the pebble-bearing beds are apparently always evenly bedded; but their coarse nature renders it difficult to speak with absolute certainty. The finer sand beds alternating with them,

* For this and much of the following, I am indebted to a paper on the "Lower Greensand of Godalming," by C. J. A. Meyer, read before the Geological Association, Dec. 4, 1868.

however, are very frequently false bedded, that is, are of what has been termed "eolian origin," and indicate a shallow drifting sea. Now, as far as my experience goes, these beds almost invariably indicate a southerly set of the sea, and this, I believe, has been pointed out by Professor Rupert Jones. Now this southerly set being assumed, it is self-evident that all drifted material must come from the north, and this (curiously enough) is exactly the direction in which the ancient rocks are now known to lie. Thus we see how facts which appear so trivial in themselves fall in with others in a most unexpected manner. The pebble-beds may be examined in several of the hollow lanes around Godalming, but perhaps the most instructive are to be seen in the lane leading from Farncombe to Northbrook, and also in the new road cut some few years since along the southern face of Frith Hill. Starting from near the Godalming Cemetery, we first come upon the greyish sands of the Sandgate division, traversed in every direction by white calcareous veins of various widths.

A little higher up we have a good series of pebble-beds, in which many fossils occur; here the beds are soft, and not cemented into a hard concrete as in some sections. Still higher we come on the false bedded sands, alternating with bands of poor Bargate stone. Higher still a sparse seam of pebbles occur with a few teeth, and then alternate bands of Bargate and sand, the latter with broken terebratulæ in abundance. In one of the last-named beds some fossil wood was found in a very peculiar state of preservation; it is chocolate-brown in colour, but when rubbed between the finger and thumb goes to a fine unctuous powder. This wood is of course not extraneous, but I have no doubt of its really being a fossil, having lately received some from the Holloway Hill Pit actually embedded in a piece of Bargate stone. I mention it here the more willingly, seeing that the occurrence of wood in any strata seems to indicate the existence of a land surface in greater or less proximity, and it would be interesting to know whether the ancient crest of rocks did, or did not, support a terrestrial flora. Returning to the pebble-beds: in a few hours' collecting one may have the good fortune to find many of the following. Firstly there are the scales and teeth of Lepidotus. The former are usually somewhat lozenge-shaped, thick, and beautifully enamelled—a good example of ganoid scales. The edges of the opposite side have a parallel bevel. One scale, however, I possess, probably referable to this genus, is thin and oblong in figure, the lines of growth being distinctly visible. The teeth of Lepidotus, which frequently occur, are mostly hemispherical, and shine in the bank like small gems. Pycnodus and Gyrodus, and the conical Saurichthys are also ganoids. Among the placoids (which by the way are more angry-looking teeth) we have the thorn-like teeth of Lamna. Of Hybodus several forms occur, and likewise the spines or fin bone. Acrodus and Notidanus nearly complete the list, though there are still a few which have not been identified. In conclusion I should only mention that the pebble-bed may be examined at Redcliffe, in the Isle of Wight, where it consists of rounded and subangular pebbles of quartz, and associated with water-worn fragments of wood and bone, and various drifted fossils. It occurs near Dorking, below the "fuller's earth" at Nutfield, as also near Sevenoaks and Maidstone. To the west of Godalming we find its equivalent in the "sponge gravel" of Faringdon, Berkshire, in certain beds near Devizes, and probably further northwards, in the phosphate beds at Upware, near Cambridge, and in the lower beds of the greensand of Hunstanton in Norfolk, as stated by Mr. Meyer.

H. W. K.

NOTES ON PHYLLOTAXIS.

By H. Walter Syers, M.A. Cantab.

A very important part of structural botany is that which is concerned with the arrangement of the leaves with regard to the stem or axis which bears them. It must be tolerably clear to any observing person that in this matter of leaf arrangement things do not go by hap-hazard. On the contrary, the whole subject is governed by rigid and somewhat complicated mathematical principles, and it is the object of this paper to briefly point out the most important laws governing the arrangement of leaves on the axis. This branch of botanical science is termed *Phyllotaxis* (φύλλον, a leaf, τάξις, arrangement), and before going farther into the subject it will be necessary to state that the point of the stem from which the leaf proceeds is called a *node*, the leaf being developed as a cellular process connected with the vascular bundles of the axis. The space intervening between any two nodes is termed an *internode*. Now there are three principal modes of leaf arrangement:

1. That in which the leaves are placed at different levels alternately round the axis. This is *alternate* phyllotaxis.

2. That in which the leaves are placed in pairs, at the same level, and opposed to each other. This is *opposite* phyllotaxis.

3. That in which the leaves come off at the same point in the axis, three or more arising from the circumference of the same circle, and assuming a whorled or verticillate arrangement. This is *verticillate* phyllotaxis.

The alternate leaf arrangement is the one that requires most consideration, it being, as it were, the foundation of the whole system, and from which the others diverge more or less. It is likewise one of the most ordinary forms, being the normal arrangement in Monocotyledons, and being extremely common amongst Dicotyledons. The leaves in this case are disposed round the axis, more or less, in a spiral manner, the spiral being a continuous one. As example is better than precept, and as in botany practical experience from actual specimens is all important, it will be well to illustrate the subject by the study of the leaf plan of some shrub or tree. Let us take the oak (*Quercus Robur*) as an example. (Should this not be readily obtainable, cherry, poplar, or apple will be equally serviceable.) On careful examination it will be found that, starting from any leaf, to arrive at the leaf which is precisely over it, it will be necessary to pass through five leaves in immediate succession to the one chosen at the starting-point. Thus the sixth leaf is exactly over the first. This arrangement is found to be universal with all the leaves. No matter which leaf is selected as the starting-point, before arriving at the one vertically above it, it will be necessary to pass five leaves. And to effect this it will be found that two lines round the stem are made, in order to complete the *cycle*, as the interval between the leaf and the one immediately above it is termed. Of course it will be noticed that the leaf which terminates one angle also commences the next, and so on. This particular phyllotaxis of the oak, pear, &c., is called the pentastichous (πέντε, five, στίχος, row) arrangement. Now it has been found easy to represent this and other plans of alternate phyllotaxis in the form of fractions, the numerator representing the number of turns round the axis, and the denominator the number of leaves in the cycle. Hence, as in the oak there are two turns and five leaves, the fraction $\frac{2}{5}$ will represent mathematically the phyllotaxis of that tree. It may

Fig. 15.—Phyllotaxial arrangement of leaf-buds of Wayfaring Tree.

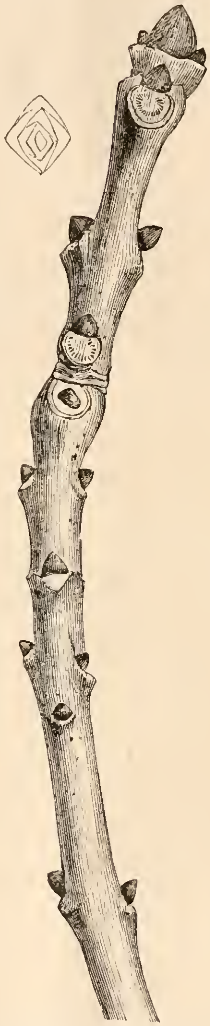


Fig. 16.—Phyllotaxial arrangement of leaf-buds of Horse-Chestnut.

Fig. 17.—Phyllotaxial arrangement of leaf-buds of Ash.

be said generally, that when we can count the number of rows (vertical) of leaves as placed on the axis, we have at once the denominator of the fraction ; for the number of rows is identical with the number of leaves in the cycle.

One of the simplest arrangements is the distichous (in two rows). This is found to be the normal plan in all grasses, in the elm (*Ulmus campestris*), linden (*Tilia*), &c. The third leaf is immediately over the first, and there is one turn round the stem. The leaves being arranged in two rows, one on each side of the axis, it is obvious that on one side there will be the 1st, 3rd, 5th, 7th, &c., and on the other, the 2nd, 4th, 6th, 8th, &c. The fraction suitable to this case will be $\frac{1}{2}$—one turn and two leaves in the cycle. Speaking mathematically, a circle contains 360°, and by taking the number of degrees, represented by the fraction, which indicates the phyllotaxis in question, the angular divergence of the leaves may be expressed in degrees. Thus in the pentastichous, or $\frac{2}{5}$ arrangement, each leaf is separated from its predecessor and successor by two-fifths of the circumference of a circle, i.e. two-fifths of 360°, or 144°. Thus in this case the angular divergence is 144 degrees. In the distichous plan the angular divergence is one-half a circle, or 180 degrees. The tetrastichous phyllotaxis has the fifth leaf immediately over the first, and examples of the tristichous arrangement are seen in the elder and in sedges. The following fractions represent common forms of phyllotaxis : $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{5}$, $\frac{3}{8}$, $\frac{5}{13}$, $\frac{8}{21}$, $\frac{13}{34}$.

Fig. 18.—Opposite phyllotaxis of *Lamium album*.

It may be noticed that the numerator of each fraction is the denominator of the next but one preceding, and that, after the first two of the series, each numerator is the sum of the two preceding numerators, and similarly with the denominators. It will now be necessary to say something concerning the subject of what we called "secondary spirals." It is obvious that difficulties are met with in determining the phyllotaxis of fir-cones, and in other cases where, by the shortening of the internodes and consequent approximation of the nodes, the leaves or scales are so closely situated that at first sight it seems hopeless to unravel the mode in which these leaves or scales are arranged. But this is accomplished by having recourse to the system of secondary spirals. If a cone be attentively examined it will be seen that, starting from any scale at the base, spirals wind round the cone to the right and left from the starting-point. Now it is obvious that the spirals running from right to left embrace between them all the scales of the cone. And the same applies to the spirals running from left to right. The least reflection will prove that this is the case. Hence, if we count the number of spirals running (say) from left to right, we know that in every one of these spirals the number of scales embraced in that spiral will be represented by the fraction having 1 for its numerator and the number of spirals for its denominator. For example, let the cone of the white pine (*Pinus Strobus*) be taken. In this cone we find eight secondary spirals passing from left to right and five from right to left. Thus we see that in each spiral running from left to right there is contained one-eighth of the total number of scales, and in each spiral running from right to left there is contained one-fifth of the total number of scales. Hence it becomes possible to number every scale of the cone; for starting from the lowest scale, which we call 1, the next scale on the spiral running from left to right will be numbered 9, the next 17, and so on, the common difference being eight.

In the same manner, the spiral originating in scale 1, but running from right to left, will have its second scale numbered 6, its third numbered 11, and so on, the common difference being five. Thus we have all the materials for determining the generating spiral as it is termed, or that spiral which passes through every scale before arriving at the one vertically above the one from which we started, and this is effected by numbering all the scales. It will, of course, be observed that it is only the generating spiral which passes through the numbers 0, 1, 2, 3, 4, 5, &c., consecutively, whereas the secondary spirals pass through the numbers already given. In the white pine, then, the 14th scale is immediately over the first, and there are five turns round the axis. Hence the arrangement is represented by the fraction $\frac{5}{13}$, which, by the way, is a "curviserial" arrangement, as will be explained shortly. It affords excellent practice to the student of phyllotaxis to unravel the arrangement of fir-cones, and, more than anything else, tends to give definite ideas on the subject of phyllotaxis. The $\frac{5}{13}$ plan is not uncommon. It is found in the house-leek and wormwood. Although usually uniform in the same species, still this is not always the case. For in some plants there may be one arrangement at the base and another at the summit. But in most cases this is observed only in the young state of the plant, and disappears with growth. Some species of the genus Sedum furnish examples. Should the generating spiral follow a similar course in both stem and branches, the arrangement is *homodromous*, but if this is not the case then it is called heterodromous (ὅμος, like, ἕτερος, different, δρόμος, course). Other series are $\frac{8}{21}$ (*Pinus sylvestris*, the Scotch fir,) other species of Pinus $\frac{13}{34}$, $\frac{21}{55}$, &c. The expression "curviserial arrangement" was used above. By this it is meant that no leaf is exactly over the leaf from which we start in situation, but it is placed a little to the right or left of that position. For if the fraction $\frac{5}{13}$ be calculated in degrees, it will be found that the result is not a whole number, but that some odd minutes are present. Thus we see that in this case the circle is not equally divided by the scales, and hence it is impossible for them to be situated in vertical rows. The fact of the leaves being thus arranged in an infinite curve suggested to Bravais the term *curviserial*, which is used in contradistinction to the *rectiserial* arrangement. In this the fractions give whole numbers, and the circle is divided into cases of equality; thus in this case the leaves or scales are actually arranged in perfectly vertical rows in the axis, and the vertical position of the leaves forming the commencement and termination of the cycle is maintained.

Before dismissing the subject of alternate phyllotaxis it is well to notice that in Dicotyledons the first leaves (cotyledon) have an opposite arrangement, and it is by the lengthening of the axis that this becomes alternate. In Monocotyledons, as already mentioned, alternate phyllotaxis is of necessity the rule.

Opposite phyllotaxis is not quite so commonly met with as alternate. In it two leaves are given off at a node on opposite sides of the axis, and very frequently the successive pairs of leaves are arranged at right angles to each other. When this occurs the arrangement is said to be *decussate*. In some cases, however, the leaves do not exactly cut one another at right angles, but deviate slightly from this decussation. In this case there is a more or less spiral arrangement, and a tendency to alternation. Opposite phyllotaxis is particularly characteristic of orders, for example the Labiatæ, and an instance may be cited in the common white dead-nettle (*Lamium album*). Again, in Caryophyllaceæ, or the chickweed order, opposite phyllotaxis is very frequent. In purging flax (*Linum catharticum*) the arrangement is seen not to be strictly decussate, so that the second pair of leaves does not exactly cut the first at right angles.

Examples of the whorled or verticillate phyllotaxis may be found in the order Rubiaceæ, which includes the common "bed-straw" (*Galium*). It is worthy of notice that in this case also the leaves frequently decussate with one another in successive whorls.

Each whorl may be made up of three or more leaves, a whorl with three leaves is described as ternate; with four, quaternate, and so on. In cases where the whorls do not decussate a series of spirals is formed, similar to the secondary spirals already mentioned. Labiatæ, as already observed, have opposite, decussate leaves, Begoniaceæ alternate, Cinchonaceæ opposite, and Tiliaceæ (linden) distichous. Such, then, are the three forms of leaf arrangement, and it will be seen what a conspicuous place phyllotaxis must take in morphological botany, both from the insight it gives us upon the strictly mathematical relation of the leaves to the axis, and from the aid it affords in all natural systems of classification.

THE STING OF A BEE.*

ALTHOUGH there are probably very few cabinets which do not contain a preparation of this portion of a bee's anatomy in a more or less compressed state, there is but little information concerning it in any of the best-known handbooks on the microscope. In some of the back numbers of SCIENCE-GOSSIP will be found some correspondence which it is worth while looking up; and in Gosse's "Evenings at the Microscope" there is also a short account of it. But the best paper upon the matter, perhaps, is that in Vol. I., No. 1, of the "American Quarterly Microscopical Journal," by Mr. J. D. Hyatt. Those who have read this will find that in the following remarks I do not quite follow his conclusions, nor do I agree that all "the drawings and diagrams [illustrating his paper] are each delineations of the objects presented and very correct as regards the relative proportion of connected parts," although some undoubtedly are. A print of this paper is in the Quekett Library.

The position the sting occupies is the last lower segment of the abdomen, the point of the lancet being just within the body; where will be found a slight notch at the posterior angle of the segment which affords a place through which the sting may pass. Immediately above it lies the rectum.

Upon cutting open the back of the bee and removing the alimentary canal the sting will at once be recognised by a pair of conspicuous white muscles, lying nearly parallel to each other and running in the direction of the length of the abdomen. When removed from its position it will present the appearance of fig. 19, but with certain muscles running in various directions, which have been omitted from the diagram for the sake of clearness.

The framework consists of six distinct parts: (1) a flat plate of chitine (*a* figs. 19 and 20), articulated to *b* by a hinge at the outer top angle, and to *c* by a sort of pivot at the inner anterior angle; (2) *b* consists of a triangular-shaped piece united at its apex with a thin rod which curves inwards for a certain distance and then becomes straight for the rest of the length of the sting, bearing barbs (not shown in the figure) at the end—it also bears upon it a curious part b^{i} of considerable importance, according to my theory, in the ejection of poison; (3) *c* another flat plate united at the anterior end with a curved rod, along the outer surface of which the curved portion of *b* runs; at the posterior end of *c* there is found a whitish membranous piece c^{iii} often spoken of as the palpus. A ridge should be noticed running along the upper surface of *c*; this is not always readily seen, as the inner edge of *a* frequently overlaid it.

These pieces appear on each side of the organ. *c* is united with the central portion of the sting c^{i} by a peculiar-shaped piece shown in fig. 21 and 22 c^{ii}—this central portion is hollow at the anterior end and then tapers away to almost a point, bearing barbs at the end on its upper surface. The next piece is a *v* or "merry-thought"-shaped piece *d* (figs. 19, 25), the posterior end being free, while the anterior ends are hinged to c^{i}. There is one portion, *e*, which it will be convenient here to mention—this is a membranous bag enveloping the hollow part of *c*, c^{i}, its internal surface is covered with hairs which appear trifurcated. The poison-bag is connected with the sting by a tube in the manner indicated in fig. 22; this tube appears to be strengthened by partial rings of chitine and also to be slightly creased or "concertina'd."

The manner in which b^{iii} and the curved part of *b* are connected with c^{iv} and c^{i} does not seem to be generally known, and probably would never be discovered from an examination of those specimens which are specially recommended for "displaying the lancet beautifully." One is constantly informed that "it is very difficult to show them;" this is undoubtedly so. A glance at fig. 23 will explain the matter. A is a section through a part of c^{iv} and b^{iii} (one part being removed) and B (copied from Mr. Hyatt's paper, my own specimen having been spoilt in mounting) is through c^{i}. It will be seen that the c^{iv} bears along its whole length a T-shaped ridge, something like a railway rail, which fits into a corresponding groove in b^{iii}, consequently if the parts b^{iii} are "displayed" it is only at the expense of wrenching them from their proper fixings. This arrangement allows b^{iii} to move both ways in the direction of its length and in no other.

Although b^{i}, fig. 20, appears to be placed on the side of b^{iii} it is really on the upper side of it leaning over, as it were. Fig. 24 is an enlarged view of this part. The semicircular piece or flap *a* is of very transparent membrane (which requires staining to be easily seen) strengthened by rods of chitine; it is also seen to be double with the two portions joined at the back by another piece of membrane; this is hinged to *b* which, as will be seen in the figure, connects it with the main piece *c*. This part, the

* Read before the South London Microscopical and Natural History Club, April 15, 1879.

"piston," moves up and down in the hollow portion of c^i. Now it will be seen by comparing A (fig. 23) with B, that the surface of the piece upon which the T-ridge is, and on which the part b^{iii} slides, is vertical in B, while in A it is much inclined, and in the series of sections given by Mr. Hyatt the transitions from one inclination to the other can be traced. It follows,

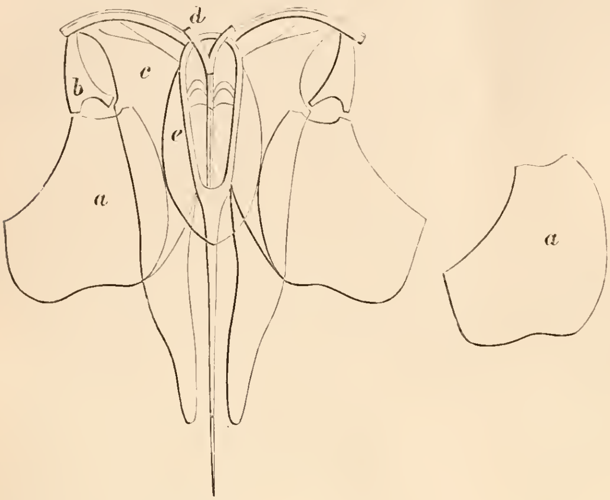


Fig. 19.

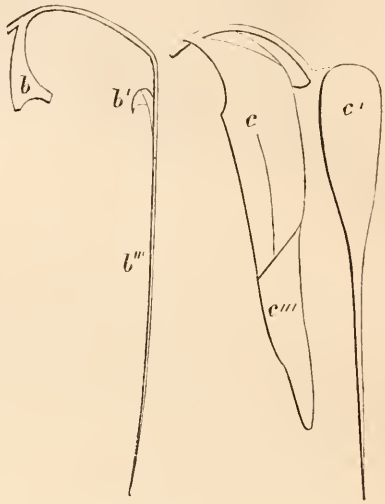


Fig. 20.

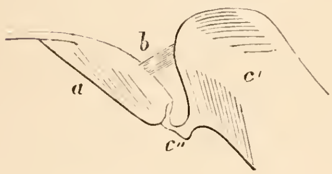
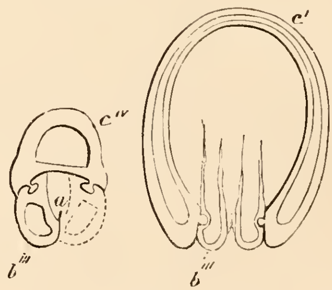


Fig. 21.

Fig. 22.



A Fig. 23. B

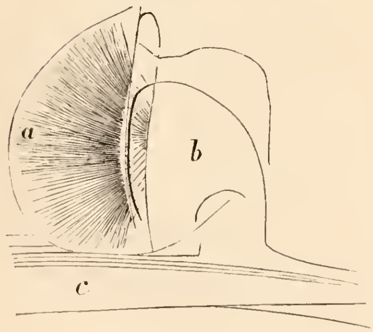


Fig. 24.

therefore, that b^i, the piston, in being moved along from the anterior end to the posterior, is thrown over to the inside, and the semicircular piece *a* (fig. 6) being hinged to *b*, any movement posteriorly through a fluid would press them apart. Turning then to fig. 22, it will be seen that the cavity c^i is smaller at the lower end than at the upper.

This is, perhaps, a convenient point for me to explain my theory of the manner in which the poison is ejected. In the first place the poison bag appears to me to be composed of two coats, in neither of which have I been able to see any trace of muscle. Mr. Hyatt, in his paper before referred to, says, "A sac or reservoir is connected with the base of the sheath and discharges into it [a poisonous fluid] by the rapid contractions of its muscular coats. . . . . Rapid automatic contractions of the muscular coats of the poison gland continue to pump out its venomous contents." He, in the second sentence, refers to his observations on a sting extracted from a living bee. But if, as I believe, the pieces b^i, fig. 20, are alternately moving in the length of the cavity c^i, it will follow that the semicircular pieces *a*, fig. 24, will open as they are pressed forward, and with the inclination to one side which is necessarily given to them as they move from one end to the other (as explained by fig. 23, A, B), they will fill the whole width of the posterior portion of c^i fig. 22. As the piston moves forward it will drive before it any fluid that may be in this "cylinder" c^i, and at the same time create a vacuum which will draw into it, through the tube, the poison contained in the bag; and here the use of the chitinous ridges in the tube leading from the bag becomes apparent, as it would otherwise collapse and stop the flow. I cannot see what purpose they would serve if the poison were forced out. On the return of the piston the semicircular pieces fold together, and so not only allow of the passage forward of the other, but also return

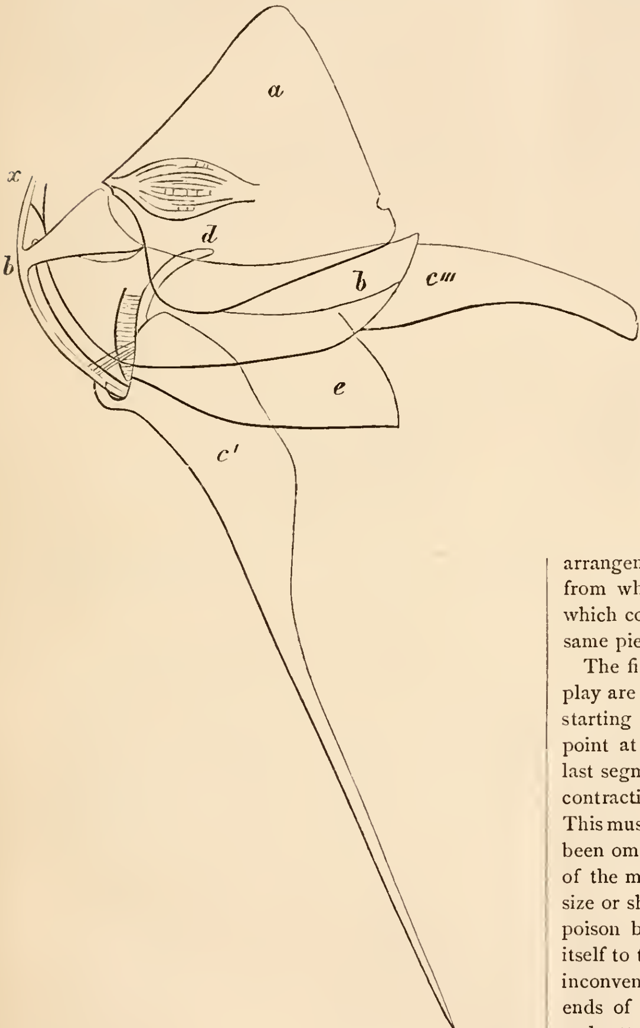


Fig. 25.

without materially impeding the flow of the liquid. The poison passes down the tube formed by the two pieces b^{iii}, see fig. 23, A. In this figure will be noticed a kind of spur marked *a*; this is the appearance presented (in section) of a thin ridge which passes along the entire length of these parts, and which when presssd together prevent the poison escaping. Mr. Hyatt not inaptly calls them valves; the continuation of them will be noticed along the curved portion running from b to b^i, fig. 19; in this place they prevent the escape of liquid behind the piston when it is passing forward.

The point of next importance is how are these movements produced? There are in the sting two pairs of somewhat obscure tendons, but which must not be overlooked. Their position is rather difficult to explain, but a reference to fig. 21 will show the

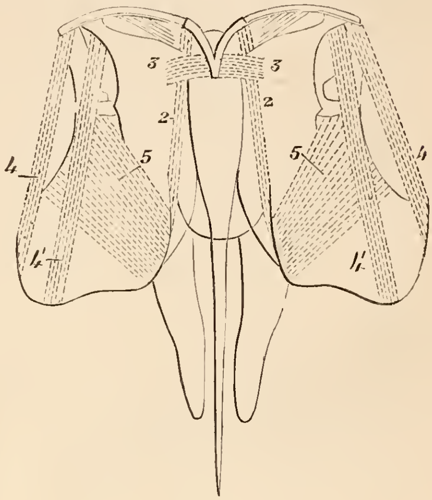


Fig. 26.

arrangement. The piece c^{ii} carries a sort of platform from which the tendon *a* runs to the curved portion which connects c with c^i, and c^i is connected with the same piece by the tendon b.

The first pair of muscles which probably come into play are a pair found on the under side of the sting, starting at the outer anterior angle of *a*, near the point at which it hinges with *b*, and running to the last segment of the bee's body in such a way that its contraction will draw forward the whole apparatus. This muscle is shown in fig. 25, where the others have been omitted to prevent confusion. The position only of the muscles is indicated in the diagrams, not their size or shape. The folds in the tube connecting the poison bag allow of its stretching to accommodate itself to the alteied position of the apparatus without inconvenience. The next pair run from the anterior ends of *d* in the direction of the length of the string, and attached to the ridge in the centre of *c*; see 2, fig. 26. The action of this pair is to depress the whole of c^i and c^{iv}, and to pull against the tendon *b*, fig. 21. Another pair of muscles run from the posterior portion of *d*, and are inserted into *c* at a position at right angles to the first pair (3); they act by bringing the two sides of the sting together, and are opposed by the tendons *a*, fig. 21. The next pair, or rather double pair, 4 and 4^i, connect *a* with *c* by two muscles slightly diverging from one another. These pull the plate *a* round its pivot at the anterior inner corner, which, acting on b, make it move on its hinge with a, so that the apex of b is carried inwards; this motion being of course communicated to the whole of this piece, the piston is moved along, while at the same time it drives its barbs farther into the poor victim. The plate a is restored to its former position (and consequently b also) by the action of a fifth pair of muscles running from the ridge in the centre of c to the outer and anterior edge of a. The movements can be followed by referring to fig. 25, which is a sting taken from a bee *in flagrante delicto*. In this it will be noticed that the point b has removed from its former position x, that d is raised from its position and depresses c^{i}, whilst it has also raised the pieces a and b; and that e is here everted. I am somewhat at a loss to understand what part e plays in this marvellous mechanism, unless it be that of protecting the sting from any interference from a distended rectum, and so have it ready for use on any emergency. The portions c^{iii}, figs. 20, 25, spoken of by some as the palpi, appear to me to act as a kind of sheath to allow the safe withdrawal of the barbed shaft within the body.

There still remain several less important points which I have not mentioned, my object being to draw attention to the matter generally, and I have already taken up too much space.

Kennington. TRAVERS J. BRIANT.

PRIMROSES AND VIOLETS.

"FIRSTLINGS of the year." Violets, favourite flowers of Athens, and no less prized in modern London, come, with their twin sisters the primroses, to us dwellers in town as real heralds of the spring. Borne along in the baskets of the flower sellers, they not only remind us that the winter is over and past, and that not everywhere do smoke-dried houses, leaden skies, and heavy fog-laden atmospheres prevail; but, as we place them about our rooms, they tell of pleasant spots in the land, where the winds, with balmy breath, are whispering to the trees that now safely may they trust their tender buds from their scaly winter covering; where the sun, pouring down its warm rays, is kissing into new life the sleeping flowers; where the sky is clear and serene, and the air is musical with the songs of birds.

Both our flowers are to be found in many European countries, and the violet wanders still farther, and is met with in Barbary, China, and Japan, whilst in the south of France and Italy it is largely cultivated for the sake of its perfume. In retired spots, where there are shade and moisture—in woods, under hedges, and on mossy banks—we may look for them. Despite their cosmopolitanism, wild primroses, in parts of Gloucestershire (Cotswold Hills) and Lincolnshire, are not to be found, and it is said, that at Cockfield, Suffolk, they will not grow when planted, the tradition being that the primroses became infected with the plague that once raged there.

Writing of tradition reminds me that in some country places the number of the first primroses brought into the house is thought to determine whether few or many chickens will be hatched that season. If fewer than thirteen, then there will only be as many chicks reared as there are primroses. Chaucer calls the primrose "primrole," and Prior gives "primprint" as an old name for it. In some parts of Germany it is styled Frauenschlüssel "Our lady's keys," but I cannot discover why this name has been given it.

Concerning the origin of the violet there are many pretty and fanciful legends. One is, that Diana, having coloured the skin of Ianthis a dusky blue, to free her from the pursuit of Apollo, the nymph so grieved at the loss of her perilous beauty, that she drooped and died, and then became a violet at the will of the goddess. Then again, we are told that Jupiter caused these flowers to spring forth to serve as food for Io, after her transformation into a cow. Perhaps the quaintest and most far-fetched fancy is that of Herrick—"How violets came blue":—

> "Love on a day (wise poets tell)
> Some time in wrangling spent,
> Whether the violets should excel
> Or she, in sweetest scent.
> But Venus, having lost the day,
> Poor girls, she fell on you,
> And beat you so (as some dare say),
> Her blows did make you blue."

Herrick was the guilty poet who stole from Carew and gave to the world as his own, the beautiful lines on primroses, commencing

> "Ask me why I send you here,
> This firstling of the infant year."

Nearly all our poets have celebrated these flowers. On the bank where Titania sleeps, the "nodding violet grows;" the "pale primrose" is to deck the grave of Imogen; Marina hangs upon the tomb of her nurse "purple violets." Kirke White compares his early death to that of the primrose, and Milton calls for the "rathe primrose" and "glowing violet" to strew on the hearse of Lycidas. The fragrant scent of the violet inspired the exquisite simile, "it (a strain of music) came o'er my ear like the sweet south that breathes upon a bank of violets, stealing and giving odour;" and we are all familiar with the quotation, "to throw a perfume on the violet is wasteful and ridiculous excess." Yet this scent, so delightful to most people, in a few cases has been known to cause faintness. Some varieties are scentless, and one of them, the dog violet, was formerly thought to be the same plant as the sweet-smelling *Viola odorata*, but robbed of its perfume by the sun.

Perhaps few, except botanists, notice the peculiar construction of the flower of the violet, yet this peculiarity attracting the attention of an American student, aroused in him an interest in flowers. In Bartram the world gained a clever botanist. The divisions of the corolla of the primrose sometimes exceed their normal number, and in former times the flower was then called a "truelove," and was much affected by the maidens of old. Both plants have, however, been esteemed for other qualities than their beauty and fragrance. In medicine they have been used from the earliest ages, the roots of our English violet having a share in the emetic properties possessed by all violaceous plants, and which are so largely developed in the Brazilian species, yielding woody ipecacuanha. In old times the parts most generally used, for their cooling and emollient qualities, were the fresh leaves and blossoms; externally, in the form of lotion or poultice; internally, in a decoction or syrup. The latter, though not officinal, is at present sometimes given to children; it was more largely employed as a test for acids (which turn it red), and alkalies (which change the colour to green), but for this purpose it has been almost entirely superseded by litmus.

The roots of the primrose, dried and powdered, were used as a snuff in nervous disorders, and of the leaves a healing salve was made, "Wherefore," says Culpeper, "do not (you that have ingenuity in you) see your poor neighbours go with wounded limbs, when a half-penny cost will heal them." Primroses are not now used in medicine, but a wine has been made from the flowers, in no wise equal, however, to that obtained from the cowslip. The Romans made a wine from violets. Astrologically considered, both plants are under the dominion of Venus, and the violet is regarded as the emblem of humility. Yet was it the favourite flower of Mahomet; also of the Athenians, who wove it into their chaplets, and cultivated it assiduously; and now it is universally recognised as the badge of the Bonapartes. Napoleon the First was called "Le père de la violette," and during his enforced stay in Elba, engravings were sold to his partisans, in which the petals of a violet were so arranged as to give the profile of the emperor; underneath was the motto: "Il reviendra avec le printemps." No need to tell of the heaps of violets, sent from all France, at the funeral of Napoleon III. and his son. In English heraldry the violet has no place, but the primrose figures in the arms of the earls of Rosebery. I will close my paper with the love story of Lantrec and Clémence, of Toulouse. Clémence's father was so sternly opposed to their marriage, that he shut her up in a tower, so as to effectually separate her from her lover. She then sent to Lantrec a violet, eglantine, and marigold, bidding him not to despair, but to fight for glory, and as her knight. Nobly he carried out his lady's behest; bravely he fought, and at length fell at an attack on Toulouse, warding off the blows aimed at Clémence's father. After the death of Clémence (hastened by grief), floral games were instituted at Toulouse in commemoration of the unfortunate lovers, and at these games the chief prize was a gold violet.

R. M.

LIST OF ASSISTING NATURALISTS.

[*Continued from page 14. Any additional names to be sent to the Editor.*]

Devonshire.

Plymouth. G. C. Bignell, 7 Clarence Place, Stonehouse. *Macro-Lepidoptera.*

Torrington. George Mark Doe, Castle Street. *Lepidoptera*, particularly Butterflies.

Durham.

Bishop Auckland. J. P. Soutter, 1 Clyde Terrace. *Phanerogamic Botany.*

Monk Wearmouth, Sunderland. Paul Kent, 131 Wayman Street. *Flowering-plants, Ferns, and Lepidoptera.*

Gloucestershire.

Clifton. W. K. Mann, Wellington Terrace, *Lepidoptera*, especially Macros., *Oology.*

Hampshire.

Itchen Abbas, 5 miles by rail from Winchester. A. Drake, Chilland Cottage. *Phanerogamic Botany.*

Kent.

Rainham. Roland Green. *Ornithology, Oology, Entomology, Botany.*

Leicestershire.

Leicester. F. T. Mott, F.R.G.S., 18 Galltree Gate; residence, Birstal Hill, 3 miles distant. British *Botany* and *Zoology.*

Middlesex.

London, N. E. M. Holmes, F.L.S., 30 Arthur Road, Holloway. *Cryptogams*, especially Marine Algæ.

F. Palmer, 12 Grove Road, Highgate Road, Highgate.

Notts.

Nottingham. C. T. Masson. British land and fresh-water *Mollusca, Geology.*

Sussex.

Brighton. Robert H. Stevens, 25 Western Road. Local *Geology.*

Lewes. J. H. A. Jenner, Hon. Sec. L. & E. Sussex. Nat. Hist. Soc. *Phanerogamia, Macro-Lepidoptera, Diptera*, land and fresh-water *Shells*, all British.

Yorkshire.

Baldersby, Thirsk. W. Gregson, Local Sec., Yorkshire Geol. Soc. *Geology* (Carboniferous, Permian, Trias, Rhætic, and Lias formations).

WALES.

Anglesea, Rhianva, Bangor. Mrs. Verney. *Botany* for children.

Montgomeryshire, Welshpool. The Rev. John E. Vize, M.A., F.R.M.S., Forden Vicarage. *Fungi*, especially Coniomycetes, leaf fungi generally. Microscopy.

SCOTLAND.

Renfrewshire, Gourock by Greenock. Thomas Steel, Lorne Place. *Microscopy*, *Geology*, especially Post-Pliocene.

IRELAND.

Co. Antrim, Belfast. W. Gault, 105 Westmoreland Street. *Geology*, especially Cretaceous Fossils, Volcanic rocks and minerals of N.E. Ireland. Specimens exchanged or returned if desired.

OUR COMMON BRITISH FOSSILS, AND WHERE TO FIND THEM.

By J. E. Taylor, F.G.S., &c.

No. XI.

HUNTING for fossil corals in the older rocks, implies visits to some of the most picturesquely romantic spots in Great Britain, with here and there a little variation in some localities whose ancient loveliness has had to give way to the deforming ugliness

Fig. 27.—*Caryophyllia*, a recent British Coral (natural size).

of extensive mining or manufacturing operations. This is the case with the Wren's Nest, near Dudley, formed of a romantic cluster of highly inclined upper Silurian limestones rising from beneath the coal formation which extends up to their very base. These limestone slabs are hard, as if the soft organic matter of the molluscs and corals, whose hard parts almost wholly make up the rocky mass, had thoroughly permeated it, and thus produced a similar induration to that effected by sculptors, when they boil their porous plaster casts in oil to render them tougher and more durable. But hard as the Dudley limestone is, the fossil corals are harder, and as the faces of the slabs are weathered, the fossils stand out in high relief. To a young geologist who is fleshing his maiden hammer, such a sight as is here presented produces an effect not likely to be forgotten during life. Myriads upon myriads here lie intombed the exuviæ of primeval seas! No museum in the world could attempt to vie with these almost bare or lichen-covered slabs for variety and abundance of organic remains. Hours can easily be spent in climbing from crag to crag, in and out of the brushwood which is irregularly growing where the layers of soft slate are intercalated between the limestone slabs; and one forgets that the wide-stretching plain at the foot of the "nest" is superficially crowded with ironworks, manufactories of all kinds, forests of chimneys (many of them out of the perpendicular), colliery works in various stages of mining development as to the modern character of their pit gear, and densely packed regular or irregular rows of unpicturesque-looking houses. The walls of the old castle look over this modern

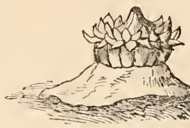


Fig. 28.—*Balanophyllia regia*, a recent British Coral (natural size).

Fig. 29.—*Omphyma subturbinata*, a common Silurian fossil coral.

scene of energy and mechanics, and the old and the new, even in human history, are thus brought into strange juxtaposition.

Leaving out other fossils, the student may find at the Wren's Nest, or in the quarries opened in the limestone, abundance of such corals as *Favosites Gothlandica*, *F. polymorpha*, &c., and various species of such characteristic Silurian corals as *Omphyma* (in great abundance), *Cystiphyllum*, *Porites*, *Heliolites*, *Palæocyclus*, *Columnaria*, *Halysites* (the well-known and very plentiful "chain-coral"), *Strombodes*, *Cyathophyllum*, &c. Not only is there an abundance of species of fossil corals, simple and compound, but of genera and species as well. Compared with the wealth of Zoantharian life our modern seas are quite poverty-stricken. All that even the warmer waters of our Devonshire and Cornish coasts can now support are a few pretty but insignificant corals, the largest of which is *Caryophyllia*, a genus which first appeared in the seas of the globe during the formation of the Wenlock limestone, and has been in existence ever since. Another recent British coral is the little *Balanophyllia regia.* Both these British corals may be seen in the living state in the small table tanks at the Crystal Palace and Brighton Aquaria, and a brief examination of them will enable the student to form a good idea of how the hard calcareous substance

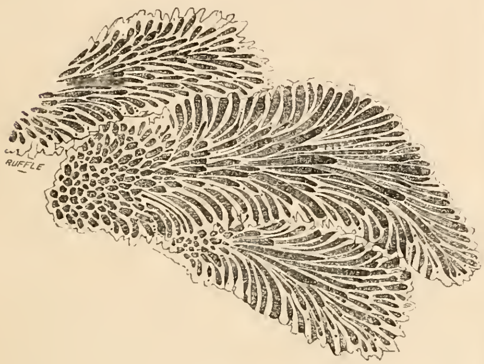


Fig. 30.—*Favosites polymorpha,* an abundant Silurian and Devonian Coral.

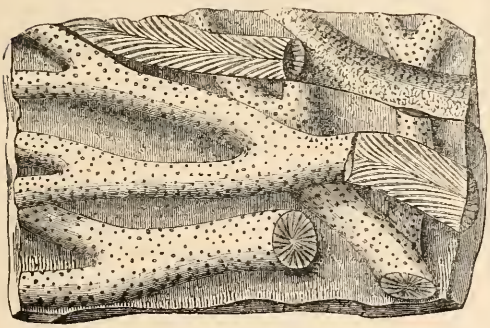


Fig. 31.—*Stenopora* (or *Favosites*) *fibrosa*, an abundant Silurian Coral.

which remains as "coral," is secreted by the investing flesh. He will also be able to restore in imagination the vivid and many-coloured appearance presented by the sea-floors of the Palæozoic epoch, when corals were so abundant, from the tints and colours with which the flesh of living coral-animals is usually distinguished.

A quieter place for fossil coral-hunting than Dudley, is the neighbourhood of Wenlock, in Shropshire, where that division of the Upper Silurian formation called "Wenlock limestone" crops up, and whence it has derived its name. No better place would be found for a short tour, and fossil collecting might be agreeably diversified by a little archæology, which the old Norman abbey, &c., of the town would afford. All the fossil corals mentioned as abundant at Dudley are also to be found in the neighbourhood of Wenlock, with the addition of the beautiful *Lonsdalia Wenlockensis.* Benthall Edge, about two miles distant from Wenlock, is a famous place for fossils, and corals are there especially abundant, and in excellent preservation. It overlooks the Severn, and the busy but still picturesque Coalbrook Dale. Wenlock Edge is interesting to the physical geologist, for it stands up from amid the softer Wenlock shale. As might be expected, the greater ease with which the latter has yielded to weather action has caused

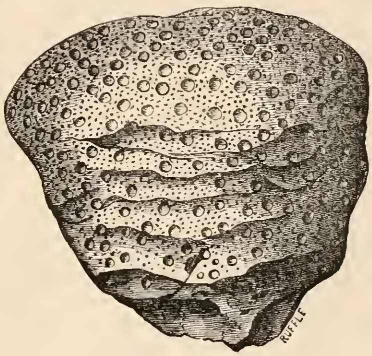


Fig. 32.—*Heliolites interstinctus*, a common Silurian Coral.

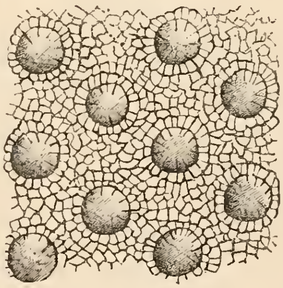


Fig. 33.—Portion of *Heliolites interstinctus* magnified, to show corallites.

it to be denuded into the plain which it now underlies. How abundant the fossil corals are in the limestone here may be gathered from Professor Owen's statement that "Wenlock Edge is itself a coral reef thirty miles in length." Nearly all the fossil Upper Silurian corals figured and described by Edwards and Haine in the publications of the Palæontographical Society may be found in the neighbourhood of Wenlock. There are plenty of quarries about, and the student will soon find abundance of materials of all kinds.

From Wenlock, the geological wanderer can soon make his way to other classic grounds, whose names are famous to the reader of "Siluria." The various subdivisions of the upper beds crop out over a large extent of Salopian country. Among localities to be specalised is Aymestry (a place which has given its name to one of the uppermost Silurian beds). Craven Arms station, near Church Stretton, is a capital place for the student to make for if he wishes to be placed at once on Silurian ground. The Aymestry limestone may here be seen forming the bold hills of View Edge and Stokesay camp, and this limestone will in places be found literally abounding with the well-known and characteristic fossil brachiopod *Pentamerus Knightii*. The Garden House quarries at Aymestry will be found capital collecting grounds. Indeed, a good many of the fossils figured by Sir Roderick Murchison in his "Silurian System," were obtained at these quarries. Nearly every village in the neighbourhood has several outcrops of or quarries into the rocks, where abundant fossils may be hammered out. The commonest of the fossil corals are *Cyathophyllum* (often well known among the quarrymen and others, by the name of "petrified ram's horns," in allusion to the irregular way in which the stony corallum usually twists), *Heliolites interstinctus*, *Halysites*, *Omphyma* (one species of which, *O. subturbinata*, is a very widely and plentifully distributed Silurian coral).

The Malvern Hills also afford several noticeable localities where the Silurian strata yield fossil corals. The Woolhope Valley is especially to be mentioned, and here the commonest corals to be exhumed are *Omphyma* (several species), *Cyathophyllum*, *Halysites*, *Zaphrentis*, *Astræa*, &c. The best localities hereabouts are Checkley Common, Warslaw, and Dormington (the limestone at the latter place appears to be simply an ancient and very local coral-reef; it is wonderfully full of fossils of various kinds). The Silurian rocks of the Malvern Hills are nearly everywhere plentiful in fossils, although evidences of the reef-building corals only occur here and there. The following are all capital collecting grounds: Netherton Valley, Stonesway, about Nenning's Farm, Colwall Copse, the quarries along the Marthon road, Martley, and Blaisdon Edge (where extensive quarrying of the Wenlock limestone is carried on).

The lateral foldings of the Upper Silurian strata of North Wales have frequently obliterated the organic remains, or left them represented by only feeble impressions. Of course, except a few single and solitary corals, we should not expect to find—nor do we find—fossil corals abundant in any other than limestone deposits, all other strata being formed in more or less muddy water, as the nature of the sediments shows; whilst coral animals are noted for their love of clear water, and their dislike to turbid. Hence in such beds as the Bala limestone, we frequently find abundance of fossil corals. One of the best localities we know of is Mynydd Fronfrys (already alluded to in former articles), a few miles' walk from Llangollen. In an old quarry along the Oswestry road there is a perfect feast of fat things in the shape of abundant and beautifully preserved Silurian fossils, and the spot is so quiet, and in the midst of such delightful and little visited Welsh scenery, that our readers would be thankful for directing them to the place, if it were for that alone.

The Coniston limestone, which runs an irregular course through the Lake District, is in places full of fossil corals, and in the neighbourhood of the little town which gives to this stratum its name may be obtained *Monticulipora*, *Stenopora* (or *Favosites*) *fibrosus*, *Petraia*, the latter now known to be only natural casts of *Cyathophyllum*, &c. Some lovely spots may be found where there is good geologising on these beds. One of the best we know is the road to Troutbeck, near Windermere. This road crosses the hill where the limestone crops up, and the walls by the roadside are formed of the local rock. They are perfect museums, but it will be noticed that nearly all the fossils occur as *casts* or impressions, and the rock is often quite perforated or "rotten" from the abundance of these casts. This is due to the lime, which formerly entered into the composition of the fossils, having been all gradually dissolved away by the rain water which has been percolating these fossiliferous rocks, ever since they were converted into dry land. Among the most abundant of the fossils is the *Favosites fibrosus*, perhaps one of the widest distributed of all Silurian corals. Many varieties of it are known, and among others one which is seen encrusting univalve shells, as if it had destroyed them, after the fashion which is still practised by some mechanically parasitic zoophytes in modern seas. The stone walls about Applethwaite Common are often very full of small kinds of fossil coral as impressions of *Cyathophyllum*, *Favosites*, *Heliotes*, &c.

(*To be continued.*)

MICROSCOPY.

Habirshaw's Catalogue of the Diatomaceæ.—We are very sorry to hear that there is no probability of the French edition of Habirshaw's catalogue being published. Therefore it is desirable to withhold the proposed subscriptions for the present.

Another Method of Mounting Microscopic Fungi.—I suppose that in all branches of microscopy each worker has his own particular mode of manipulation which, to him, seems better than any other, and in which, perhaps, he is most successful. In Mr. Williams's interesting and instructive paper on "Mounting Microscopic Fungi" in the January number of Science-Gossip for 1879, he describes a process of mounting which is frequently used for dry objects with more or less success, but which, I think, in some respects at least, can be improved upon. For some time past I have used *wooden* slides for objects which require a moderately deep cell, and I have always found them to answer exceedingly well.

Slides made of wood are lighter and stronger than glass ones, and look quite as elegant if made of ornamental wood and polished, or covered with fancy papers. In the first place, procure some thin boards, about one-sixth or one-eighth part of an inch thick; these should be cut up into strips three inches long and one inch wide, and ground smooth with sandpaper. In the centre of these slips burn a hole to the required depth by means of a heated iron rod. I consider that this is a very good way of making a cell in the wood, as it leaves the surface black, and if the iron is carefully used it makes the bottom of the cell beautifully even. Into this cell drop a little *thin* liquid glue (which is made of shellac dissolved in methylated spirit), and with a small brush spread it all over the interior of the cell, and some little distance round the margin. This process has the very desirable effect of rendering the cell *damp proof.* For small objects a circular piece of black or dark coloured paper should be glued in the bottom of the cell, and the object (carefully dried) should be stuck in the centre of the paper disc; if, however, the leaf with fungi has been cut sufficiently large to fill the bottom of the cell the paper circle may be dispensed with altogether. After another proccss of drying the thin glass cover may be affixed by means of any of the various cements. The slide may now be finished in the ordinary way of glass slides by means of a ring or two of sealing-wax varnish, or by pasting a piece of ornamental paper $1\frac{1}{2}$ inch long and 1 inch wide (with a hole of the same size as the cell previously punched out) over the slide. Nothing now remains to be done but to write the label and gum it to the slide. I venture to think that this method will be found to be equal, if not in some respects superior, to others in which the cell is built up on the slide, as there is no danger of the cell breaking off when roughly handled. To many of the readers of these remarks the method I have described may not be new, and I believe wooden slides are often used for dry objects by many workers, but to those who have not yet given it a trial, and especially to those who make a special study of that delightful branch of micro-botany, micro-fungi, I hope it will commend itself as a thoroughly efficient and simple method.—*George Clinch.*

Cheap Polariscope.—"Economy" in January number inquires about a cheap polariscope. Years ago I made one as follows, which was as efficient as the prisms I have used latterly. I took one dozen oval pieces of crown glass —thin covering glass—and fixed them at an angle of about 56° in a tin tube, which I made to spring into the stage aperture. Another similar tube of glasses slid to the bottom of the draw tube of the microscope. The polariser was thus fixed in one position, and I rotated the draw tube to vary the effects obtained. A few pieces of mica served instead of selenite. Obviously paper tubes could be easily made, and would do perfectly. I append sketch of tube of glasses, and think "Economy" will have no difficulty in producing an efficient instrument. If he has, I will give more instructions, or if he has any difficulty with the theory of polarisation I will try to clear it up for him.—*Edwin Holmes.*

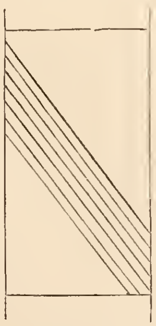


Fig. 34.—Cheap polariscope.

Cheap Polariscope.—"Economy" will find a full description how to construct a make-shift polariscope in Dr. Lankester's "Half-hours with the Microscope." If he has not got this book, I shall be happy to send him a copy of the description.—*E. Clover, Sudbury.*

Steinheil's New Combined Achromatic Triplet Magnifying Lenses.—We have used one of these capital lenses, which are constructed so as to be used at a great focal distance from the object. They are "aplanatic," and give wonderful definitions over the whole field, even to such an extent that they may be tilted to almost any angle without distortion. Consequently the highest powers may be used with the greatest ease. They are conveniently mounted in brass, as shown in the drawing, or in horn setting,

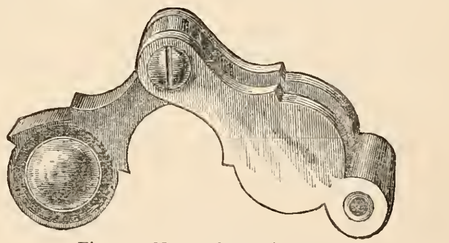


Fig. 35.—New Achromatic Lens.

or tortoiseshell frame, and are intended for pocket use. The linear magnifying powers are about $5\frac{1}{2}$, 8, 12, 16, and 24 times, the equivalent focus being $1\frac{5}{8}$, $1\frac{1}{16}$, $\frac{11}{16}$, $\frac{1}{2}$, and $\frac{3}{8}$ inch respectively. For all microscopic examinations we regard them as the most perfect and useful pocket lenses that have yet been introduced either in this country or abroad. The drawing represents the exact size of the $1\frac{1}{16}$ inch focus. The sole agents for these useful lenses are Murray & Heath, 69 Jermyn Street, S.W.

The Bittern in Kent.—It may interest some of your ornithological readers to know that a fine bittern (*Botaurus stellaris*) was shot in our marshes on the 24th November. It was flushed from a little stream close to a brickfield by a bargeman, who was walking for snipe. I believe it has been a stranger to our locality for a long time, and there is every prospect of its being one.—*Roland Green, Rainham, Kent.*

ZOOLOGY.

THE BITTERN.—I think it may interest some readers of SCIENCE-GOSSIP to know that a bittern was shot at Isleham Fen, near Newmarket, last December.—*A. G. W.*

THE BEAVER.—I beg to mention the discovery of an antler of *C. elaphus* and some teeth of the beaver (*Castor fiber*) from Isleham Fen, near Newmarket, which are in my possession.—*A. G. W.*

THE EVOLUTION OF THE EYE.—We are glad to note that the Actonian prize has been adjudged by the Royal Institution to Mr. G. S. Boulger, F.L.S., &c., for his essay on "The Structure and Functions of the Retina in all Classes of Animals, viewed in relation with the Theory of Evolution."

SENSE-ORGANS OF THE HYDROIDS.—At a recent meeting of the Linnean Society, Professor Allman gave a description of the true sense-organs of the hydroid-animals. In one form the organ is a bulb, with rod-like structures and a series of radiating filaments, which latter terminate in conical bodies, also containing filaments that resemble thread-cells. Another form is met with in a medusa (*Gemmellaria*), where free club-topped filaments constantly in motion are attached to the tentacles, and possess sacs with thread-cells, but incapable of being exserted. For these Professor Allman suggested the term *podocysts*. He says they have a wide extension among the Hydroida.

FERTILITY OF HYBRID GEESE.—Dr. Charles Darwin has sent to "Nature" an account of an experiment made by him as to the fertility of male and female hybrids (brother and sister) between the common goose and the Chinese goose. Being of so near affinity, the experiment between these hybrids is of the greater zoological importance. The result of this pairing was that eggs were laid, and three birds hatched from the first set. From a second set of eggs two birds were hatched. These five hybrids are very fine birds, and resemble their parents in every detail.

EPPING FOREST AND ESSEX NATURALISTS' FIELD CLUB.—We are glad to see that a society of this kind has just been started. The inaugural meeting was held on Saturday, January 10, 1880, at the rooms of the Buckhurst Hill Art Classes, 3 St. John's Terrace, (opposite the Church); R. Meldola, Esq., F.C.S., &c., Secretary to the Entomological Society of London, taking the chair. The objects of the club, as set forth in the proposed rules, are as follows:—"The investigation of the Natural History, Geology, and Archæology of the county of Essex (special attention being given to the fauna, flora, geology, and antiquities of Epping Forest); the publication of the results of such investigations; the formation of a library of works of local interest and other publications, and the dissemination amongst its members of information on natural science and antiquities." Excursions, under skilful direction, to various localities of interest to the naturalist and antiquary, will also be a main object of the club. We are glad to see that the club will strongly discourage the practice of removing rare plants from the localities where they are to be found or of which they are characteristic, and of risking the extermination of rare birds and other animals by wanton persecution; it will also endeavour to use its influence with landowners and others for the protection of the same, and to dispel the prejudices which are leading to their destruction. In like manner the club will endeavour to cultivate a fuller knowledge of local antiquities, and to promote a taste for carefully preserving the monuments of the past from wanton injury. Considering the fine field offered to the biologist in Epping Forest and the surrounding country, it is certainly a matter of surprise that a society similar to that now in process of formation was not long since founded. The proposed subscription will be fifteen shillings per annum for gentlemen and ten shillings for ladies. Persons residing beyond a certain radius (say fifteen miles) from the headquarters of the club will only be required to pay subscriptions of ten shillings and seven shillings respectively. Persons joining the club upon or within two calendar months from its establishment will thereupon be considered original members. Much credit is due to the Hon. Sec., Mr. Wm. Cole, for the zeal and energy he has thrown into the work of organisation.

THE DEAL-FISH.—Mr. Thomas Southwell gives an account, in the "Zoologist" for January, of the capture of the deal-fish, or Vaagmœr (*Trachypterus arcticus?*), by some fishermen in a draught-net at Holkham Bay, Norfolk, on October 8th. Unfortunately, Mr. Southwell did not see the fish in the flesh, and it appears to have been much decomposed before it was sent to be preserved.

CANTHOCAMPTUS FURCATUS.—This marine entomostracan, recently sent out by Mr. Bolton to his subscribers, has sprung up lately in the aquarium at the Aston Lower Grounds, Birmingham. It is rapidly reproducing itself, and has extended to the majority of the marine tanks. The fact of its occurrence is interesting, because it is the first animal (excluding infusoria) which has appeared, without being purposely introduced, in the aquarium which was opened six months ago. Even vegetation has hardly commenced, and is limited to Diatomaceæ. The whole of the sea water is artificial, and it is extremely probable that this is the first time in the history of the species that it has multiplied itself, almost indefinitely, under the artificial conditions consequent on the use of manufactured sea-water, aerated by machinery.

Parasitic Fungi on Insects.—Professor Hagen, of Harvard, describes some experiments that had been made by Mr. J. H. Burns and others, and comes to the following conclusions: 1. That the common housefly is often killed by a fungus, and that in epizootics a large number of insects which live in the same locality are killed by the same fungus. 2. That the fungus of the housefly works as well as yeast for baking and brewing purposes. 3. That the application of yeast on insects produces in them a fungus which becomes fatal to the insects. 4. That, in the experiment made by Mr. J. H. Burns, all potato beetles sprinkled with diluted yeast died from the eighth to the twelfth day, and that the fungus was found in the vessels of the wings.

Knotty Cushion Starfish.—Mr. E. Howard Birchall, of the Tynemouth Aquarium, has just forwarded to me for this aquarium about a dozen very beautiful examples of the knotty cushion starfish (*Goniaster equestris*) taken off the Northumberland coast. The late Professor Edward Forbes, in his history of British starfishes, describes this species as "one of the rarest and most beautiful of our native starfishes." The specimens sent by Mr. Birchall are pretty even in size and are about six inches in diameter. They are of a good rich orange colour, but I fear none of the specimens are sufficiently "strong alive" to hope for their recovery after their long journey from Shields to London.—*John T. Carrington.*

The Exploration of Socotra.—The Committee of the British Association have appointed Dr. I. B. Balfour, Professor of Botany in Glasgow University, as naturalist for the exploration of Socotra, off the east coast of Africa. Dr. Balfour left for Aden, and thence to Socotra, on the ninth of January.

"The Midland Naturalist."—With the January number, this spirited and ably edited periodical enters upon the third volume. It contains articles on "The Age of the Pennine Chain," by E. Wilson, F.G.S.; "On the Structures of Pitcher Plants," by Lawson Tait; "Cryptogamic Flora of Warwickshire," by J. E. Bagnall; "The Magpie," by W. B. Strugnell, together with reviews, notes, meteorological notices of the Midland Counties by W. J. Harrison, F.G.S., &c., altogether a cheap sixpennyworth.

"The Popular Science Review."—The quarterly number of this excellent periodical, dated January, is to hand. Among other articles of permanent value are "Notes on the Argentine Republic," by Charles Orland, chiefly of a geological and mineralogical character; "Meteors and Meteor Systems," by W. F. Denning; "The Law of Association in the Animal Kingdom," by Mr. E. Perrier; and "The Dinosauria," by Professor Seeley. The latter is a popular and exhaustive review of these ancient reptiles, showing their affinities to birds, and their general and special character.

Northern Stone Crab.—I have recently received for the Royal Aquarium several consignments of *Lithodes arctica*, the northern stone crab, from the Northumberland coast, where they occur not infrequently. Both sexes are represented, and may easily be defined by the curious arrangement of the abdominal segments of the female. Most of the females are now carrying the ova, which appear to be well developed. I shall be glad to communicate with any student of marine zoology, for I frequently have duplicate fresh specimens, which are dead on arrival from the coast, and which might be useful.—*John T. Carrington, Royal Aquarium, Westminster, S.W.*

BOTANY.

New Species of British Fungi.—The "Scottish Naturalist" states that at the meeting of the Cryptogamic Society at Forres, the following species of fungi, new to the British flora, were discovered:—*Hydnum scabrosum*, Fr.; *Hypomyces violaceus*, Tul.; and *Helvella infula*, Schœff. Dr. Buchanan White states that during a visit to Rannoch last September, he found some specimens of *Ustilago succisa*, a species not hitherto found in Britain. It is parasitic on the anthers of *Succisa scabiosa*, which are filled with the white spores, so as to render the parasite rather conspicuous.

Notes on Potamogeton nitens (Weber).—In our late Exchange Club parcels, many excellent specimens of this species were sent out, collected in Loch Ascog, Isle of Bute, where it was originally discovered by Mr. G. E. Hunt, of Manchester. We may remark some of the specimens were evidently confused with *P. heterophyllus* (Sch.). In the "Student's Flora" it is made into a sub-species, in connection with Heterophyllus; placed side by side (British examples) there is evidently a wide specific difference.

a b

Fig. 36.—*a*, stip. of *P. heterophyllus*; *b*, stip. of *P. nitens*. Both from Bute specimens.

Characters from dried specimens: Nitens (Weber): stem branched, L. all submersed, alternate, rounded, and clasping at their base, recurved, lower slips, with three prominent ribs. Peduncles not thickened upwards. Heterophyllus (Sch.): stem much branched, L. submersed opposite, not clasping at the base, upper L. floating, coriaceous, lower slips unicostate, lanceolate, peduncles thickened upwards. Mr. Bennett kindly suggests, "It is misleading to say nitens differs chiefly by absence of floating, or coriaceous leaves;

P. nitens most certainly has floating leaves on the Continent, although they have as yet not been observed in Britain. The most typical British nitens is undoubtedly that found by Dr. Moore, in a lake near Castle Gregory, Ireland." We may observe that specimens, when collected in running streams, or rivers, can never be mistaken for *P. heterophyllus.* —*James F. Robinson.*

LOCAL FLORAS.—In the list of local Floras given in the January number of SCIENCE-GOSSIP, I find for Aberdeenshire "Flora Aberdonensis" (1838), by G. Dickie. I beg to state that there is a fuller and later edition of this work, viz., "The Botanist's Guide to the Flora of Aberdeen, Banff, and Kincardine," with map (1860), 5*s.*, by Professor Dickie. Published by A. Brown & Co., Aberdeen, and Longman & Co., London.—*Tom W. Ogilvie.*

LOCALITIES FOR RARE PLANTS.—As I have been unable to send a parcel of plants to the Exchange Club, having sent a lot abroad, I thought the following localities for some rarities I came across may be of service to my confrères. About Kingston: *Caltha Guerangerii*, *Geranium rotundifolium*, *Trifolium subterraneum*, *T. striatum*, *Carduus pratensis*, *Inula pulicaria*, *Campanula Rapunculus.* This, Dr. De Crespigny, in his little book, thinks, has disappeared; it is still to be found, sparingly. *Hottonia palustris* and *Scilla autumnalis*, *Crepis taraxacifolia*, and at the foot of Box Hill, on nettles by the Mole, *Cuscuta Europæa.* This also Dr. De C. thinks has disappeared; it grows in one spot. *Leonurus Cardiaca* was found by the Itchen, near Winchester. In the Isle of Purbeck I found, *Trifolium scabrum*, *Lathyrus Aphaca*, *Rosa systyla*, *Œnanthe pimpinelloides*, *Carduus eriophorus*, *Cyperus longus*, *Sclerochloa loliacea*, *Epipactis palustris*, *Spergularia marginata*, and many other rarities.—*Julius R. Neve, Kingston-on-Thames.*

THE FLORA OF WARWICKSHIRE.—The moss flora of this county, by James E. Bagnall, is in course of publication in the "Midland Naturalist" (London, D. Bogue, monthly, 6*d.*), the first part of which appeared in the September number last year. Directly this is finished, a complete flora, for the same county, of phanerogamia will be printed in the same magazine, also from the pen of Mr. Bagnall, who has all the materials for the work already collected The flora will subsequently be issued as an independent work by the Birmingham Natural History and Microscopical Society.

THE "TOURIST'S FLORA."—I am very glad to see the article "Tourist's Flora," by T. B. W., as it gives me the opportunity to say a word or two upon the subject. I was afraid to do so before, lest I should be taken as an ignoramus. I have recently, and in time gone past, done a little botanising, having used as my guide Hooker's "British Flora," in which was a *clavis analytica* of the Linnæan system, by which I have been very much assisted in determining the specimens gathered; but in the more recent edition of the "Student's Flora" no such assistance is given, and although a student may determine class, division, &c., yet I cannot understand how he is to remember the characteristics of orders. The remarks of T. B. W. suggest the publication of genera according to the Linnæan system.—*J. A., Coventry.*

GEOLOGY.

PREHISTORIC CANNIBALISM IN JAPAN.—An ancient mound resembling the Aztec mounds of the Mississippi Valley has been discovered in Japan. A scientific examination of the remains that have been dug up from it furnishes reason for believing that cannibalism was practised by the Japanese in prehistoric times. The human bones that were found among the bones of beasts gave evidence that the flesh upon them had been cooked, and the marks still left upon the joints are such as could have been made only by human teeth. It is from just such evidence as is furnished by the Japanese remains that archæologists came to the conclusion that cannibalism had been practised by some of the ancient inhabitants of North America.

STONE ARROW-HEADS.—A young man in the Smithsonian Institution has just made public the discovery of the method employed in making the stone and volcanic glass arrow-heads, daggers, knives, axes and razors of the prehistoric races. He started to solve the difficulty by putting himself in the identical position of the Aztecs or mound builders—without anything to work with except sticks, various-shaped stones such as he could find on the banks of any stream, and his hands. After making some rude implements by chipping one flint with another, he discovered that no amount of chipping would produce surfaces like the best of these which he was trying to imitate. He therefore came to the conclusion that there was another way of doing it, and, by chance, tried pressure with the point of a stick instead of chipping by blows of a stone, when he found that he could break the stone, flint, or obsidian in any shape he chose. Soon he made spear heads and daggers that would cut like a razor, as good as any he had before him, which had been picked up from all over the world. By a little more observation he found that the "flaking," which he calls his process, on the old arrow-head left grooves that all turned one way. He produced a like result by turning his stick the easiest way, from right to left. He, therefore, concludes that the prehistorics were right-handed people like ourselves. This conclusion is reinforced by the fact that occasionally an arrow-head is found that has flakes running from left to right, showing a left-handed person.

A Silver Ammonite.—Among some specimens from the silver mines at Caracoles, South America, examined at Paris by M. Jannettas, is an extraordinary example of an Ammonite transformed into native silver. It was found with a number of other Ammonites belonging to the two species, *A. perarmatus*, and *A. plicatilis*, but the latter were not mineralised with silver salts. The silver Ammonite in question has been entirely replaced by chloride of silver, which has been partly reduced to the metallic condition. It is therefore inferred that the silver ore in the Caracoles mines may have been reduced from a state of chloride at a period not earlier than the deposition of the Oxford clay.

Artificial Diamonds.—A not uncommon sensational story has been going the round of the newspapers, to the effect that some fine artificial but real diamonds had been manufactured at the St. Rollox works, Glasgow, and that they had been tested by Professor Maskelyne, who had declared them to be genuine diamonds. In contradiction to this story, Professor Maskelyne writes to "Nature" to say that a few crystalline particles of so-called "artificial diamonds" were sent him, the largest of which was about $\frac{1}{50}$ inch long. These were submitted to mechanical, optical, chemical, and blow-pipe tests, and Professor Maskelyne declares them to be "not diamonds at all, but to consist of some crystallised silicate, possibly one resembling an augite."

The Physical History of the Chalk Flints.—At a recent meeting of the Geological Society, a paper on this subject was read by Dr. Wallich. The author described the origin, the mode of formation, and the cause of the stratification of the Chalk flints. Taking as the basis of his conclusions the fact brought to notice by him in 1860, namely, that the whole of the protozoan life at the sea-bed is strictly limited to the immediate surface-layer of the muddy deposits, he pointed out in detail the successive stages of the flint-formation, from the period when the chief portion of the silica of which they are composed was eliminated from the ocean-water by the deep-sea sponges, to the period when it became consolidated in layers or sheets conforming to the stratification of the chalk. In relation to this subject the author claimed to have sustained the following conclusions:—1. That the silica of the flints is derived mainly from the sponge-beds and sponge-fields, which exist in immense profusion over the areas occupied by the Globigerine or calcareous "ooze." 2. That the deep-sea sponges, with their environment of protoplasmic matter, constitute by far the most important and essential factors in the production and stratification of the flints. 3. That, whereas nearly the whole of the carbonate of lime, derived partly from foraminifera and other organisms that have lived and died at the bottom, and partly from such as have subsided to the bottom only after death, goes to build up the calcareous stratum, nearly the whole of the silica, whether derived from the deep-sea sponges or from surface protozoa, goes to form the flints. 4. That the sponges are the only really important contributors to the flint-formation that live and die at the sea-bed. 5. That the flints are just as much an organic product as the chalk itself. 6. That the stratification of the flint is the immediate result of all sessile protozoan life being confined to the superficial layer of the muddy deposits. 7. That the substance which received the name of "Bathybius," and was declared to be an independent living moneron, is, in reality, sponge-protoplasm. 8. That no valid *lithological* distinction exists between the chalk and the calcareous mud of the Atlantic; and *pro tanto*, therefore, the calcareous mud may be, and in all probability is, "a continuation of *the* chalk-formation."

Undescribed Fossil Carnivora from the Sivalik Hills.—Mr. P. N. Bose has just given a description of some fossil carnivora from the miocene of the Sivalik Hills, in the collection of the British Museum, but which have hitherto been undescribed. The communication contained descriptions of nine species of carnivora from the ossiferous Sivaliks, together with an introduction, in which the age of the Sivalik fauna, and several matters of general interest, were briefly discussed. The species described were:—*Machærodus sivalensis*, *M. palæindicus*, *Felis grandicristata*, *Hyæna sivalensis*, *H. felina*, *Viverra Bakerii*, *Lutra palæindica*, *Canis curvipalatus*, and *C. Cautleyi*. *Canis curvipalatus* is so named on account of the curvation of the palate. *C. Cautleyi* is closely allied to the wolf, as is *Viverra Bakerii* to the civet. The form of the forehead is peculiar in *Lutra palæindica*. In the form of the skull, the dimensions of the upper tubercular, &c., *Hyæna sivalensis* approximates to the living Indian hyæna (*H. striata*): but, in the absence or extremely rudimentary character of the postero-internal cusp in the lower carnassial, as well as in the entire absence of the anterior accessory cusps in the upper and the first two lower premolars, the Sivalik species comes closer to *H. crocata*. *H. felina* differs from all other species of hyæna, living or extinct, in the absence of the upper premolar 1. *Felis grandicristata*, which was of about the same size as some of the larger varieties of the royal tiger, had the sagittal crest even more prominent than the *F. cristata* of Falconer and Cautley. *Machærodus sivalensis* was of about the same size as the jaguar. One of the specimens, on which this species is based, shows two molars in the deciduous dentition instead of three (as in the genus Felis). *M. palæindicus* was considerably larger than *M. sivalensis*. Both differ from all other known species of *Machærodus* in the form of the lower jaw, &c.

Fossil Insects.—The "Entomologist's Monthly Magazine" for January contains the tenth of Mr. Herbert Goss's valuable contributions to Fossil Entomology. The paper in question deals with the insects of the Miocene period, and the animals and plants with which they were correlated.

Palæolithic Implements.—An important discovery has just been made in the neighbourhood of Elbœuf (Seine-Inférieure), by M. Noury. He found a multitude of prehistoric implements in the sands which form the subsoil of the Seine valley, between Elbœuf and Rouen. In a single locality he collected more than 400, as well as bones of large quaternary mammals. The implements are said to belong to the palæolithic age; they consist of cut flints forming axes, cores, punches, and hammers of various dimensions.

NOTES AND QUERIES.

Yew Poisoning.—S. A. B., in Science-Gossip for December, doubts the cases of alleged poisoning of animals from eating the yew. I am able to bring forward a case which may perhaps remove his doubts. This occurred so late as the 1st of December, at Noblestown, Bew Castle, Cumberland. Mr. Leonard Potts, of Kirkcumbeck, bought two valuable bullocks from his uncle, Mr. James Potts, of Roansgreen, on the 1st of December. The bullocks were removed the same day to Noblestown Farm, and were put into the orchard for the night; next morning, both the bullocks were found dead in the orchard. In order to ascertain the cause of this sudden death both animals were opened, when several pieces of the bark of the yew-tree were found in the stomach of each. There is a yew-tree in the orchard, of which the cattle had eaten pieces of the bark, thus causing death. Another case came within my knowledge some twelve months ago, when a valuable horse belonging to an extensive cartman of a railway company was poisoned by eating the branches of a yew. The horse had been left standing beside a yew-tree for a few minutes, in the absence of the cartman, during which it had eaten some of the twigs, which caused its death on the following day. The remarkable characters and properties of the yew have drawn towards it at all times much attention. Dioscorides, Pliny, Theophrastus mention its poisonous properties; and Cæsar (Bell. Gall. vi. 31) relates that Cutivolcus, king of the Eburones, committed suicide by swallowing the juice of the yew. Plutarch and Pliny say the fruit is poisonous, but this is an error, as it is now an established fact that the berries can be eaten with impunity by children, and are greedily devoured by wasps, caterpillars, and several kinds of birds. It is said that deer and goats can feed on the leaves with impunity. There are several varieties of yew, but those best known are the common yew (*Taxus baccata*), and the Irish yew (*Taxus fastigiata*), this latter having been made by Lindley a distinct species. It is distinguished by its upright mode of growth, and by its leaves not being arranged in ranks, but scattered. It was first discovered at Florence Court, on the mountains of Fermanagh, and has since been observed in other parts of Ireland. Now if the yew possesses such deadly qualities, why are its effects not shown in every case when eaten by horses and cattle? I think that Professor Wiborg, of Copenhagen, accounts for this. He states that the leaves of the yew are only poisonous to animals when they are eaten alone, but that if eaten with three or four times the quantity of other food they are innocuous. This may account for the animals mentioned by S. A. B. having eaten the branches with impunity. Those who have paid attention to horses and cattle grazing in a pasture-field, will have noticed them nibbling the branches of any trees that come in their way; but this is only after they have become satisfied with their proper food.—*Dipton Burn.*

What are "Mealies"?—It would be interesting to the readers of Science-Gossip to see a description, botanical and economical, of the plant which produces the "mealies," so often mentioned in the reports from Zululand, which are read daily with interest by all Englishmen.—*E. Y. S.*

Water-Cresses.—Can any one give me a few citations from eminent authorities as to the dietetic value of the above plant?—*R. B. B.*

Notes on Rookeries.—Many years ago a rookery was established in a plantation on the north side of St. George's Church, Newcastle, Staffordshire, through some rooks' eggs being placed in a magpie's nest, which was built on one of the trees; the magpie's eggs were taken out, and the rooks' put in their place. Various vicissitudes have from time to time befallen this rookery, such as the birds being recklessly shot, the nests robbed of their eggs, and more especially a high wind, which several years ago, blowing many of the trees down, all but drove the rooks entirely away. But of late years the rookery has gradually increased in size; last year there were between eighty and ninety nests, this year (1879) there were only seventy, doubtless, owing to the long severe winter and stormy spring we have just experienced. One of the rough windy days last March blew some of the nests out of the trees and killed the young birds. Two or three friends now contribute a small sum yearly for the preservation of the rookery, which is full of interest to all who love to watch the habits of these intellectual and remarkable birds; indeed this little colony is quite an ornament and pleasure to the neighbourhood. The following notes upon the above subject may not here be out of place; they were sent to us by a friend living in Leamington. She remarks: "There are a few old elm-trees before my sitting-room window, and I see the rooks are beginning to build. Last year it was much amusement to watch them; they are very quarrelsome, but are very wonderful in their habits, and a delightful study. I watched one pair that were most persevering, but as fast as they had begun their nest, or somewhat progressed, a party of some four or five would come all together and pull every stick down. At last I saw the nest half finished, and the poor disconsolate bird was sitting in the only half-made nest; her head was always to be observed above the edge of the nest, while all the other birds were totally hidden. A gentleman who had made the rooks a study for some time past said he noticed there was one tree where they would assemble and caw away, but if any attempted to put a stick there to build a nest it was a sure sign for them all to protest against it, and not one would they allow to be built in that special tree." The Rev. Gilbert White has given us several interesting accounts of the habits of rooks. In his "Natural History of Selborne," he remarks, "that during the breeding season, rooks are continually fighting and pulling each other's nests to pieces; these proceedings are inconsistent with being in such close community. And yet if a pair offer to build in a single tree, the nest is plundered, and demolished at once. Some rooks roost on their nest trees. A few unhappy pairs are not permitted to finish any nest till the rest have completed their building. As soon as they get a few sticks together, a party comes and demolishes the whole. As soon as the rooks have finished their nests, and before they lay, the cocks begin to feed the hens, who receive their bounty with a fondling, tremulous voice, and fluttering wings, together with all the little blandishments that are expressed by the young while in a helpless state. This gallant deportment of the males is continued, through the whole season of incubation." We should be glad to hear what, as a rule, leads these interesting birds to make choice of the trees in which they build, and should be grateful for further information on the subject.—*E. Edwards.*

GORDIUS AQUATICUS.—If your correspondent, Mr. T. Q. Couch, page 281, will refer to an article of mine in last year's (1878) vol. pp. 222–3, he will find reference made to the Gordius.—*Vincent Clementi.*

THE "LONG-PURPLES" OF SHAKSPEARE.—It does not seem to be satisfactorily settled which of two plants Shakspeare alluded to as "long-purples," whether *Orchis mascula* (the early purple orchid), or *Lythrum Salicaria* (the purple loose-strife). Dr. Taylor, in "Green Lanes," mentions *Lythrum Salicaria* as probably the one. Professor Balfour in his manual gives *Orchis mascula* as the plant in question. In an edition of Shakspeare, published by Routledge in 1854, it is given in a footnote as *Orchis morio-mas.* It is very likely, as suggested in Dr. Taylor's work "Green Lanes," that Shakspeare may have seen the purple loose-strife growing on the banks of the Avon. I have seen, however, very large dense spikes of *Orchis mascula* growing on the banks of the river. This plant when luxuriantly grown, has, to the casual observer, somewhat the habit of *Lythrum Salicaria.* Can any of our readers give information on this subject? —*G. T. Harris.*

URTICATING MOTHS.—I was pleased to notice some remarks under this heading by your correspondent, Mr. J. Anderson (No. 179, Nov. 1), but I cannot persuade myself satisfactorily as to the cause of the irritant. I have found that the hairs surrounding the ova deposits can offend as well as the hairs of the larvæ, and the feathers of the perfect insect's wings. We have here three conditions for the same results. Again, I have found in experimenting, that cocoons laid aside for twelve months produce when played with, a tickling sensation about the face (the nose being perhaps most sensitive). If this urticating property were produced by existent poisonous liquid, then we must surmise that when dried up, (as it would most likely be after twelve months' duration) the irritant still produces power of affection. May not the tickling or poisoned sensation be brought about by an exhalation at once pungent and affecting, proceeding from the body of the larva and imago, and introduced into the hairs surrounding the cocoon, for the sake of protecting the eggs when the parent is no more? Auriflua and Chrysorrhœa are intensely careless in exposing their cocoons to the inclemencies of weather, and the attempts of marauders. The covering protects them from the first, urtication from the latter. But this theory is clouded in practical falsity, as Auriflua is exceedingly subject to victimisation by a parasitic microgaster. The whole matter is covered with obscurity, and requires proven investigation. In the case of the poisoned part itself, the little "bumps" do not appear to ripen or "come to a head," so that the poison, if introduced, must disperse itself in some method or other.—*Ess Dee Bee, Huddersfield.*

A SPIDER.—Professor Allman is reported by the "Times" of the 21st of August to have said in his presidential address to the British Association at Sheffield, that "the simplest physical law is absolutely inconceivable by the highest of the brutes." A few minutes after reading this startling dogma from such an authority, I was in a position to watch a small spider, commonly called a money spinner, for an hour and a half. If a spider comes under the brute denomination, it would seem as if two complex physical actions were comprehended and performed by this individual brute. A lady sat close before me with a straw hat on; there was a rather straggling ostrich feather on it, a plaited satin ribbon, and a broad brim. The spider was spinning its web over the gaps in the feather, between that and the plaits, and from these to the outer edge of the brim. In doing this it had occasion to form lines from feather to the ribbon and to the brim. As the lady frequently moved her head, the relative positions of the three points were constantly changing. The first attempt to run a line from feather to brim was apparently a failure, it dropped beyond the point, till it was within a few inches of a neck frill; it stopped there suddenly, as if aware that if its web was fastened to two separate articles, it would be useless. After hanging there for a few moments, it climbed up its stay to the feather again, there it rested. In a short time the head moved; the brim came under it; down dropped the spider, and fastened its stay. Now the journey from the brim to a plait was short and easy, but that would not satisfy the architect; it climbed up again to the feather, passed on to another point, and dropped a radius of its circle on to a plait. These actions were repeated several times; but after the first overshot, the distance was never overdone. If the plait on the brim were not in the right place, the builder hung suspended till they came there, as a very slight incline of the head forward, or a lifting of it back, altered the position of the points; these proceedings were frequent; the spider constantly changed this feather point, while always working to one centre on the plaits, and from there to its circumference on the brim. I read this sermon, that the spider was gifted not only with a conception of relative distances, and with a knowledge of motion, but with the faculty of forming the web on a complicated body, the points of which were frequently changing their relative positions, while the patience of the brute enabled it to spin its net over the gaps in the feather, from the feather end to the satin ribbon, with one set of radii from the ribbon to the hat brim, and the main rigging from the feather to the brim. My conclusion was that the brute reasoned on the physical conditions of its situation, and acted on its convictions; that this spider was gifted by its Creator with a reasoning capacity fitted to its grade in the world, and that it carried out its object by a practical application of complex physical laws.—*H. P. M.*

CAN NEW SPECIES ORIGINATE BY CROSSING?—In Mr. H. D. Barclay's letter of October he says, "there are some 20,000 species of animals, and not one instance is known of different species being crossed without sterility ensuing in the animal thus begotten." In reply to this I would state that a new species of deer has originated under our eyes in the United States, the following being extracted from Darwin's "Descent of Man," vol. ii. pages 255–256: "A writer in an excellent American Journal (the "American Naturalist") says that he has hunted for the last twenty-one years in the 'Adirondacks' where the *Cervus Virginianus* abounds. About fourteen years ago he first heard of spike-horn-bucks, these became from year to year more common; about five years ago he shot one, and subsequently another, and now they are frequently killed." The new species has a horny spike projecting forwards from the forehead more slender than antlers and about half as long, the end being a sharp point. The same writer then continues: "Undoubtedly the first spike-horn-buck was an accidental freak of nature. But his spike-horns gave him an advantage, and enabled him to propagate his peculiarity. His descendants having a like advantage have propagated the peculiarity in a constantly increasing ratio, till they are slowly crowding the antlered deer from the region they inhabit." I think we have here an unquestionable case of a new species arising of which we have the origin, and other species may have originated in the same manner. When Mr. H. D. Barclay says that sterility ensues in an animal propagated from two different species, I would remark that the varieties of ducks, dogs, pigeons, &c., are almost endless, but the first of each variety was the result of cross-breeding of two species of dogs, ducks, or pigeons, as the case may be, and who has not heard of and seen mongrel dogs, produced by the mixing of two species? It may be argued that such "freaks of nature" are only occasional occurrences, but the animal kingdom has existed for an enormous length of time.—*E. A. Brunetti.*

Mr. Dealy and the Gamekeepers.—I am glad to find that Mr. S. Woolley has taken the trouble to expose the fallacy of Mr. Dealy's very curious calculation "with regard to the destruction of small birds by the sparrow-hawk," and I quite agree with him that such a style of writing cannot be too highly condemned as misleading in the extreme, in proof of which this curious calculation will be found seriously quoted in a letter which appeared in the "Standard" newspaper of January 2. Nothing can be more illogical than Mr. Dealy's whole style of reasoning; he first takes great pains to show that the habitat of the sparrow-hawk is "the wooded districts of mountainous regions . . . . amid the savage repose of nature," &c., that its "shy, wary, restless disposition . . . . necessitates it to shun man's society, and seek rather the deep solitudes and quiet seclusion of the most tangled retreats of the forest;" he then chooses for its favourite food the house sparrow, which, as its name implies, is scarcely to be found beyond the busy haunts of man. There can be no doubt that the sparrow-hawk is a great destroyer of insect-eating birds, and that if Mr. Dealy's argument for their preservation were the only one which could be adduced, their chance of finding favour would be small indeed. But my object in troubling you is not at all in defence of the sparrow-hawk, but of a class of honest industrious men whom Mr. Dealy has chosen to speak of in terms of the greatest severity—I refer to gamekeepers. I have had no little experience of gamekeepers, and am persuaded that if they are no better than the average of men in their class of life, they are certainly no worse. The gamekeeper holds a position of very considerable trust, much valuable and very marketable property is absolutely at his disposal, from hatching-time till his coverts are shot his whole time (day and night) and energy are given up to the care of his birds, and very often his life risked in their protection. The gamekeeper well knows that the estimation in which he is held by his master will be just in proportion to the head of game he is able to show at the proper season, and his "dark illiterate mind" tells him that if he wishes to keep his birds, he must destroy their enemies. What says Mr. Dealy? "If there are any preserves of partridges or pheasants in its vicinage, it will acquaint them with its presence. It levies frequent contributions on all—farm-yard and preserve, poultry and game," and again, "In fact, its life is essentially one of continued action and exertion, of marauding expeditions, of ceaseless plunder and deeds of piracy. Indeed this bird is a pirate among feathered creatures, the tyrannical despot of the woods, a rover, a pillager and a plunderer. It shoots through the air like a passing meteor—dark and mysterious—and as a flash of heavenly light (sic) dashes itself upon its poor luckless victim," &c., and much more to the same purpose. Surely this is quite sufficient to procure the death-warrant of the poor sparrow-hawk! And yet Mr. Dealy exclaims, "Keepers of the woods, divest yourselves of selfish prejudice or the wrong will recoil on your own heads," &c. I cannot but think the gamekeeper who chances to read Mr. Dealy's article will go into the woods, his heart more steeled than ever against the poor sparrow-hawk, and not the least cause of this result will be the hard and undeserved language which has been used towards him. It is quite true that "the balance of nature is disturbed, nay, her equilibrium is upset," and we "behold the consequence, witness the result," but it is not by attacking the gamekeeper that things can be put right, the remedy must come from their masters; and if Mr. Dealy can induce the landed proprietors to sternly interdict the destruction of hawks and owls, and enjoin greater attention to the rats, he will be doing a service in which all good ornithologists will wish him success.—*T. Southwell, Norwich.*

Friends in Council—if you like—i.e. folks to help one another, *mutually* (according to the exact meaning of that word). I however never "signified my *ability* (which *willingness* implies) to help learners," but only that I was willing to correspond with others, and so to interchange views as well as specimens—botanical, geological and mineralogical—with such.—*Veneo.*

Troubles of "Assisting Naturalists."—As one of the "assisting" naturalists, whose names appeared in your list in December last, I have received many parcels of mosses and a few hepaticæ for identification. Some, however, have been sent in such a state of confusion as to make it impossible to name them, e.g., half-a-dozen species of hypnum in one mass; in another parcel infinitesimal fragments of a Bryum with enough soil and lime dust to cause extra postage. The packet however of one lady muscologist was a pattern for all others. Each species (most of them excellent examples) was enclosed in a folded envelope of thin but tough paper, on which was a number, with a note of the habitat, soil, &c., while on a half sheet of note-paper were corresponding numbers, habitats, &c., with a blank for the names, thus leaving the nomenclator nothing else to do but to inscribe the name of the species opposite to its corresponding number. Good examples should be sent, and, if possible, specimens in fruit.—*R. A., Wellington, Shropshire.*

The Extermination of Birds.—Major Lawson's suggestions to ornithologists have again drawn the attention of all those interested in the protection of birds. Last winter birds of all kinds were slaughtered in the most ruthless manner. Thousands of such birds as fieldfares, thrushes, starlings and finches were to be seen exposed for sale in the game-shops. During the whole of the summer bird-catchers may be seen to set their lime-twigs and nets to catch the various small birds, and the game-keepers have improved the hawks and other "vermin" off the greater part of the British Isles. No sooner does a rare bird appear than several enthusiastic collectors go in pursuit, and usually the unfortunate wanderer is added to some collection, and a paragraph appears in one of the papers recording the appearance and death of the *rara avis.* It is time some movement was made, as the Wild Birds Protection Act is a perfect dead letter. Even the present close time does not meet with the approval of the gunners along the coast. A petition for the extension of the open season was signed during the past summer by a large number of the inhabitants of Holy Isle. The close time is little protection to the birds at the Farn Isles, as the eggs are taken twice and the birds hatched from the third laying are not fit to fly when the open season commences. Large numbers of gunners from Newcastle, Shields, and Sunderland go in steamers to the Farn Isles and shoot the birds in thousands, not five per cent. being picked out of the water. At the Bass the close time is no protection to the young gannets. It is to be hoped that ornithologists will unite and endeavour to protect the birds which in many places are in danger of extermination.—*J. T. T. Reed, Ryhope, Sunderland.*

Parasites (?) of Fly.—While examining a blue-bottle fly in a live box it excreted a drop of clear fluid in which under $\frac{1}{4}$ obj., I saw something moving. I then put on an $\frac{1}{8}$, and found them to be minute oblong bodies, slightly larger in the centre than the ends. At each end there were two or more cilia with which they moved with great rapidity; they had a nucleus. Could they be spermatozoa, or were they parasites? Any information would oblige.—*R. W. Watson.*

Painting on White Satin.—In answer to your inquiry respecting this subject, you will find that by using a little white of egg with the colour, it will serve both to prepare the surface and also to give the painting a soft-glazy appearance.—*G. E. W.*

Woodcocks or Goat-suckers?—In "Westward Ho!" p. 89, chap. v. Charles Kingsley, describing an evening scene "under the hunter's moon," speaks of "woodcocks, which chuckling to each other, hawked to and fro like swallows between the tree-tops and the sky." How could a naturalist, as he was, make such a blunder as it seems to be? Is it not the fern-owl or goat-sucker here described?—*T. A. B.*

Late appearance of Swallows.—On Dec. 17, while at Exeter, I saw two swallows flying about. Their flight was not so rapid as during warm weather, and every now and then they would perch on some tree, as though wearied with their exertions in making way against the strong east wind that was blowing at the time.—*W. H. Newbery.*

Nesting of the Wren at Christmas.—On Christmas Day of last year I was at Daventry, about twelve miles from here, where I was shown a nest of the wren (*T. vulgaris*), containing two eggs, and which had been taken that morning from a field close to the town by a man in the employ of Mr. Alderman Wilcox.—*F. F. R., Northampton.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

To Anonymous Querists.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

J. W. Carr.—In answer to your query as to the floras of Northumberland and Durham, we refer you to the article on "Local Floras," in the last number of Science-Gossip.

A. G. W.—We are always glad to aid correspondents in naming specimens; but we do not undertake anything which a little trouble would enable a correspondent to do for himself.

F. H. A. (Fishbourne).—As we told you, we were quite puzzled with the carex; now however, we can without doubt state that the larger one is *Carex axillaris*, and the other *C. divulsa.*

P. and others.—We cannot reopen the discussion on "Intelligence in Man and Animals"; the continuance thereof would be endless. We allowed both evolutionists and anti-evolutionists to express their relative views, and of the two the latter occupied by far the greater space. As the discussion had run nearly the whole year, and there seemed no more likelihood of the opponents satisfying each other, than of two parallel lines meeting, we thought the December number of Science-Gossip was a fitting one in which to close it.

R. G. S.—We have found that by carefully throwing the sand containing foraminifera into a still glass of water, we could separate the foraminifera, which float for a time on the surface, whilst the grains of sand fall immediately to the bottom. The foraminifera can then be picked out by a bristle.

J. H.—We have received, per Indian parcel post, a package signed with these initials, containing a thin slab of arenaceous limestone, marked on both sides with very pretty fern-like markings, often mistaken by young geologists for fossil plants in a fine state of preservation, but which are merely the dendritic crystallisations of oxide of manganese, and not of organic origin at all.

W. H. Shrubsole.—Many thanks for your specimen of London clay. There can be no doubt of diatoms occurring in it. We ourselves detected numerous specimens of *Coscinodiscus in situ.*

T. C. Ryley.—The supposed *Æcidium* on the thallus of *Marchantia* is merely one of the usual cup-like receptacles containing gemmæ or bulbils.

S. B. A.—If your sea-anemones are placed in a saucer of sea-water until their tentacles are fully expanded, and then a solution added slowly and quietly, composed of bay salt, 4 oz., alum, 2 oz., corr. sublimate, 2 grains, dissolved in one quart of rain-water, the anemones will be killed in their expanded state. The price you mention (2*s.* 6*d.*) is too small for any good book on British mammals, birds, or fishes. Some excellent and cheap books on fishes, &c., are published at the *Bazaar* office, 170 Strand.

W. L. Sothern.—No properly constructed telescope should admit of moisture being formed within the tube on the side of the object glass nearest the eye. Occasionally moisture will be found between the lenses, in which case the lenses must be taken from the cell and carefully cleaned, taking care that they are replaced precisely as at first. Moisture on the outside of the object glass can always be prevented by the use of a dew cap of sufficient length, which you can easily supply of card-board if the instrument maker has not affixed a metallic one.

J. R. N. (Kingston).—We have little doubt it is *Orobanche minor*, though they are difficult to name in a dried state.

G. S. W. (Ventnor).—You are quite correct; it is a specimen from the Lace bark tree (*Daphne Lagetta*), but it is not the Chinese rice paper; you can probably procure good sheets of the latter from Messrs. Horniman, tea merchants, London.

J. O. (Ovenden).—There can be no doubt, it is the rhizome of the common bracken (*Pteris aquilina*) which has been formerly growing from some crevice in the quarry; it will keep fresh, in its present state, for many years.

A. A. (London).—It is one of the Deutzias, most likely the *D. scabra*; the hairs are most beautiful microscopic objects.

W. B. (Plumstead).—You will find Hooker's "Student's Flora" the most reliable work on British flowering plants; the other work you name is almost valueless to an amateur. The examples sent are, No. 1. *Ornithopus perpusillus*, L.; No. 2. *Polygala vulgaris*, you have been confused in this by mistaking the floral organs; No. 3. *Scabiosa succisa*, L.

W. R. P. (Cheltenham).—There is a work on orchids published by Lovell Reeve & Co., Covent Garden, London, which you would find very useful; it is the only monograph on the order. We should advise you to write for their catalogue; your friend might procure the work in India.

EXCHANGES.

Good fossils wanted for igneous and metamorphic rocks (fine), last four volumes of "Quarterly Journal of the Geological Society," "Geologist Magazine" 6 volumes, Penning's "Field Geology," &c.—F. G. S., 3 Melbourne Road, Leicester.

Black Poduræ scales, mounted dry or in balsam, and straw bristle mould in balsam, for any good mounted objects.—E. Holmes, 149 Essex Road, N.

Lepidoptera for birds' eggs.—Wm. Simmons, 6 New Walk Terrace, York.

Limacina antarctica, for atlanta, firola, hyalaeá, diphyllidia, spirula or voluta (animal indispensable).—J. Turner, Davenport, Stockport.

Wanted, microscopic cabinet, for slides, material, &c., exchange small collection of British coleoptera, gold ring, &c.; write for list to F. S. Lyddon, 32 High Street, Warminster, Wilts.

Have vols. i. and ii. of Cassell's "Science for All," and vol. i. of "Great Industries of Britain" (unbound); wanted, magic lantern or offer.—A. Alletsu, 11 Foley Street, Langham Place, London, W.

For well-mounted slide of hedgehog tick, send really good slide to Geo. Turvill, East Worldham, Alton.

British mosses, marine algæ, zoophytes, &c., offered to collectors in foreign countries in exchange. Wanted correspondents in all parts of the world, particularly South America, China, East Indies, West Indies, and Africa.—B. B. Scott, 24 Seldon Street, Kensington, Liverpool.

West Indian marine soundings, micro specimens of foreign mosses, algæ and zoophytes, for micro slides or herbarium specimens of algæ, mosses, or zoophytes (British or foreign).—B. B. Scott, 24 Seldon Street, Kensington, Liverpool.

Wanted, chalk, wealden, oolitic, and Devonian fossils in exchange for permian and carboniferous limestone. Address, Henry Horner, jun., Sunderland.

"Natural History Review," bound, 1857 and 1859 (bis), and many odd numbers; "Cornhill," unbound, for 1860, 1863, 1864, 1875; "Good Words," unbound, for 1867, 1868, 1869; "Punch," odd numbers for 1876, 1877, and many odd numbers, for many years of "Illustrated London News," in exchange for "Natural History Magazine" or books. Wanted, "Natural History Review," 1860, April and October.—Alpha, 18 Upper Fitzwilliam Street, Dublin.

Duplicates—*Mytilus barbatus*, *Calyptræa sinensis*, *Cardium Norvegicum*, *Pecten varius*, *Tapes virginea*, and a few specimens each of *Rissoa parva*, *striata*, *Punctura*, *Kellia rubra*, *Cyamium minutum*, *Hydrobia subumbilicata*; also about forty species of British lepidoptera; wanted, British marine shells and birds' eggs.—Thomas H. Hedworth, Dunston, Gateshead.

Sparrowhawk, warblers, wood-wren, gold-crest, fire-crest, tits, nuthatch, night-jar, grouse, oyster-catcher, eider duck, puffin, razor-bill, gannet, arctic fern, gulls, and many others, for British birds' eggs, side-blown.—W. F. Sutton, High Claremont Terrace, Newcastle-upon-Tyne.

Wood's "Illustrated Natural History Zoologist" January and February, 1875, Gregson's "Notes on Variety—manufacturing of Lepidoptera," Wood's "British Beetles," "Angling," by Blakey, any or all of which I would exchange for, together with Beeton's "Home Pets," the following: Newman's "Entomologist" for 1868-69, Harting's "Handbook of British Birds," Duncan's "British Moths," or "Half-hours in the Green Lanes," by J. E. Taylor.—W. Thomas, St. Andrew's Hospital, Northampton.

Unmounted material wanted in exchange for slides. Lists to be sent.—E. Clover, Springfield, Sudbury, Suffolk.

Wanted, fresh spores of *A. lanceolatum*, *Ceterach officinarum*, *Woodsia alpina*, *Woodsia ilvensis*, *Lastrea æmulum*, *Gymnogramma leptophylla*, *Cystopteris alpina*, *C. montana*, *Polypodium alpestre*, *P. flexile*, for spores of other British and exotic species.—J. W. W. Brook, 256 Kensington Street, Bradford, Yorks.

Wanted, all kinds of parasites for mounting for cash payment.—T. S. Morten, 40 Haverstock Hill, London, N.W.

Splendid diatoms *in situ*, mounted opaque for binocular, in exchange for parasites or other objects of interest.—J. Horn, Yew Villa, Bacup, Lancashire.

Wanted, good micro slides, in exchange for fossils or minerals.—T. H. Needham, 5 Mecklenburgh Street, W.C.

A good slide of seed of *Epilobium angustifolium* (stained), to be had for diatoms or diatomaceous deposit, boiled. Address, H. S., Fairoak, Palatine Road, Didsbury, near Manchester.

Wanted, fossils, in exchange for entomological apparatus, books, &c.—C. Swatman, 11 London Road, Sevenoaks.

British birds' eggs wanted, in exchange for either minerals or foreign shells.—F. M., 13 Daisy Grove, Wavertree Road, Liverpool.

Well-mounted diatom deposit exchanged for picked diatoms or pure gatherings.—P. Z., Lilly Villa, Victoria Park, Manchester.

Send diatomaceous material for guano containing forms of *Aulacodiscus Comberii*, *Pyxidicula cruciata*, *Actinosphæria halyonyx*, &c. Letter previous, stating amount.—J. Millins, 6 Brighton Place, Stretford, Manchester.

For a well-mounted slide I will send scales of bib, smooth dab, John Dory, power cod, horse mackerel, burbolt, &c., unprepared, and about 100 scales of each.—E. Matthews, 40 Ponsonby Place, Vauxhall Bridge, London, S.W.

A slide of satin spar from Matlock, a pretty polarizing object, and other good slides, in exchange for good material.—J. Blackshaw, 57 Cross Street, Louth, Blackenhall, Wolverhampton.

"Midland Naturalist" for 1879 (unbound), in exchange for Proctor's "Half Hours with the Stars" or a few fossils.—T. A. Pearson, Milnrow, Rochdale.

Wanted, slides of foraminifera, &c., also cretaceous limestone, and other fossils. Books on general literature, &c., in exchange. Lists and desiderata to B., 9 Royal Terrace West, Kingstown, Ireland.

Platino-cyanide of magnesium, mounted in balsam for exchange; parasite or diatom preferred.—W. H. Symons, 2 Queen's Terrace, St. John's Wood.

For beautiful stellate hairs on leaf of *Crysteria coccinea*, and cuticle of yucca, &c., send foraminiferous material or micro slide.—M. Meadhurst, 1 Gladstone Road, Liverpool.

Rare birds' eggs to exchange for others not in collection.—Dr. J. T. T. Reed, Ryhope, Sunderland.

Desiderata—*H. obvoluta*, *H. lamellata*, *H. fusca*, *Z. nitidus*, *Z. excavatus*, *Azeca tridens*, *A. acicula*, *Pisidium obtusale*, *T. haliotoidea*, *Dresseina polymorpha*, *L. auricularius*, *L. involuta*. For the above in quantities of each, are offered—*Succinea oblonga*, *L. Burnetti*, *V. antivertigo*, *V. pusilla*, *V. alpestris*.—W. Sutton, Upper Claremont, Newcastle-upon-Tyne.

I have the first vol. of "Grevillea" in numbers that I wish to exchange for a copy of "Rust, Smut, Mildew, and Mould," by Cook. I have also a lage number of selected specimens of fossil plants, showing internal structure, illustrating the memoirs of Brongniart, Binney, Williamson, Carruthers, and others, which I am wishful to exchange for small cabinets of about three or four trays to hold about two or three dozen microscopic slides, or I would take cash.—John Butterworth, Goat's Shaw, near Oldham.

I am willing to exchange "Experimental Chemistry," Lochar and Heaton; "Inorganic Chemistry," Wilson; "Manual of Mineralogy," Dana; for zoological books or microscopical objects. Arthur Marshall, 35 Connaught Square, Hyde Park, W.

BOOKS, ETC., RECEIVED.

"Propagation of Food Fishes." United States Commissioners' Reports, 1877.

"The Crayfish." By Professor Huxley. London: C. Kegan Paul.

"Fourteen Months in Canton." By Mrs. Grey. London: Macmillan.

"Youth: its Care and Culture." By Dr. J. M. Granville. London: David Bogue.

"The Great Frozen Sea." By Captain Markham, 4th edition. London: C. Kegan Paul.

"Field Geology." By W. Penning, 2nd edition enlarged. London: Baillière, Tindal, & Co.

"Bulletins of the United States Geological and Geographical Surveys," vol. v. Nos. 2 & 3.

"A Monograph of the Silurian Fossils of the Girvan District, Fasciculus II." By Professor Nicholson and R. Etheridge, jun. London: W. Blackwood & Son.

"Journal de Micrographie."

"Feuille des Jeunes Naturalistes."

"Botanische Zeitung."

"American Naturalist."

"Canadian Entomologist."

"Scottish Naturalist."

"Midland Naturalist."

"Popular Science Review."

"Land and Water."

&c. &c. &c.

Communications received up to 10th ult. from:—J. F. R.—F. K.—S. H. N.—J. H.—R. M.—J. W. C.—J. D.—E. S. B.—G. H. B.—J. S.—A. G. W.—J. C.—A. K.—Dr. M.—C.P.—G. T. H.—J. A.—J. M.—T. S. M.—O. J. B.—Dr. C. C. A.—J. B. R.—V. C.—C. J. U.—H. W. K.—C. W. S.—H. W. S.—J. W. W. B.—H. P. M.—S. A B.—J. O.—E. A.T.—E. W. B.—J. T. C.—E. C.—E. A. B.—F. H. P.—W. J. H.—A. L.—W. B.—E. S.—W. R. P.—E. H.—J. T.—W. H. N.—F. S. L.—W. S.—E. C.—A. A.—W. H. S.—G. T.—B. B. S.—F. F. R.—G. M. D.—J. A.—T. B. L.—B. H.—H. H.—W. W. F.—T. H. H.—T. W.—W. T.—H. J.—C. J. A. C.—W. F. S.—T. C. R.—F. M.—W. L. S.—C. S.—J. T. T. R.—W. D. S.—H. S.—M. M.—J. L.—F. P.—W. H. S.—R. G. S.—J. B.—P. K.—T. A. P.—J. E. W.—E. M.—R. W. W.—T. W. O.—P. Z. jun.—G. E. W.—M. W. N.—J. R. N.—J. A.—R. A.—S. B. A.—J. A. W.—W. H. S.—J. F.—M. J. S.—H. G.—T. H.—M. M.—W. G.—H. B.—&c.

THE REPORT OF THE "CHALLENGER" EXPEDITION.*

By AGNES CRANE.

FOUR years have elapsed since H.M.S. *Challenger* anchored at Spithead on the termination of a most successful voyage round the world of three years' (1873–76) duration. A considerable interval was necessarily requisite to distribute the immense amount of material accumulated during the cruise. But the long delayed publication of any official account of the zoological results of the expedition has been unfavourably commented on. The appearance of the first part of the initial volume of the series of reports at the commencement of the new decade will therefore be eagerly welcomed by the scientific world. Professor Sir Wyville Thomson's announcement, that the whole of the first volume—comprising the memoirs of Professor Kölliker on the Pennatulida, of Dr. G. S. Brady on the Ostracoda, Professor Turner (bones of Cetacea), Dr. Günther (Shore Fishes), and that of Mr. Kitchen Parker on the Embryology of the Green Turtle—will shortly be forthcoming, and that others by the various eminent naturalists engaged are in an advanced state of preparation, will be regarded as highly satisfactory. Now that the work is all distributed and is proceeding simultaneously on all branches, we may reasonably hope that the fifteen quarto volumes to complete the series (each of which, it is stated, will almost equal in bulk an annual volume of the Transactions of the Royal Society), will proceed more rapidly towards publication, and that information concerning the rich harvest of zoological treasures accumulated by the *Challenger* will ere long be within reach of that section of the public specially interested.

The instalment now published comprises the report first completed, that of Mr. Thomas Davidson, F.R.S., on the Brachiopoda. It is issued separately by Sir Wyville Thomson, under whose superintendence the whole will appear, for distribution among the naturalists engaged as illustrating the method of treatment to be adopted, and the style in which the series will be brought out. This is an advance in the right direction, though one that, so far as Mr. Davidson was concerned, might have been taken several months back. The part contributed by that eminent brachiopodist contains sixty-five clearly printed quarto pages, and four artistically drawn plates of the new species dredged by the *Challenger*. The illustrations are furnished by the skilful pencil of the author in accordance with his invariable custom.

A considerable number of specimens referable, however, to comparatively few species, were collected during the cruise. In fact only thirty-one species out of about 130 known surviving forms of this once far more abundant group of humbler molluscs were obtained. Ten of these proved new to science, and are appropriately named by their describer after the members of the naturalist staff, or specialists on the group. By far the larger number of the thirty-one species were found to belong to the more lowly organised division of clistenterate brachiopods, or those which are destitute of an anal aperture. Only one species of Crania, one of Lingula, and two Discina represented the more highly organised tretenterates which are provided with that structure. A solitary Rhynchonella, a variety of the well-known black species *R. nigricans* of New Zealand, was brought up off Kerguelen Island from 150 fathoms. A single specimen of a new species of the subgenus Terebratulina (*Wyvillii*), the largest hitherto discovered either in the recent or fossil state, was also dredged off Culebra

* Report on the scientific results of the voyage of H.M.S. *Challenger*, "Zoology," vol. i. 1880. Sold in London, Edinburgh, and Dublin. Published by order of Her Majesty's Government.

Island in the West Indies, in comparatively shallow water. Our knowledge of the ranges of depth at which Brachiopods exist has been considerably extended. Thus, Mr. Davidson tabulates six species from 1000 to 1500 fathoms, four from 1500 to 2000, and three from 2000 to 2900 fathoms. At that enormous depth (three miles and a quarter), the remarkable new and far ranging species of Terebratula named *Ter. Wyvillii* was procured from one station. The exceeding delicacy and transparency of the shell in many of the deep-sea forms is very extraordinary.

The brachiopods appear to adapt themselves readily to every variety of depth. The deep-sea forms however are apparently widely distributed; below 2000 fathoms the same species recur again and again. In a word, the uniformity of the abyssal forms is just as marked among this group as among others, and results probably from the influences of temperature which never exceeds a few degrees above freezing-point below a certain depth. Mr. Davidson gives full descriptions of the new species, clears up the history and synonymy of many forms before imperfectly known, and conveys a considerable amount of valuable information in a condensed form relative to the geographical and bathymetrical distribution of the 130 recent species. Therefore his report is especially valuable to students, who will find therein an epitome of our present knowledge concerning the living members of this interesting group of organisms.

A LADY'S VISIT TO A DERBYSHIRE CAVERN.

ONE of the most beautiful, interesting, and at the same time least known of all the natural curiosities, which render the peak of Derbyshire famous, is Bagshaw's Cavern, Bradwell, near Castleton. Fifty years ago an account of it was published in "Picturesque Excursions in the Peak," and also in Hutchinson's "Tour through Derbyshire;" but few of the later guide-books even mention it. On one of the few fine days of last summer, my brother and I left Miller's Dale station, soon after nine o'clock, on a walking tour through the Peak, intending first to visit this wonderful cavern. After a lovely walk through Tideswell, Hacklow, and past Hazlebadge, we reached Bradwell a little before twelve o'clock, and found the proprietor of the cavern, Mr. John Hall, ready to accompany us.

After providing ourselves with candles, matches, magnesium wire, &c., at his house, we proceeded to the cavern, the entrance to which lies on the hillside, about a quarter of a mile south-west of the village. Here Mr. Hall has erected a stone building for the accommodation of visitors, and has spent much time and money to make the exploration of the cavern easier. Having put on gingham dresses to protect our own, as the cavern is in some places narrow and rather wet, we, each carrying a light, commenced our journey by descending one hundred and twenty-seven steps, most of them cut out of the solid limestone, the guide first, and my brother bringing up the rear. On leaving the bright sunlight it was difficult to see anything, so we waited a few minutes to become accustomed to the gloom. The steps follow the course taken by the miners, who, in search of lead, discovered the cavern; the remains of the mineral vein, with pieces of lead in it, can be plainly traced in the roof. For some distance the rock is full of Encrinites, and bands of chert (silicate of lime) also appear, which to the geologist are well worth studying. Nearly at the bottom the mineral vein becomes "straiter," and soon after dies out.

After entering the cavern we first proceeded through a long passage, with numerous stalactites on each side, to the "Hall of Fairies," which is covered with crystallisations, and well deserves its name; the passage then becomes rather low and narrow for some yards till it arrives at the "three lane ends," where is a curious hole in the rock called the "elephant's throat," and in the roof is a band of chert like the sole of a foot, with stalactites hanging from the toes, which, from its enormous size (about five feet long), is called the "Giant's Foot."

Taking the way to the right for about fifty yards we came to the "church hole," which is 30 feet long, 15 feet wide, and about 40 feet high, the sides being covered with incrustations in all stages of growth. Returning to the "Giant's Foot" we now took the path to the left, and soon reached the "Bell House," in the roof of which are a number of holes looking like bells hanging in a church tower. A little further on we observed a stalagmite, about 3 inches across the bottom, and 4 inches high, formed by drops of water continually falling from the roof, where they have left but little deposit in the shape of stalactite. As we proceeded we saw on the sides nodules of chert of all shapes imbedded in the limestone, resembling flies, beetles, butterflies, &c.; we then came to the "Bursting of the Tomb," where the crystallisations in one part resemble a mass of maggots, and in another look as if melted wax had been poured over the rocks; and the guide told us of one visitor who was so incredulous about the matter, that he actually applied the lighted candle to see if he could not detect what he thought was a fraud, and not the work of nature. The passage now becomes covered with brilliant crystallisations, numbers hanging from the roof, some of them after growing straight for a time, turn up at the point and form hooks, others resemble stags' horns, &c. For a few yards these crystallisations are lost, then suddenly reappear more beautiful than before. Amongst the many grotesque forms they assume, one resembles an elephant's head, with trunk and tusks, and near it in the roof, is a piece of chert covered with a deposit of lime, very like a shoulder of mutton.

We next arrived at the "Chamber of Worms." This name exactly describes the appearance of the small curling stalactites on the roof and sides, looking like worms writhing out of the rock, their colour varying from white to deep yellow. A few more steps bring us to "Tom of Lincoln's Bell Hole." Here the water, dropping from the roof, frequently changes colour, from white to red, giving a beautiful variegated appearance to the stalagmite forming underneath.

Further on is a piece of chert in the shape of a sheep's head, and also a perfect forest of small stalactites, varying in size to three inches in length; these have all been formed since the cavern has been in the hands of the present proprietor, and are growing more quickly than any others, the drop of water at the end of each hanging long enough for a deposit of lime to take place before it falls to the ground; in other places, where the water percolates more rapidly, the growth is slower. Passing along, almost every step brings in view some new form or colour in the incrustations, and in a small chink in the rock the guide pointed out a stalagmite, exactly like a goose roasting. The succeeding caverns, however, far exceeded in brilliancy and colour everything we had previously seen. The first, named "The Grotto of Paradise," is about 20 feet long and 12 feet high, and has a pointed roof like a gothic arch hung with numberless splendid stalactites, and a floor and sides one mass of crystallisation.

The second is called "Calypso's Cave." It is impossible to give any idea of the beauty of the long slender stalactites hanging like icicles from the roof, and of the rows of columns, and the masses of honeycomb which adorn the sides. The floor also is covered with a stalagmitic deposit, to which numerous stalactites, fallen from the roof, are fastened by the dripping water. To obtain the best view of this cavern we ascended some steps to a recess, while the guide illuminated it with magnesium wire, and the effect of the brilliant light on the mass of crystallisation was beautiful in the extreme, and is more easily imagined than described. Climbing up the encrusted side we entered a narrow chink called the "Straits of Gibraltar," where splendid masses of crystallisation cover the whole of the rock, many of them 2 to 3 feet long, and of great thickness. We then retraced our steps for some distance, and turning to the right, through a low passage, entered the "Hall of State," which is much wider and higher than the other parts of the cavern. Beyond this is the Dungeon, a circular hole about 30 feet deep, which the guide has explored and found other spacious openings leading out of it. The next object of interest is a large rock covered with crystallisation, like honeycomb or net-work, and above it, in a niche, is a stalagmite resembling a recumbent figure on a tomb. The stalactites on the roof are of all shades, from deep red to pure white, each with a drop of water at the end, sparkling like a diamond.

The way is now very rugged, large blocks of limestone having fallen from the roof ages ago, their shape exactly corresponding with the roof, which is now covered with stalactites. We then came to a large pile of limestone blocks, about 30 yards long, and 2 to 3 yards wide, in the shape of an old boat, pointed at each end, lying in the middle of the cavern, with a path on each side; the guide took the right-hand side, and we the other, and his light shining through the chinks in the rocks as we proceeded had a very curious effect.

Further on a small stream runs through the cavern, and in it are many smooth pebbles covered with a black deposit; the water has also brought with it a large quantity of sand, which is in some places ripple marked. The presence of this sand is very strange, as the country is limestone for some distance round. In the roof is a chink, which the guide a short time ago ascended, and found a narrow passage running for some distance over the one we were in, and filled with beautiful crystallisations. We next came to a fine opening, with curious stalactites running down the centre of the roof for more than ten yards, greatly resembling the backbone of a huge fish.

It was now half-past three o'clock, so we were obliged to defer till another day further exploration; the guide, however, informed us that the path descends for about a quarter of a mile and then branches off in five different directions, down each of which he has gone for hours without arriving at a termination; and in one of them is a large waterfall, falling 60 feet. The noise of it is deafening, and the guide has been so far beyond it as to lose all sound of it without finding the end of the passage. We were agreeably surprised to find the air of the cavern remarkably pure and fresh, and quite free from the unpleasant dampness so often experienced in such places.

The return journey was soon accomplished, and we reached daylight again soon after half-past four o'clock, highly delighted with our visit to this wonderful place.

ADA E. G.

LIST OF ASSISTING NATURALISTS.

[*Continued from page* 36.]

CAMBRIDGESHIRE.

Cambridge. Albert H. Waters, B.A., 1 Panton Street. *Geology*, *Entomology*, particularly *Lepidoptera*. Interested in Natural Histoiy generally.

CORNWALL.

Falmouth. Ernest Bullmore. *Phanerogams*, *Acrogenous Cryptogams*.

DEVONSHIRE.

Exeter. W. H. Newberry, Elm Grove House. *Ornithology.*

HAMPSHIRE.

Near Newbury (Berkshire), Miss Marian Ridley, Hollington House. Will assist by post only, in determining *British Ferns* and *Mosses.*

MIDDLESEX.

London. G. S. Boulger, F.L.S., F.G.S., 144 Kensington Park Road, W. *Biology, Geology*, and *Mineralogy.*

Hornsey. T. J. Lane, Rise House, Hornsey Rise, N. *Mammalia, Aves, Reptilia, Amphibia* (British).

SOMERSETSHIRE.

Bridgwater. Wm. Stoate, Elm Grove, Wimbdon. *Microscopy, Oology* (Foreign and English).

ON ALTERNATE DEHISCENCE OF ANTHERS.

IN Sir J. Lubbock's book on "Insects and Flowers," there occurs the following account of the movements and ripening of the anthers of Parnassia. The phenomena described are so curious that the writer was induced to take the first opportunity that presented itself, to examine them personally. As the passage referred to is brief, it may be quoted entire.

"It" (Parnassia) "has ten stamens, of which, however, only five bear anthers, while the others secrete honey at the base, and terminate in globular glands. The five polliniferous anthers ripen *not simultaneously but successively, and as each ripens it places itself right on the top of the stigma*, with its back to it, and the pollen is then discharged from the anthers on the side away from the stigma, so that it is scarcely possible for any to fall on it, and this is done by the five stamens in *succession*." Quoted from Bennett's "How Flowers are Fertilized," p. 19. The italics are not in the original, and are placed to indicate the parts of the description that do not appear to agree with the facts, so far as one could note them. The observations were repeated on a number of flowers, obtained from Bedfordshire, Hertfordshire, and Northumberland, and were continued through the summer and early autumn of 1878 and 1879. The conclusion arrived at was that the parts of the description referring to the placing of each anther on the top of the stigma, and the successive ripening of them are scarcely correct. The following account is based upon observations on some two hundred blossoms, and may be taken as pretty closely in accordance with the facts of the case. When the corolla expands the stamens are recumbent on the ovary, and closely applied to it, forming a compact whorl on the top of the stigma. First one of the anthers is slightly elevated, and as the dehiscence continues it is carried forward, describing an arc in its course, till the filament lies extended between the petals. The empty anther is suspended over the edge of the sepal, to which the stamen is opposite, and soon falls off. These movements are repeated by

Fig. 37.—Grass of Parnassia *(Parnassia palustris).*

the stamens, invariably in alternate order, which may be expressed thus, $\begin{smallmatrix} & 1 & \\ 3 & & 2 \\ 5 & & 4 \end{smallmatrix}$, or $\begin{smallmatrix} 4 & & 5 \\ 2 & & 3 \\ & 1 & \end{smallmatrix}$, and never in such a succession as would be represented by $\begin{smallmatrix} & 1 & \\ 2 & & 5 \\ 3 & & 4 \end{smallmatrix}$ or $\begin{smallmatrix} 3 & & 4 \\ 2 & & 5 \\ & 1 & \end{smallmatrix}$.

If a careful examination be made of the illustration of Parnassia, in "Flowers: their Origin, Perfumes, &c.," by J. E. Taylor (our Editor), it will be seen to be confirmatory of the above description.

Subsequent observations showed that this alternate ripening of anthers is not peculiar to this plant alone, but occurs also in the exquisite flowers of *Menyanthes trifoliata* (fig. 38). As it is improbable that these two plants present isolated instances of such peculiarities, it would be interesting to extend the observations to others, which have the same number of stamens as petals. In many instances in which the stamens are bicyclic, and thus double the number of the petals, the dehiscence occurs first, of the outer whorl or those opposite the sepals, and afterwards the inner cycle or those opposite the petals. In these instances the alternation is between the cycles of the stamens, and agrees with the sequence of their development. Examples of this are furnished by several species of the genera Stellaria, Saxifraga, Epilobium, and

Fig. 38.—Bog-bean *(Menyanthes trifoliata)*.

Lilium. Observations were made in May, 1879, on *Saxifraga granulata* and *S. umbrosa*. Both these are proterandrous, and the stigmas remained closely opposed to each other, till the whole of the anthers on the same flower had discharged their contents. In both cases the outer cycle of stamens ripened first, and afterwards the inner, which alternates with the other. In *S. granulata* each anther as it ripens bends over the unopened stigmas, thus occupying a position very near the centre of the corolla. An insect visiting a flower in which the ripened anther is thus placed strikes it with that part of its body which would come in contact with the stigmas of another flower that are in a receptive condition. When the anthers have discharged their pollen, they return to the position which they occupy when the corolla expands, which is near the circumference of the perianth, and thus the stamens do not prevent easy access to the stigmas. Their mission having been accomplished they are moved out of the way so as not to be a hindrance. In this instance there may be observed three movements of the stamens, which are—a motion towards the circumference as the flower expands, an alternate motion towards the centre as the anthers ripen, followed by another movement outwards. During the months of June and July, 1879, many observations were made on the flowers of *Stellaria holostea*, *S. graminea*, *Scilla nutans*, and *Epilobium hirsutum*, and there was no exception to the rule that the dehiscence of the two cycles of stamens was in alternate order.

J. SAUNDERS.

SKIN PRESERVING.

JUST at this time of year, when the "close season" is in abeyance, and when pottering round the hedgerows for the chance of a rabbit, one occasionally meets with feathers or fur worth preserving, I have been several times asked for hints as to making up skins, till a competent stuffer, a rarity unluckily, can be met with; and not being without experience of my own as to the difficulty of the matter, perhaps a few simple hints which may assist in overcoming the first difficulty, the *premier pas qui coûte* may be useful.

With a little practice, a bird's skin can be removed from the body as easily as that of a quadruped, and with a much more satisfactory result, as in the one case, there is a thick coating of feathers which will make up for any slight deficiency in the perfection of the skin itself, while, in the latter case, the greatest possible care must be taken, not to stretch the skin in the least; or a bare patch, which no amount of art will cover, will be the result. So that premising that the method of skinning is in both cases precisely the same, it will be as well to take the easier subject, the bird, on which to commence.

By "making up a skin," so arranging and preserving it is understood, that a professional taxidermist will have no difficulty in softening and setting it up, after a reasonable lapse of time,—while the plumage of the bird is preserved, as nearly as possible unruffled, in the ordinary position when dead.

The tools required are, I had almost said, none; but nothing more than a penknife is necessary, while a stout pair of pointed nail scissors are more handy for cleaning, and by no means cumbrous. Taking the bird as it lies, yet untouched, it is better to leave any dried blood stains to be removed after skinning. There is no advantage in cleaning at once, as after removal the feathers can be grasped from within, as well as from without, and there is less chance of stretching, the thing to be guarded against throughout. Any wet stains had better be removed at once with a bit of sponge, as they will be infinitely more troublesome when dry.

Having disposed of stains, notice where there are any wounds in the skin, for future guidance: one is very likely to increase a rent if it is unexpectedly come upon. Then take the bird by the beak, and smooth down the feathers with the free hand; placing the bird carefully on its back when every thing is in place.

The next step is to prepare the way for skinning the limbs. Taking the leg by the "knee," where the bare shank meets the feathers, and by the bone just above the joint, the leg is snapped—taking care that the pointed ends of the bone do not injure the skin—just within the commencement of the feathered portion. The same is done with the wings, and the ruffled feathers are replaced.

If the thick feathers covering the breast are now separated, a broad bare space will be found running the whole length of the body. Along this line an incision is made with the penknife, from the projecting end of the breastbone to the arms; then keeping the feathers as much as possible from the edges of the cut, though, if carefully made, there is not the least bleeding from the breast, and the special covering of the intestines is not cut through. The skin is separated with the back of the knife from the sides as far as possible, without lengthening the incision. Then carefully working down by the side of the abdomen, the legs are reached; the skin is turned back till the broken bone is found, and the muscles cut through; freeing the skin of the leg, and leaving only the broken bone end in the pocket formed by the removal of the "drumstick." The other leg is treated in the same way.

The connection of the arms with the abdomen must next be severed, and the skin turned back to the tail: the attachment of the spine to the tail severed, and then the skin of the back is carefully—for owing to the thinness of the covering here, the slightest stretch will make a woful gap in the feathers—reflected till the wings are reached. These are treated in the same manner as the legs, and then the skin is entirely removed from the body, leaving only the head and neck to be completed. The neck is cut through at its junction with the chest, as it and the head are treated separately.

So far this sounds like a very lengthy proceeding, but, in practice, the skinning of the whole body of, say a thrush, does not occupy more than five minutes, and there should not be more than the very slightest soiling of the fingers, if any, and none whatever of the feathers. Do not throw the body away, as it will be useful in finishing.

We now come to the head, which is the hardest part of the whole operation, since any stretching here, beyond what is unavoidable, must be very carefully guarded against. And, in mentioning this, it is well to remember that the skin should be supported during the whole process as much as possible, being allowed to rest on the tables, or on the knee, which, for myself, I prefer, as the weight of the feathers alone is enough to cause an awkward stretch in the thin backskin.

The head is cleaned by turning it backwards through the skin of the neck in most birds. Some of the waterfowl though must have a special slit made below the beak, to allow the skull to be turned through, but they are very few, and it is only a modification of the usual process.

Taking hold of the end of the neck, where it was severed from the body, the skin is gradually turned back till the skull is reached. The head is then steadied by grasping the back from the outside, and the skin gently pushed back over the smooth cranium till the eyes are reached. Then, grasping the exposed skull, the eyelids are detached from the orbit, and the skin turned forward to the commencement of the beak.

This leaves the head ready for cleaning, which is generally found the hardest part of the finishing process. I find that the best and quickest way, and one which answers exceedingly well, is to insert the point of the knife into the base of the skull as far forward as possible between the two halves of the lower mandible, passing it up to the roof of the skull, and then by cutting backwards along the sides of the lower mandibles to the back of the skull, removing the tongue and the whole attachment of the neck and its organs with about one-third of the skull, allowing the contents to be removed entirely. When the eyes are next removed, the anterior two-thirds only of the skull remain attached to the beak, and the whole is perfectly cleaned.

The skin is now ready for making up. Of course some preservative composition is a desideratum; and the best is the time-honoured arsenical soap. That which I have used, and which answers perfectly, is made of one ounce of white arsenic to four ounces of yellow soap. The soap is first shredded into a pot; and melted by being stood in hot water; and the arsenic stirred in gradually, then allowed to cool; covered, and a poison label affixed. But in case there are nothing but the ordinary household stores available, skins will keep very well, and for an indefinite time if the moth be kept from them, by curing with equal parts of alum and salt. This is rubbed into the skin extended on a board, and allowed to dry; after which the superfluous crystals are brushed away. This however has disadvantages, owing to the hard coating given to the skin, but for curing skins not meant for further stuffing than sufficient to retain their form, is quite satisfactory.

We now come to the final making up; and here the materials required are again simple; the preservative, tow, a needle and cotton, stout thread, and the scissors. The first step is to examine the skin, and remove any superfluous fat which may have been left attached; and to see that no portions of muscle remain on the broken ends of the limb bones; in doing which the preservative is well rubbed over the interior of the pouch formed by the skin of the legs and wings. Before returning the ends of the bones into the sheath, a shred of tow is wrapped round the end of the bone, and then formed into a pad as nearly as possible the size of the removed portion which still remains attached to the body, and the limbs will require no further treatment.

The whole of the skull, inside and out, is now treated with preservative, and the orbits filled with tow to as nearly as possible the natural amount of fulness given by the eyes when in their place—and the back of the skull is replaced by a ball of tow rolled up tightly, so as to fit the interior and give the requisite roundness lost by the removal of the hinder third in cleaning. The head is then gently returned through the "glove finger" formed by the neck, and any sinking about the eyes rectified by inserting more scraps of tow through the eyelids. The neck is then filled by gently passing up shreds of tow by means of a stick, taking care not to overfill it, or leave lumps of tow evident by their undue protrusion.

It is better, at this stage, to bring together any small gaps in the skin caused by shot or accident during skinning, by means of the needle and cotton, avoiding the rumpling of plumage which would be caused by including the root-ends of feathers in a stitch.

There only remains now to pad the body to prevent undue shrinking during the drying stage. This may be done either by merely filling up with loose tow, folding the skin over and allowing it to dry in position, or by making a fresh body of tow to replace the natural one as nearly as possible ; and this latter method is, I think, the better.

Taking the body, which has been kept as the model, a lump of tow is rolled into a compact ball, rather larger than the required size, and of the same proportions. The strong thread is then wound around it tightly, reducing it to the right size, and with a little management, giving a pretty correct model of the contour of the breast, &c. If anything, when completed, the tow body should be smaller than the natural one, to allow for the unavoidable shrinking of the drying skin. It is then placed in position, and the skin of the breast brought together evenly across it by a few stitches in the edges of the bare streak along which the first cut was made. Holding the skin by the beak, the feathers are carefully smoothed down, and returned to their natural positions. There will be no difficulty in the pose of the wings, which, unless stretched, will fall perfectly naturally into their places. The skin should be laid carefully on its back on a flat surface, in the same position as when held by the beak, securing the wings, if necessary, by a thread passing round the body, and left untouched till dry, which will take a longer or shorter period, according to the size of the specimen, and the state of the weather. Occasionally during drying there will be a tendency of some few feathers to become prominent, owing to contraction ; if they are few, they may be removed when the skin is dry ; but, in the case of a tuft of plumage, they must be kept down, either by a weight, or by a strip of paper crossing them and pinned through the skin to the tow body ; but, unless the body is overstuffed, there should be no difficulty as to smoothness of feathers. Perhaps the thick tuft covering the shoulders is most prone to rebel, and I have often found it useful to surround the wings with a broad strip of paper, secured by one pin through the breast, instead of the thread.

Quadrupeds are prepared, when small, in precisely the same way ; but, owing to the shrinking of lips, &c., they are never satisfactory ; and if required for stuffing, had better be packed off at once, unless they can be finished on the spot. Still, skins are ornamental, and I may conclude by one or two remarks as to preparing them for other purposes, than stuffing, *e.g.*, mats.

For this purpose I have found nothing better than the alum and salt already mentioned. Taking the animal, the body is laid on its back, a cut made through the skin from chin to tail, and two transverse cuts across the first to a short distance along the inner side of the legs, as far down towards the feet as the length of skin to be removed from the limb requires. In case the head is not to be retained, a cut is made from the bridge of the nose, past the angles of the jaws, to the first cut below the chin on each side, so that when the whole skin is removed, the included portion remains attached to the jaws, while the eyelids and ears are removed with the rest of the skin, the bone is drawn from the tail. The next step is to tack the skin, with the hair downwards to a board ; stretching it only just sufficiently to render it quite flat, and putting the tacks as near the edge as possible. Any adherent fat is then removed with a blunt knife, and the whole surface slightly scraped. It is then thoroughly rubbed with equal parts of alum and salt, and set aside for two days to dry. A second curing, and in two more days, a third are required, and the skin should be by the end of a week, nearly dry ; but it will be perfectly stiff and hard.

Taking the blunt knife, the best form of which is the ordinary round pointed table knife, the skin is thoroughly scraped, and the scraping continued till the hard surface is removed, and the skin is as pliant as washleather. In a day or two more a second, very rarely a third, scraping may be necessary, and the skin is then fit for use, and perfectly sweet.

There is one beautiful skin which deserves special mention in connection with this method of curing —the mole's. The best way to preserve it is by making a circular incision round the chest, as close to the "hands" as possible, and then turning the skin inside out over the body ; so that as much as possible of the skin is left untouched. The method of drying is to fit the pocket thus obtained, over a wooden cylinder, about twelve inches in length, and of the requisite diameter, and proceeding in the usual way. The hind feet may be cut off close to the skin, as they leave no appreciable hole.

So far I have given an outline which may be useful to some of the readers of SCIENCE-GOSSIP. I do not lay claim to much originality in method, but I have tried to put myself in the place of a beginner, in describing the ins and outs of the simple process which puzzled myself at first, and to give some idea of the way in which I have learnt to overcome the difficulties I have met with. If I have succeeded, it may be that a rare specimen may be saved from loss, and I am content. Who knows whether, if some Dutchman had only known how to make up a skin, there might not be a stuffed specimen yet existing of the Dodo!

CHARLES D. WHISTLER.

A STARFISH BED IN THE RHÆTIC FORMATION.

By W. JEROME HARRISON, F.G.S.

THERE is I believe in the Rhætic Formation, a layer which deserves the name of a "starfish bed." The earliest allusion to the occurrence of these interesting fossils in this deposit, is in Mr. Chas. Moore's excellent paper "On the Zones of the Lower Lias, and the *Avicula contorta* Zone," "Quarterly Journal of the Geological Society," vol. xvii. p. 483 (1861), where he writes, "*Ophiura*, a single joint found in the clay band at Vallis, Somersetshire, appears to have represented this or an allied genus in the Rhaetic age."

In February 1873, I found a perfect starfish in the Rhætic black shales of the Spinney Hills, near Leicester, and further search detected a thin sandy layer about half an inch thick, literally made of the scattered joints of such an organism. Other examples which I have since found, show a disc of one-eighth of an inch in diameter, with an extreme breadth across the arms of about an inch. My specimens were of such a fragile nature that they would not bear carriage, but they were seen by the Rev. P. B. Brodie, F.G.S., who alluded to them in a paper on the "Lower Lias and Rhætics of the Midlands," "Quarterly Journal of the Geological Society," vol. xxx. p. 746, 1874. This Spinney Hill section is minutely described in my paper "On the Occurrence of the Rhætic Beds in Leicestershire." Q. J. G. S. vol. xxxii. p. 212.

About this time, Dr. Thos. Wright, of Cheltenham, the well-known palæontologist, described some specimens of a starfish from the Rhætic beds at Hildesheim, in Hanover, "Zeitschrift der Deutschen geol. Gesellschaft," under the name of *Ophiolepis Damesii*; from these the British specimens present no perceptible difference.

In 1875, Mr. G. Embrey, of Gloucester, obtained the same species from the Rhætic black shales at Garden Cliff, Westbury (specimens may be seen in the Jermyn Street Museum), and the Rev. P. B. Brodie has also found it near Stratford-on-Avon, and Mr. H. J. Elsee near Rugby; in SCIENCE-GOSSIP for December 1878, I see Mr. T. Stock mentions that he found a "starfish" (doubtless *O. Damesii*) at

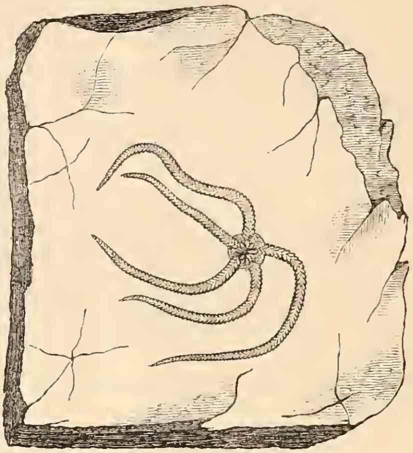


Fig. 39.—Fossil Starfish (*Ophiolepis Damesii*). Lower side.

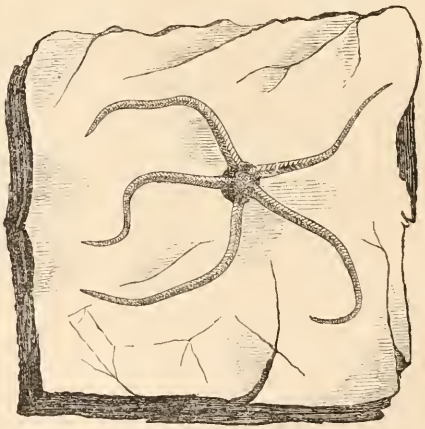


Fig. 40.—Fossil Starfish (*Ophiolepis Damesii*). Upper side.

Aust Cliff. In the same month I paid a visit under the guidance of Mr. Storrie, of Cardiff, to the famous Rhætic section which stretches along the coast from Penarth to Lavernock. Besides other good fossils, we got a fine slab (now in the Cardiff Museum) covered with specimens of the three characteristic Rhætic shells: *Cassianella contorta*, *Protocardium Philippianum*, and *Pecten Valoniensis*; between the molluscan remains, I was delighted to recognise several specimens of *Ophiolepis Damesii*.

Everywhere this Rhætic starfish bed occupies, I believe, the same relative position, viz. about half-way between the commencement of the black shales and the first band or nodular layer of limestone, in which *Estheria minuta* var. *Brodicana* is usually found.

It is somewhat singular that this beautiful brittle-star should turn up almost simultaneously at so many points, after having so long remained unknown. It shows the importance of knowing "what to look for," as Faraday said, and thin and almost imperceptible as this starfish bed of Rhætic age may be, I believe from its occurrence at points so far distant as Leicester and Penarth, that it will be found on or about a definite horizon in almost every Rhætic section. The fossil is of some interest too, as proving the undoubtedly marine origin of the Rhætic strata.

THE ROSE OF JERICHO.

IN the January number of this Magazine, there is an interesting account of the *Anastatica Hierochuntica*, commonly, but erroneously (as I think) known as the Rose of Jericho.

Old Gerarde gives capital figures of this plant in

Fig. 41.—Rose of Jericho (*Saulcya ?*). Expanded by three minutes' immersion in tepid water.

its expanded and unexpanded state, and quaintly remarks that "the coiner spoiled the name in the mint, for of all plants that have been written of there is not any more unlike unto the rose, or any kind thereof than this plant."

There is however another plant growing in the same country as the Anastatica and possessing the very same hygrometrical properties, but in a far higher degree, which closely resembles a rose in its general form, and above all the heraldic or crusader's rose. It is described by De Saulcy in his "Journey round the Dead Sea," and, he thinks, apparently with reason, that it is "the real Rose of Jericho, long lost sight of after the fall of the Latin kingdom of Jerusalem, and replaced by the Anastatica or Kaff-maryam."

Now some years ago I had for a short time in my possession a specimen of this plant, which together with one of the Anastatica, was found in a small box in the collection of the late Sir James Smith, and I forward you three drawings which I made of it; two

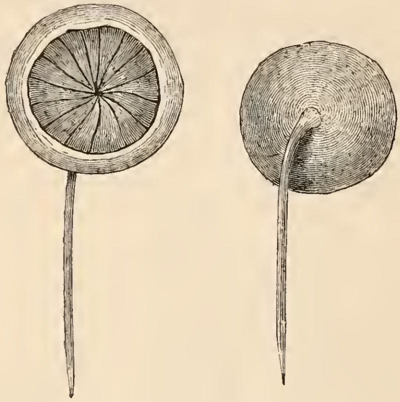


Fig. 42.—True Rose of Jericho (*Saulcya ?*). There are neither leaves nor roots. (Natural size).

of them represent the unexpanded head (a back and front view) (fig. 42) and the third (fig. 41) the same with the carpels fully expanded, and of the rich brown colour I have painted it, after immersion in warm water for three minutes.

The drawings are of the natural size and the late Sir William Hooker, to whom they were shown, pronounced them to be very accurate representations of some kind of Mesembryanthemum. The lady who lent me the specimen is long since dead, but I have no doubt it is still in the possession of her daughter who is an accomplished botanist. It had neither leaves nor root. I can find no mention of the plant in Tristram or elsewhere.

Diss. T. E. AMYOT.

MORTALITY OF SHREWMICE.—The Rev. J. G. Wood in his "Garden Friends and Foes," writing of the common shrew, says:—"It has many enemies, and, moreover, is liable to a kind of epidemic in the later months of the year, which kills it in great numbers, hundreds being found lying dead without any apparent cause for their death." I should think that the fact of their death being caused by an epidemic of some kind, would account for cats, owls, &c., not eating the dead bodies. I believe it is a fact, however, that cats, though they are always ready to kill a shrew, never eat the body, as they do that of a mouse.—*G. M. Doe, Torrington.*

THE NATURAL HISTORY OF THE TOAD.

By J. Arthur Eisdel.

The toads (*Bufonidæ*) are a family of the sub-order sabentia, order batrachia, class amphibia, division vertebrata. Only two species are British, viz., *Bufo vulgaris*, the common toad, and *Bufo calamita*, the natterjack toad.

I shall confine my remarks to one member of this family, *Bufo vulgaris*, the common toad, beginning at the earliest visible stage of his existence, namely the egg, tracing that existence on to maturity, and then, having thoroughly gone into the toad's natural history, I shall examine a general question or two about him; after which I will just describe the natterjack toad, *Bufo calamita*.

In the months of March and April may be found in great abundance in the stagnant water of many of our ditches and ponds the ova eggs or spawn of the toad. These ova are arranged in a double series, placed alternately and perfectly regular, and are enveloped in a jelly-like mass which forms a continuous line, extending to the length of three or four feet, sometimes even twenty or thirty feet.

The embryo (for whose development immersion in water is necessary) is found, in the first place, to consist of a small globular body. In a short time the sphere begins to elongate, the head becomes prominent, the tail begins to show itself. In time also a small projection takes place on each side of the head, which is the earliest indication of the branchiæ or gills, which soon become visible and gradually more developed. In a short time longer the first voluntary motion of the embryo is discovered on the application of any means of disturbance, but it consists only of a slight movement of the head or tail. Later on there is a slight division of the branchiæ into lobes, and the appearance of the beautiful phenomenon, the circulation of the blood through these organs. The embryo, which is still confined to a curved position by the envelopes, now frequently extends itself by sudden jerks as if to get free, which it eventually does by tearing the membrane of the egg.

The tadpole, as the little creature is now called, is now hatched. In our own climate, in the ordinary temperature of our spring, this hatching does not take place until at least a month. The development may be greatly hastened by a constant elevation of temperature. After hatching, the branchiæ speedily enlarge, and continue to do so till they arrive at their maximum of development. No sooner do these branchiæ arrive at this stage than they begin to diminish in size; they become obtuse and are gradually so reduced as to be withdrawn within the branchial cavity, and concealed by a little operculum of the integument. When this is done the tadpole has the form of an enormous belly and head in one undistinguishable outline. The eyes are now perfectly formed; the holders, which are small simple organs placed on the under surface of the head, enable the little animal to attach itself by means of a viscid secretion at their extremities, have become much diminished in size; the mouth, which has horny cutting processes, has acquired movable lips, and the little creature, which has hitherto derived its sustenance from its own resources, or by absorption, now seeks its food amid softening and decomposing vegetable matter, which forms its principal nourishment until it reaches the toad stage. The tadpole now undergoes but little change in its external form for a considerable time, but increases rapidly in bulk. On examining the tadpole internally we find that it has an extremely long intestinal canal coiled spirally within its large abdomen, which, for a reason I will mention later on, is very long in proportion to the length of the tadpole's body. Now how does the tadpole breathe? The water enters the mouth by the orifice of the nostrils, which are supplied with valves. When in the cavity of the mouth, which is well closed on all sides, with the exception of the throat, where are placed the branchial slits, the water acted upon by the muscles, which cover them, traverses these spaces and bathes the branchiæ before its exit through the branchial holes. The blood which is driven by the heart into the branchial vessels is then distributed, as it is in the fishes, in fact the respiration and the circulation of the tadpole are very similar to those processes in the fishes. And now return to the exterior of the tadpole. By-and-by a little tubercle appears on each side of the vent; this tubercle soon acquires somewhat the form of the perfect limb, the toes budding as it were at the extremity, but still it continues very short. Meanwhile the anterior extremities are also budding forth in the same manner and gradually assume their distinct and final form, though not so soon as do the hind limbs. As the hind limbs become developed, the tail, the former organ of progression, is removed by absorption, not thrown off as has been erroneously stated. This is a gradual process, the absorption beginning at the apex and progressing onwards to the base until the whole is removed, so that the posterior part of the body becomes rounded. The tadpole's mouth too widens, and the eyes are guarded by eyelids, while the belly lengthens. Externally the tadpole has now assumed the form of a young toad; let us see what has been going on internally. The intestines have become shorter, the branchiæ have been removed by absorption, and most beautiful cellular lungs have been developed, while the circulation has undergone an entire change. I may add that it is not until the approach of autumn that the young toads, having assumed that form in manner just described, come to seek their food on the land. And now we will suppose our young toad to be full grown; let us examine it. Its skin is naked, as it is called, being without scales, and is covered on the back and sides of the animal with small tubercles or follicular glands which secrete an acrid humour, more about which later on.

(*To be continued.*)

LIST OF "LOCAL FLORAS" OF THE BRITISH ISLES.

[*Continued from p.* 3.]

Had I been acquainted with the "Botanical Bibliography of the British Counties," by H. Trimen, M.B., F.L.S., published March, April, May, June, August, 1874, in the "Journal of Botany" (West, Newman & Co., 1*s.* monthly), I should not have commenced this list. A few additional titles are given below, but for full lists refer to the above-mentioned paper, or to the "Student's Guide to the Literature of Botany," by B. D. Jackson, F.L.S., shortly to be published by the "Index Society" (21*s.* subs., H. B. Wheatley, Hon. Sec., 5 Minford Gardens, West Kensington Park, W.)

Berkshire.

"Cont. to F. of," J. Britten, in Pro. Newbury District Field Club, 1871.

Buckinghamshire.

"F. of," J. Britten, 1867 (a catalogue merely).

Cornwall, *see* Devonshire.

"F. of D. and C." (not descriptive). J. W. N. Keys, Trans. D. and C. Nat. Hist. Soc. 1866.

Plymouth and Devonport. "F. of" (descriptive), G. Banks, F.L.S., 1831; W. Byers, Devonport.

Torquay. "Handbook of the F. of" (descriptive). Robert Stewart, M.R.C.S., 1860; Hamilton & Co. London.

Gloucestershire.

Cheltenham. "Bot. Guide to," J. Buckman, 1844. Linn. sys.

Kent.

"Floral Guide to East" (Linn. sys.), with map, by M. H. Cowell, 1839, 4*s.* (not descriptive).

"Wild Flowers of Dover and its neighbourhood," English and Latin names, 1*s.*, published Dover: T. Rigden; London: Van Voorst.

Thanet. "F. Thanetensis." Flower, 1847.

Norfolk.

"F. of," Trimmer, 1866.

Oxfordshire.

Banbury. "Catalogue of Plants of" (Linn. sys.). Geo. Gulliver, F.R.S., F.Z.S., 1841; Bogue. Cryptogams included.

Surrey.

Battersea and Clapham. "Cat. of Rarer Plants;" W. Pamplin, 1827.

Sussex.

Brighton. "Nat. Hist. of," Mrs. Merrifield, 1860.

Warwickshire.

Rugby. "Register of Plants" (within 10 miles), mean and earliest flowering dates, localities of less common species. L. Cumming, and H. W. Trott, 1876, 9*d.*; Billington, Rugby.

Wilts.

"F. of," T. B. Flower, in vols. iv. and succeeding, of W. Arch. and Nat. Hist. Mag. 1857-73."

Worcestershire.

"Botany of," with map, Edwin Lees, F.L.S., 1867; W. Nat. Clubs, pub.

Yorkshire.

"F. of W. Riding" (Ainsty excluded); 2 maps, Miall & Carrington, 1862, about 2*s.* 6*d.*; Pamplin.

SCOTLAND.

Aberdeen, Banff, and Kincardine, "Botanist's Guide to Counties," G. Dickie, F.L.S., 1860.

Aberdeen (town), "A. F. of," P. H. Macgillivray, A.M., 1853, 2*s.* 6*d.*; Whittaker.

Lanarkshire (and the whole valley), "Clydesdale Flora" (Glossary and diagrams), R. Hennedy. 4th ed., 1878, 5*s.*; H. Hopkins, Glasgow.

IRELAND.

Ulster, "F. of, and Botanist's Guide to N. of I." G. Dickie, F.L.S., 1864, 1*s.*; Aitchison, Belfast. Lovell Reeve, London. *Ulster,* "List of the Mosses of," A. Stewart, F.B.S.E., in Report of the Belfast Nat. Field Club, 1874.

Co. Antrim, Belfast. "F. Belfastiensis" geog. and geol. distrib., Ralph Tate, F.G.S., 1863; may be had from R. B. Matthews, Victoria Street, Belfast, at 6*d.*

It seems to me that the object of a "Local Flora" differs from that of a general one, in that it should point out the exact spot where a plant is to be found. Mere catalogues without localities, or with vague remarks, such as "near Sheffield," seem to be practically useless. Unless the plant be a rare one, a general "Flora" is quite as useful as such a local one. Minute description of the exact position, roads and paths to be taken, &c., such as Baedeker gives in his guide-books would be a very great advantage. This is merely a suggestion. No doubt many will disagree from me, but let them test the value of a bare list, by trying to discover any less common plant by its aid.

Tapton Elms, Sheffield. BERNARD HOBSON.

NOTES ON THE NESTS OF EUROPEAN TRAP-DOOR SPIDERS.

By G. H. Bryan.

SINCE returning to England, I have been much surprised that the trap-door spiders are not more fully described in any popular work on entomology, &c., that I have seen.

Had the descriptions been omitted altogether, I should have supposed it was because they were out of place, as referring to spiders, and not to true insects; however, they are mentioned, but the reader is led to infer, either that there is only one species of trap-door spider, commonly called the mason spider, or else, that all the spiders build their nest of a simple silken tube with a tight-fitting door at the surface of the ground.

Now certainly the nests of some species are much more ingeniously constructed than the simple nest usually described, and it seems strange, therefore, that no short popular sketch has, so far as I know, been written on this interesting subject.

Fig. 43.—Cork or Plug-nest of Trap-door Spider (open).

Fig. 44.—Cork or Plug-nest of Trap-door Spider (closed).

Messrs. Kirby and Spence in their "Introduction to Entomology," say: "Several species of mason spiders form nests of this kind. Among these are the *Mygale nidulans* of Walckenaer, and the *Mygale cratiens*, or clay kneader of Latreille. Another is the *Mygale cœmentaria* of Latreille, found in the south of France. An allied species, the *Mygale Sauvagesii* is found in Corsica."

The Rev. J. G. Wood in his "Homes without Hands," describes the nests of exotic trap-door spiders rather fully, but does not allude to any found in Europe, nearer than Albania. Nor does he even mention those found in that out of the way corner of Europe, in an article in the "Sunday Magazine" for December 1879, entitled "More about Spiders." He says: "There are many species of trap-door spiders, the best known of which is a native of Jamaica, and is scientifically termed *Cteniza nidulans*. His accompanying drawing of a spider and nest, is identical with the one in my English edition of "The Universe" by Pouchet, and which is there described as representing the mason spider, *Mygale cœmentaria* of Latreille, and its dwelling.

Before the late Mr. Moggridge's valuable work, on "Harvesting Ants and trap-door Spiders," was published, little appears to have been known about the European species. In his second volume, or supplement, he makes a complete re-arrangement of them, and two species are named after himself, *Cteniza* and *Nemesia Moggridgii*. Their old names are *Cteniza fodiens* and *Nemesia cœmentaria*. However, as "Harvesting Ants, &c.," is rather an expensive handbook, it is not much read by dilettanti, except at Mentone, where Mr. Moggridge was so well known, and where the spiders abound.

Fig. 45.—Wafer-lidded nest of Trap-door Spider (open).

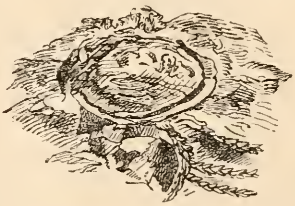


Fig. 46.—Wafer-lidded nest of Trap-door Spider (closed).

There are two genera of trap-door spiders; namely, the Ctenizas which make the so-called cork nests, and the Nemesias which make generally wafer nests; both genera being plentiful in the south of Europe. In the cork nests (figs. 43 and 44), the door is thick and fits in to the top of the tube like a plug or short cork, while in the wafer nests (as shown at figs. 45 and 46), the door is comparatively thin and just laps over the edge of the tube. The *Nemesia Moggridgii* is an exception to the general rule of Nemesias, and constructs a nest of the "cork" type. It inhabits the south of France, and is the one most generally described under its old name of *N. cœmentaria*.

All the cork nests consist of a simple unbranched silken tube, with one door at the top, but the wafer nests are usually more complicated.

The simplest form of wafer nest I found occurring in great numbers on the hill of Posilipo near Naples.

No Neapolitan species are mentioned by Moggridge, but this one is possibly identical with the *Nemesia Simoni* found by him at Bordeaux. It is a simple silken tube without inner door or branch, and sinking ten or twelve inches deep into the ground (fig. 43).

Another species abounds in the same locality, and may be the *N. suffusa* described as being found at Montpellier. The tube of its nest differs from that of the preceding in having an upward branch coming nearly, but not quite to the surface of the earth as in (fig. 47 *a*).

Alluding to *N. Simoni* and *N. suffusa* Mr. Moggridge says, "It may perhaps be no more than a coincidence, but we can scarcely avoid commenting upon the fact, that, just as the Montpellier wafer nest

Fig. 47.—Sections of nests of Trap-door Spiders.

is simpler in construction than any found along the Riviera, so in like manner is the Bordeaux nest simpler than that of Montpellier. It thus becomes tempting to ask whether in the case of these wafer nests, we shall not discover that the colder and damper climates are the homes of the simpler types, while the warmer and drier ones, where more food, more enemies and more competitors are found, are reserved for the architects of the more complicated nests.

Certainly this cannot be the case, seeing that the same types of nest as occur separately at Bordeaux and Montpellier, occur together at Naples, where the climate if not drier, is at least warmer at Mentone.

I found no other type of nest at Naples, therefore it seems strange that the same ones should occur in two places so far apart, unless they be found also in intermediate locaties. I observed one or two nests of the wafer type in the grounds of Hadrian's Villa at Tivoli, but had not time to examine them.

The Rev. C. P. Cambridge, in his description of *N. meridionalis* at the end of the supplement to "Ants and Spiders," seems to say that this species was supposed to have been found in Corsica by M. Simon, but that the only thing he observed about its nest was, that it was branched. It was described by Professor Costa as occurring near Naples and in Ischia.

Is it not probable that it may construct the single door branched wafer nest just mentioned?

There is of course quite a possibility that the single door unbranched nest of Naples may turn out to be the work of some hitherto undescribed species, instead of *N. Simoni*, as no one appears to have noticed two types of nest in this locality. I was unfortunately under the full impression, when in Italy, that both these Neapolitan spiders were fully described by Mr. Moggridge, but find, on referring to his work, that I was mistaken, and to my great regret, have none of the spiders preserved for identification. Any observer staying at Naples could, however, easily solve these difficulties.

The Nemesias, found along the Riviera, generally, if not invariably, add a thick inner door to their nests, about a third down the tube. This door differs entirely in structure from the upper door, and opens inwards instead of outwards, otherwise I should have fancied that the nest with two doors, alluded to by the Rev. J. G. Wood as in the British Museum, and which as yet I have found no opportunity of seeing, might have been one of those possessing an inner door.

These inner doors are always white, thick, and hard, somewhat resembling hardened paper pulp in texture, and becoming soft when the ground is very wet. As I have already said, this door opens downwards, and is furnished with a groove on its upper surface, to allow the spider to pass more readily when open; and silken drapery is attached round the door, except at the hinge, in order that it should close more perfectly.

(*To be continued.*)

Natural History Society in South London.—I shall be obliged if any of your readers interested in the above, would kindly furnish me with their names and addresses as soon as possible, as I propose commencing the opening session in March or April. A meeting will shortly be held for the purpose of appointing a chairman and other officers, full particulars of which I shall be happy to give on application.—*Stuart Taylor*, 77 *Crampton Street*, *Walworth*.

PLANT RAMBLES IN WALES.

By G. C. Druce, F.L.S.

Starting from Conway at 3 A.M. one beautiful morning in July last, which is, as Kingsley in his "Water Babies" says, the most pleasant part of a midsummer's day, passing by Conway Castle, on waste ground we noticed *Smyrnium Olusatrum*, *Lavatera*, and *Centranthus ruber;* and by the side of the embankment, *Sedum dasyphyllum* and *anglicum;* by the railway-side, toward Deganway, were seen *Spergularia marginata*, *Trifolium striatum* and *arvense*, *Œnanthe crocata*, *Lotus crassifolius*, *Glaucium luteum*, *Hordeum maritimum*, *Triticum junceum*, *Juncus Gerardi*, and *Scleroehloa maritima*. On a little hill near Deganway—a locality noticed previously in Science-Gossip by Mr. Lees—appeared the pretty *Dianthus deltoides* and profusion of *Galium verum* and *Jasione montana;* on Deganway Craig occurred quantities of *Silybum Marianum*, *Carduus tenuiflorus*, *Borago officinalis*, *Marrubium vulgare*, *Lycopsis arvensis*, and other introduced plants; on the ivy-covered rocks looking north were *Orobanche Hederæ* and *Silene nutans;* on the sandy ground towards Llandudno were seen *Carex arenaria*, *Geranium sanguineum-prostatum*, *Scilla verna* in fruit. On the Orme's Head some fine specimens of *Orobanche Hederæ* were gathered, and after a long hunt Cotoneaster—a single plant—was found in the locality given by Mr. Lees, near it being seen *Rubia peregrina*, *Geranium sanguineum*, *Solidago Virgaurea*, *Epipactis ovalis*, *Juniperus communis*—a very prostrate variety, and *Spiræa Filipendula*, *Helianthemum canum*, *Orchis pyramidalis*, *Hieracium cinereum*, *Hyoscyamus niger*, *Arabis hirsuta*, *Erodium maritimum*, *Silene nutans*, *Serratula tinctoria*, *Verbena officinalis*, *Lepidium Smithii*, *Carduus tenuiflorus*, and *Marrubium vulgare*. I could not find *Veronica hybrida*, *Spiranthes autumnalis*, or *Linosyris vulgaris*. The coast back to Conway yielded *Convolvulus Soldanella*, great quantities of *Eryngium maritimum* and *Glaucium luteum* (see two paintings by Miss Harrison in the Institute of British Water-colours), besides *Phleum arenarium*, *Psamma arenaria*, *Honkeneja peploides*, *Glaux maritima*, *Salsola Kali*, and *Atriplex Babingtonii* and *arenaria*. The picturesque ruins of Conway Castle are interesting to botanists from the vast quantities of *Orobanche Hederæ* on the ivy, even little transplanted stems bearing two or more parasites. A species of Dianthus, probably *plumarius*, was also frequent.

In the Fairy Glen, near Bettws-y-Coed, we first saw the delicate *Wahlenbergia hederacea*—a fitting place for such a lovely flower; several Carices (Œderi, pallescens and stellulata), *Orchis latifolia*, *Veronica montana*, and *Solidago cambrica*. Pandy Mill was covered with multitudes of *Cotyledon Umbilicus*.

On the hilly road to Festiniog were seen the usual heath and moor plants. An evening's walk up to the falls near Festiniog was very enjoyable, the scenery being some of the best in North Wales. In a coppice above the Upper Fall were found *Vicia Orobus* and *Festuca sylvatica*. Among other plants noticed were *Habenaria chlorantha*, *Gymnadenia conopsea*, the ferns *Phegopteris* and *Dryopteris* being frequent. Towards the quarries *Corydalis claviculata* was found.

The pass of Aberglaslyn was interesting both geologically and botanically. *Sedum Forsterianum* was frequent at the bottom of the valley, and on the sandy delta occurred *Sagina nodosa*, *Agrostis pumila*, *Equisetum arenarium*, *Ornithopus perpusillus*, *Carex arenaria*, and *Isoëtes Savii*. On the rocky sides of the pass grew *Hypericum Androsæmum*, round which was a colony of the gregarious Burnet moth.

The Beddgelert ascent of Snowdon is very easy, but as a mist thickly enshrouded the ridge, not much botanising was done till the summit was reached, where, free from mist the heat became almost unbearable. I soon made up my mind to have a good search for Lloydia; first climbing the ridge to Llywedd, finding *Allosurus crispus*, *Rhodiola rosea*, called by the guides the Snowdon rose, *Saxifraga stellaris* and *hypnoides*. Then returning to the summit, to the south of which a descent was made to the lake, which entailed some good crag climbing, I noticed *Poa alpina*, *Carex rigida*, *Saxifraga oppositifolia* in flower, *Alsine verna*, *Thalictrum minus-montanum*, *alpinum* rarely in flower, *Silene acaulis*, *Asplenium viride*, *Cystopteris fragilis* and *Lycopodium alpinum*, but no *Lloydia*. Returning to the summit by the Pen-y-Gwryd the ascent was too barren and exposed for plants, but the view was very fine and extensive, Cader Idris and Plinlimmon being seen. In Llanberis lakes *Isoëtes lacustris*, *Alisma ranunculoides*, *Littorella lacustris*, and *Lobelia Dortmanna* were found.

A visit to Aberfraw Common and Llyn Coron resulted in the finding of *Prunella vulgaris*, var. *alba*, *Mentha rotundifolia*, *Lepidium campestre*, *Helosciadium repens*; it was quite necessary to have a swim in the lake, where a long search was at length rewarded by gathering *Elatine hexandra* and *Hydropiper*, both nearly crowded out by Chara, *Potamogeton crispus*, *Ranunculus fluitans*, var. *Bachii*, and *Myriophyllum spicatum*, the borders of the lake yielding *Alisma ranunculoides*, var. *repens*, *Peplis Portula*, and *Montia fontana*. On the sandy common *Viola Curtisii* was very abundant, growing round the strange little bunches of furze, and here and there *Erythræa pulchella*, *Carex ampullacea*, *Festuca uniglumis*, *arenaria*, *Erodium maritimum*, and a dried-up specimen of *Knappia agrostidea*.

Returning to Nant Francon, where *Saxifraga stellaris* grows by the roadside, washed down from the Carnedd, and passing by some white foxglove and thyme, a climb was made up to Llyn Idwal, where, by the quiet, dark lake, some good botanising was enjoyed. *Subularia aquatica* in flower, *Isoëtes lacustris*, *Sparganium affine*, *Callitriche autumnalis*, and *Littorella lacustris* were gathered in the lake, and on its borders *Comarum palustre*, *Carex pulicaris*, *dioica*, *alpicola* (*vitilis*). An old watercourse whose precipitous course made a good climb, was rich in plants, *Phegopteris*, *Dryopteris*, *A. viride*, *Cystopteris fragilis*, *crispa*, being frequent till, at higher elevations, some half-slaty ledges were covered with *Rhodiola rosea*, *Poa alpina*, *Silene acaulis*, *Saxifraga elongella*, *stellaris*, *oppositifolia*; specimens also being found of *Aspidium Lonchitis*, *Alsine verna*, *Botrychium Lunaria*, and the so-called *Polygala grandiflora*. The rocks at Twll Du were quite a garden from the number of Hieracia, Rhodiola, and other plants, but Lloydia was not seen. *Meconopsis cambrica* still occurred in its old locality. Besides finding *Hymenophyllum Wilsoni* at the Swallow Falls, and *Lactuca muralis* at Bettws and Aber, but little else was done; but certainly Wales is well worth working, as it is easily accessible and very interesting.

MICROSCOPY.

Mounting Micro-Fungi. — Since I wrote my paper on this subject in January, 1879, to which Mr. George Clinch very kindly refers in this month's (February) Science-Gossip, I have tried the method of mounting on wooden slips, having been advised to do so by a gentleman whose method of mounting these interesting specimens is simply superb. In most cases I find the plan answered very well, though I do not think the slides present so nice an appearance in the cabinet. Of course there are cases in which the perfectly opaque method does not answer, for instance, in mounting specimens of such a fungus as *Peridermium Pini*, where it is necessary that the structure should be examined both by opaque and transmitted light. I may mention that prepared wooden slips may be bought for a small sum, but I regret that I have not the name of the optician by me who supplied those I have; doubtless, however, there are many who keep them in stock, and I think it is far better and saves time to buy than to make yourself.—*Charles F. W. T. Williams, St. John's College, Cambridge.*

Microscopical Society of Liverpool.—The eleventh annual meeting of this Society was held at the Royal Institution, on Friday evening, January 16, 1880; Rev. W. H. Dallinger in the chair. The president elect, Dr. J. Sibley Hicks delivered his Inaugural Address, choosing for his subject the Embryology of the Lower Vertebrates, with special reference to the development of the chick. He pointed out the striking similarity which exists in the early stages of development in all animals. After describing some of the most important features in the early stages of development in the chick, up to a period when it could be prepared in its entirety as a transparent object for microscopic examination, he proceeded to describe the evolution of the heart, comparing the various forms that organ assumes during its gradual development in the embryonic condition, to the adult heart of animals of a lower order, commencing with the dorsal vessel of the insect and gradually ascending to the incomplete four-chambered heart of the reptile. The address was illustrated by means of skilfully prepared diagrams.

Rock Sections.—At a late meeting of the San Francisco Microscopical Society, a paper by Mr. Melville Atwood was read, entitled "The Importance of a Classification of Metalliferous Veins." The paper, after dwelling at some length on the various means, &c., of determining the value of a lode, the uncertainty which attends it, and consequent risk to the miner, dealt as follows with a section of Mineralogy which may be interesting to some of our readers, namely, the cutting of rock-sections for microscopical examination. Mr. Atwood says, "after many experiments, I found a simple plan by which rock-section cutting can be done at little cost and labour, by the use of a few emery stones, or blocks, of different degrees of fineness—say, from one and a half to two inches square, and eight or nine inches long—the same as I have brought here for your inspection. The chips to be cut should be first made as thin as possible; the plan recommended by Mr. Rutley, to use a cold-chisel, the end let into a block of wood, and then by holding the specimen on the edge of the chisel and striking it a sharp blow with a light hammer, will generally give you a satisfactory chip. The chip must then be rubbed on the emery blocks, with water, till you get a good, even surface on one side of it, commencing with the coarse emery blocks first; then, with Canada balsam, fasten the smooth surface of the chip to a common glass slide, which is done by heating the slide over a spirit lamp and then applying a small quantity of the balsam. As soon as the balsam liquifies, press the smooth surface of the chip into it, and then allow it to cool. The balsam is better to be dried, so that you can use it like a stick of sealing-wax. As soon as the slide and chip are cold, you can commence to rub the outer, or rough surface of the chip attached to the slide, on the emery blocks until you get it nearly thin enough for mounting. To finish, use the fine, smaller blocks, as you would a file. You can hold the section up to the light and examine it during the operation. Mount and cover the section with thin glass, in the usual way."

Pond Life.—We have received from Mr. C. Baker, 244 High Holborn, a large mounted photograph, containing groups of British microscopic animals and plants, collected from a pond at Leytonstone, near London, and drawn from life by Mr.

H. C. Richter. The photograph contains no fewer than thirty-five different objects, and as there is a key accompanying the photograph which gives their names, the illustrations have great value to the student. For exquisiteness of finish and natural history accuracy, we have never before seen anything to equal this photograph, and our surprise is none the less great that it should be mounted and sold for 3*s*. 6*d*.

ZOOLOGY.

Climbing Powers of the Common Toad.—The late Mr. Coldwells, gardener, of Sandford Lane, Stoke Newington, several times assured me that he had seen toads climb the dwarf brick walls that inclose many of the gardens in the newer districts of the parish. He once took me into a garden and pointed out a toad he had seen enter by way of the wall, and he added, "I was always puzzled when I found a toad in one of these gardens until at last the mystery was explained by my observation of their capacity for climbing." I have never seen a toad climb a perpendicular surface, but I have seen them get up slippery sloping surfaces.—*Shirley Hibberd, Stoke Newington.*

Ovarium of Freshwater Sponge.—Since the publication of my paper with sketches "On the Freshwater Sponge" in Science-Gossip, my attention has been drawn to an excellent drawing of the egg of the sponge in "Science for All," vol. i., page 61, fig. 8 *a*, named there, "the winter bud or gemmule of Spongilla, in its natural condition." At *b*, is represented one as the same prepared with nitric acid to show its spicular coat. This is incorrect, the fig. at *a* is an ovarium of *Spongilla fluviatilis*, but at *b* is a skeleton of an ovarium of *S. lacustris*, prepared with nitric acid, showing the spicula. In my next paper on the Spongilla to Science-Gossip I shall send some sketches of the spicula peculiar to the ovaria of *Spongilla fluviatilis*.—*J. Fullagar*.

The Bustard (*Otis tarda*) was shot at Salisbury last January; it was a female, and weighed about nine lbs.—*F. S. Lyddon.*

The Introduced Birds and Mammals of New Zealand.—A paper on the above subject was read by Mr. H. M. Brewer, before the Linnean Society, who referred to Dr. Butler's "Avifauna of New Zealand," as not written too soon, for the rapid disappearance of many highly interesting forms is to be deplored. Finches and other small birds introduced are preyed on by the New Zealand owl, but nevertheless quite a long list of British songsters, game birds, and others have been successfully established. Pheasants in some districts abound, and it is observed that when the tremor of an earthquake occurs, the cock pheasants set up a continuous crow, either of defiance or fear. Partridges thrive best on the south island. Red deer are now seen in herds on the hills near Nelson. Hares have increased too rapidly, and the female in New Zealand has become more prolific, giving birth to six or seven young at a time. Kangaroos, and various other mammals, have likewise been imported; but, unfortunately, facts mentioned point out that the acclimatisation of some of them is not altogether an unmitigated blessing to the farmer colonist.

A New British Fish.—A paper was read on this subject at a recent meeting of the Zoological Society, by Dr. A. Günther, F.R.S., who exhibited and made remarks on a drawing of a West Indian fish (*Holacanthus tricolor*), obtained on the coast of the Island of Lewis, and believed to have been found for the first time in British seas.

Effect of Frost on some Freshwater Molluscs.—On January 19, the Ouse, at York, was considerably lowered by opening Naburn Lock, and a very large number of freshwater shells were consequently left exposed on the banks. A hard frost set in the same night (my thermometer registered eight degrees of frost), and continued till the lock was closed. The mud banks became perfectly hard to the water's edge, and it was very interesting to observe the behaviour of the various species of molluscs under their novel situation. *L. peregra* burrowed itself a hole in the mud, apparently by a rotatory movement of the shell, and lay there, warm and damp. I opened several of these holes, mistaking them for burrows of Sphaerium. I don't think a specimen of it died. *Sphærium ovale*, which lives in deep burrows, and when the water is lowered in the summer, sinks into them to maintain its moisture, behaved in a very singular manner. It left its hole and lay dead on the surface in numbers—very convenient for my collection, but I fear the species will become almost extinct, as it is confined to a very limited locality. Anodonta and Unio had evidently made a struggle to follow the water as it retreated, but failed. A hard frozen track, a few inches long, marked their efforts. They were all, I believe, dead. *Paludina vivipara* (which occurs in great abundance), was unable to resist the frost in spite of its operculum and thick mud coat. All the specimens I examined were dead. Some had made a futile effort to bury themselves, but as they live in a stony part of the river, they had not a fair chance. As no *Sphærium rivicola* appeared, and it is generally abundant, I infer it remained in its burrow. How far the following inferences may be justified, I leave to your readers to judge. 1. That *L. peregra* has learnt, by a kind of hereditary instinct, how to behave under frost. How determined nature is to preserve and multiply this species! 2. That *S. ovale* is used to exposure in hot weather from drought, but is not used to the unnatural circumstances of rivers drying up in winter. 3. That Unio and Anodonta can save themselves under ordinary circumstances of falling water, but that the sudden fall of the Ouse was too much for them. 4. That *Paludina vivipara* lives too deep to be accustomed to a temperature below thirty-two degrees.—*Rev. W. C. Hey.*

Carnivorous Bees.—Mr. Packard, jun., writing in the "American Naturalist," says that an asclepiadaceous plant was brought to him last September, with several moths hanging dead from the flowers, having been caught by their tongues in one of the opposing edges of the horny contrivances covering the pollinia. A short time afterwards a correspondent sent an account to Mr. Packard about some moths being entrapped in a similar manner, and around which, as they endeavoured to get away, several bees were buzzing, constantly attacking them with their stings. After they became apparently lifeless, the bees settled on them and began to devour them. The same correspondent had previously noticed the tongues of some moths entrapped in the pollinia, whose bodies had disappeared. The fact was communicated to Dr. Darwin, who wrote that he had never heard of carnivorous bees, but he suggested it was possible that the bees opened the bodies for the sake of the honey.

Bulwer's Petrel.—There was a mistake in the identification of the specimen thought to be this very rare bird, to which reference was made in our January number. It turns out to be the black variety of the Pomatorhine Skua.

BOTANY.

The "Tourist's Flora."—I am happy to see that J. A. Coventry has the courage to say a word in behalf of the Linnean system; agreeing, as I do, with Mr. Woods, that it is "almost impossible for a student to determine a plant by the natural orders." Thirty years ago, when I commenced the study of botany, the Linnean system gave me all the aid I needed. It is to be regretted that "The Student's Flora" is not supplemented by a clavis analytica; a separate publication of it, in which the references were given to the natural order, would be gladly possessed by those in whose floras the key to them is omitted.—*T. B. W., Brighton.*

Phyllotaxis.—We are sorry that, owing to a printer's error, the blocks of figs. 16 and 17, illustrating the article on this subject, were transposed; 16 is that of the ash, and 17 is that of the horse-chestnut.

Popular Names of Plants and Animals.—Mr. James Britten, F.L.S., of the botanical department, British Museum, writes to us as follows: I am preparing for the English Dialect Society a dictionary of the popular names of mammals, insects, reptiles, and crustacea, which will, indeed, include all zoological names, except those of fishes and birds, which are in the hands of Mr. T. Satchell and the Rev. C. Swainson respectively. I shall be very glad of help from the readers of Science-Gossip.

The "Fagus" of the Latins.—In the January number of your very interesting Science-Gossip, is an able article on the "Fagus of the Latins," with which I cannot altogether agree. If we take Virgil for instance, in the line at the commencement of Ecl. I. "Tityre tu patulæ recubans sub tegmine fagi," he speaks of the fagus as wide-spreading; a term which could not be applied to *Quercus ilex*, nor indeed to any of the evergreen oaks, so appropriately as to the beech, of which it is truly characteristic. Again, in Geor. i. 173, "Altaque fagus," the term lofty is applied to that tree, and is certainly much more appropriate to the aspiring as well as wide-spreading beech, than to the round-headed evergreen oak. My son informs me that "Billerbeck, in Flora Classica, considers the Greek *phegos* to be *Quercus Esculus;* but he makes fagus to be a different tree, namely, *Fagus sylvaticus*, our beech."—*M. Moggridge.*

Bees *v.* Kalmia latifolia.—The Editor of the "Bee-Keeper" answers the query which appeared in Science-Gossip, in his own journal as follows:—"From 'A General System of Botany,' by Le Maout and Decaisne, we learn that the genera (of Ericaceæ or Ericineæ), Rhododendron, Ledum, Kalmia, and Azalea are narcotic; the honey extracted from their flowers is extremely poisonous. Lindley ('Vegetable Kingdom') tells us the same thing, adding that the whole species of the Ericaceæ (or Heathwort) tribe is narcotic, and that the leaves are deleterious to the goats, cattle, and sheep which feed upon them. Some writers affirm, however, that the different genera of the Ericaceæ are merely astringent, not poisonous. Loudon ('Encyclopædia of Trees and Shrubs') says that the leaves of *Kalmia latifolia* are poisonous to cattle and sheep, but not to deer. The 'Nouveau Dictionnaire Classique d'Histoire Naturelle' (1845) observes that the leaves are poisonous to horses, kine, and birds, but not to goats or deer. It has been said that the common evergreen shrub *Rhododendron ponticum*, another species of Ericaceæ and closely allied to the Kalmia, was the plant from flowers of which the bees of Pontus collected the honey that produced the extraordinary symptoms of poisoning described as having attacked the Greek soldiers in the famous retreat of the 10,000. Xenophon says that after eating it the men fell stupefied in all directions, so that the camp looked like a battle-field covered with corpses. But the Russian traveller, Pallas, is of opinion that *Azalea pontica* (again a species of Ericaceæ) was the real cause of the mischief. *Kalmia latifolia*, or mountain laurel, is a native of North America, and was introduced into England in 1734.

GEOLOGY.

Correlation of the Drift-deposits.—Mr. D. Mackintosh, F.G.S., has just contributed a paper on this subject to the Geological Society. The object of the author was to present the subject in a concise form so as to stimulate to further research. His scheme of correlation was founded on the horizontal continuity of the deposits and their included erratics. He gave an account of his discovery of the continuous extension of the upper Boulder-clay of Cheshire, above a great thickness of sand and gravel, as far as Berrington, south of Shrewsbury, and its appearance at intervals along the Severn valley to below Worcester, where it was probably represented by a bed with Malvern-hill boulders above shelly sand and gravel. He traced the great boulder-bearing clay and gravel around Wolverhampton eastward through central England, to where it graduated into the chalky clay of Lincolnshire; and laid great stress on the commingling, at Wolverhampton, in this deposit, of erratics (chiefly granite and felstone) from the north with erratics (chiefly chalk-flints and gryphites) from the east. He described the clay and sand around Gainsborough, Retford, &c. He correlated the "carrion," or lower Boulder-clay of the Vale of York (containing Carboniferous, Jurassic, and granitic erratics), with the lower yellowish-brown clay of the Aire and Wharfe valleys and the plain of Craven. He likewise correlated patches of upper clay in the latter areas with the upper Boulder-clay of the Lancashire plain, but was not certain that they were of Hessle age. The solution of the main question depended chiefly on the relative age of the Wolverhampton and Stafford clay-and-gravel, which he was disposed to regard as the equivalent of the lower brown Boulder-clay of the north-west and likewise of the chalky clay of Lincolnshire.

The Portland Rocks of England.—At a recent meeting of the Geological Society, a paper on this subject was read by the Rev. J. F. Blake, M.A., F.G.S. The author gave a general account of the relation of the several Portland rocks in the areas of their development to each other, and hence deduced the history of the Portland "episode." The name is used on the continent in a wider sense than in England, and this use was shown to be unjustifiable. After giving an account of his observations on the rocks at Portland itself, and dividing the limestones into the building-stone and flinty series, the author showed that the so-called "Upper Portlandian" of Boulogne corresponds to the latter, and the upper part of the "Middle Portlandian" to the Portland sand. He then endeavoured to prove by the proportionate thickness, the indications of change in the lithology, and the distribution of some of the fossils, that the rest of the so-called "Middle" and the "Lower Portlandian" are represented by integral portions of the Upper Kimmeridge, which are thus the "normal" form corresponding to what the author calls the "Boulognian episode." The series in the vale of Wardour has been made out pretty completely. The Purbeck is separated by a band of clay from the Portland and is not amalgamated with it. The building-stones, and flinty series are here seen again; and a fine freestone occurs at the base of the latter. The representatives of the Portland sand were considered to be older than those of other districts. The relations of the Purbeck to the Portland rocks at Swindon were very carefully traced; and it is shown that, while the upper beds of the latter put on here some peculiar characters, the former lie on their worn edges. The upper beds of the Portland, which have been referred to the sand, correspond to the freestone and the base of the flinty series of the Vale of Wardour; hence the Purbecks of Swindon may be coeval with the upper beds of the Portland to the south. At the base of the great quarry and elsewhere in the neighbourhood are the "Trigonia-beds," beneath which is clay, hitherto mistaken for the Kimmeridge Clay; and beneath this are the true Portland sands, with an abundant fauna new to England. The limestones of Oxfordshire and Bucks were considered to represent the "Trigonia-beds" only; and, as the Purbecks here lie for the most part conformably, it was suggested that they were formed in a lake at an earlier period than those at Swindon, which are of a more fluviatile character. Hence the Portland episode considered as marine, was at an end in the north before it was half completed in the south.

Cave-hunting.—Messrs. James and W. E. Backhouse, by whom the interesting "Teesdale Cave" was discovered in 1878, obtained during the last season the bones of twenty-two vertebrate animals, including a species of the cat tribe. Mr. W. Davies of the British Museum, thinks it to be the lynx. We believe that lynx bones have been found in a Derbyshire cave.

The Volcanic Rocks of Dartmoor.—At a recent meeting of the Geological Society, a paper was read on this subject by Mr. Frank Rutley, F.G.S. Among the ashy beds of this district are certain amygdaloidal schistose rocks, which the author is of opinion are really lava-flows, which have probably been crushed or infiltrated, and have so assumed a foliated structure owing to pressure from superincumbent beds acting on rocks thus constituted. They are much altered, but were probably once basalts. The author considered it very probable that these schistose beds and Brent Tor, considered to be of Carboniferous age, are identical with beds near Tavistock and in the Saltash district, which are of Upper Devonian age. In the concluding part of the paper the author described the beds of alternating ashes and lava, now much disturbed by faults, which constitute all that remains of the ancient Brent-Tor Volcano, and endeavoured, from the evidence which can be thus obtained, to give a probable reconstruction of the former cone.

Geologists' Association. — We have received No. 4, vol. vi. of the proceedings of this association, containing, amongst other matter, the following articles. "On the Insect Fauna of the Palæozoic Period, and the British and Foreign Formations of that Period in which Insect Remains have been Detected," by Herbert Goss, F.L.S., &c. ; "On the Fossil Corals obtained from the Oolite of the Railway Cuttings near Hook Norton, Oxfordshire," by Robert F. Tomes, F.G.S. ; "Note on the Rev. J. F. Blake's paper on the Chalk of Yorkshire," by Dr. Charles Barrois ; "Reply to note on the Rev. J. F. Blake's paper on the Chalk of Yorkshire," by the Rev. J. F. Blake, M.A., F.G.S. ; "On the Dinosauria," by Professor H. G. Seeley, F.R.S., F.G.S.

Fossil Fungi from the Lower Coal Measures.—Two papers have been read on this subject before the Yorkshire Geological and Polytechnic Society by William Cash, F.G.S., and Thomas Hick, B.Sc. (Lond.) In a previous communication made to the society by these gentlemen, a list of plants which had been discovered in the Lower Coal Measures near Halifax was given. At that time only one species of fossil fungus had been discovered, since then, however, Mr. Binn has brought to light additional examples of fungoid growth. The specimens, taken from some nodules, were exhibited in three microscopic slides. The first is a transverse section of the petiole of a fern, and a similar section of a branchlet or rootlet of some other plant. The fern (*Zygopteris Lacatii*) evidently lay exposed for some time to the atmosphere before fossilisation set in and during that period it was attacked by the fungi. The vegetative part of the fungus consists of a large number of very delicate hyphæ, not more than $\frac{1}{7000}$ inch in diameter, which are frequently branched. In one respect the hyphæ differ from those of most fungi in exhibiting at different points what appear to be a number of closely approximated constructions, which give the filaments at these points a moniliform character, possibly the constructions may be transverse septa. The reproductive organs are unfortunately neither abundant nor well-defined, indeed the only structures to which reproductive functions can be assigned are minute spherical bodies, apparently produced at the extremities of the hyphæ, or their branches. They are probably oospores. The fungi, from various characteristics, probably belong to the suborder Peronosporæ. The second slide exhibits a section cut parallel to the first, from the same species of material, and is nearly identical with it. The slide is confirmatory of the results obtained from the first, but it does not contain a greater number of the supposed oospores. The third slide is entirely different, having been cut from material obtained from a different pit. It consists of small and disconnected fragments of vegetable tissue, most probably the broken débris of several plants. In and between these fragments are immense numbers of small round bodies, the spores of some fungus ; but no trace of mycelium or any filamentous structure has been discovered. In this peculiarity they very much resemble the Myxomycetes. It is just possible that the fossil spores may be of a myxomycetous nature, seeing that they occur in and among tissues that are partially decayed, and in so far resemble the conditions that favour the development of existing forms. The size and appearance of the fossil forms also agrees almost exactly with that of existing specimens.

NOTES AND QUERIES.

Climbing-irons.—Can any of the readers of Science-Gossip give their experience about the use of climbing-irons ? Where are the best irons to be had, and are they really of service in ascending trees ? —*Beta.*

Acclimatised Parakeets.—Some years ago, I recollect reading that a pair of the Australian undulated grass parakeets, commonly called budgerigars, had bred in a tree in Lincoln's Inn Fields, and reared young ones, which, together with their parents, were, the writer asserted, to be seen daily disputing with the sparrows for the crumbs thrown to them by the residents, and the oats that fell about the cab-stand. What became of these birds I have never heard ; but having kept budgerigars for some years and bred them, in a cold room, at all seasons of the year, I think there would not be the least difficulty in acclimatising them. If some gentleman in the country would turn a couple of hundred of them into a wood in the spring of the year, I have no doubt they would soon make themselves at home, and as they are very harmless pretty little birds, would soon become general favourites.—*W. T. Greene.*

Acclimatised Canaries.—It may be interesting to some of your readers to know that canaries are not such delicate birds as it is often supposed. True, many die from catching cold ; cages are hung up in a room, and when the little songsters are exposed to draughts from the door or window they die, and are thought to be very tender. Well, mine have been out of doors all this winter, exposed as they were to a frost which on two or three occasions has registered from 12 to 20 degrees below zero. The aviary is about 9 feet high, 12 feet long, and 6 feet wide, covered with a zinc roof, and has a wall on the north, east, and west sides ; the front facing the south has no protection whatever during the most intense frost, except a quarter inch wire netting. Night and day, sunshine and shade, some have been there year after year, and never yet have I found that cold or frost has been the destruction of one. Some young and some old, it makes no difference as far as the thermometer is concerned, they roost on the dried stumps or branches inside, and never sing more sweetly than during the winter snowstorms. Like children, they seem to derive amusement from the falling snow. The birds like eating snow too. When the frost is so severe that the water freezes almost as soon as given to them, which has been the case this winter, I take care to shovel some snow into the cage, and so long as they have snow to pick, or water to drink, they do not mind the cold. They enjoy a cold bath, however, as long as the frost does not prevent them having a dip, which, by adding a little water only on the top of the ice, they were long able to do, till at last, the ice in the pan was one frozen mass and they had to satisfy themselves with the snow. Turn your canaries out of doors in the warm air of July or August, and as the cold of winter comes on gradually they will month by month get accustomed to it. My experience for years has proved if they are protected from a draught or current of air through the aviary, you may fearlessly expose them to any amount of cold such as can get to them from a southerly aspect, protected (only to prevent them flying away) by a wire netting.—*W. Budden, Ipswich.*

PHOSPHORESCENCE OF SHORE SAND.—The phosphorescence (so called) spoken of by Mr. J. G. T. Lee, as occurring on the sands at Whitby, was doubtless caused by *Noctiluca miliaris*, stranded by the receding tide. I have frequently observed the same effect, and by microscopic examination have ascertained the cause. These little creatures only "shew their tiny spark to the traveller in the dark," when irritated in any way; but the effect, if not visible by daylight, can be felt at any time. Last summer, I experienced a very unpleasant sensation, similar to that caused by a galvanic battery, on putting my hand into a dense mass of them floating in the sea. Subsequent experiments with a large quantity at home, proved that the flash is always accompanied by the "shock," and that after two discharges have taken place—the second one much feebler than the first—a rest of ten or fifteen minutes must be allowed before the phenomena can be repeated. Am I right in thinking that the shock with the coincident flash, is intended as a means of self-defence?—*W. H. Shrubsole, F.G.S.*

STEERING-POWER OF SEA-BIRDS.—Among other interesting notes made during a passage to Australia and New Zealand, one relates to the flight of sea-birds, and as I have not noticed it elsewhere, I think it may be worthy of a place in SCIENCE-GOSSIP. It is, I fancy, generally believed that the sole steering-power of birds lay in their tails, and this perhaps may be true so far as land-birds are concerned, but several observations I made lead one to think that sea-birds possess a more or less powerful auxiliary to the tail, and which is to be found in their feet. Shortly after leaving Plymouth, during a fresh breeze, several gulls flew close to and around the ship, and I noticed that when turning sharply, or making a curve in their flight, they lowered their feet from the ordinary position taken when in a direct course and made a kind of paddling motion, the toes being outstretched so as to form a kind of fan with the web. As this was the first time I had noticed anything of the kind, I determined to make a point of observing the flight of the various kinds of birds we might meet with during the remainder of the passage. Until we reached Madeira no case presented itself, as birds became rare, in fact only two or three petrels were seen, and these too far off to be observed with any certainty. When off the above island several gulls and terns came round us, when exactly the same motions were seen. No other chance then presented itself until we had passed the equator, the southern tropic, and entered the colder climate of the southern seas, where, as is well known to those who have had the fortune (or misfortune!) to sail, birds collect and follow in the ship's wake by hundreds, and continue without ceasing until the antipodes are reached. They fly without the slightest sign of fear almost within reach of the outstretched hand, affording excellent opportunities for being closely observed. Without exception, each time they made a curve or angle, the feet were lowered and the same paddling motion gone through, but immediately it was completed, they were re-collected to the former position. As this occurred with all the birds which flew around, from the gigantic albatros down to the tiny petrel, one may, I think, infer with tolerable certainty that sea-birds derive considerable aid from their feet as a steering-power, and especially when crossing adverse currents of wind.—*W. M. Cole, F.G.S.*

THE "LONG-PURPLES" OF SHAKSPEARE.—The plants alluded to by the queen in Hamlet, act iv. scene 7, by this name, are most probably the riverside growth of *Orchis mascula*. She observes that to these "long purples"

> "Liberal shepherds give a grosser name,
> But our cold maids do dead men's fingers call them."

What the "grosser name" of the "liberal shepherds" was, may be seen on reference to the description of *Orchis mascula* in any of the olden herbals, and in "Withering's Botany" (1776); while the name of "Dead-men's-fingers" is still applied to this plant by rustics hereabouts.—*R. A., Wellington, Shropshire.*

THE "LONG-PURPLES" OF SHAKSPEARE.—There can be no doubt that *Orchis mascula* is the plant Shakspeare alludes to under the above name, in Hamlet, act iv. scene 7. From the above reference we learn that the same plant was designated by three names, and we also learn that it was not *Lythrum Salicaria* any more than it was *Digitalis purpurea*. They are both long and purple; but that certainly does not make them the plant of the poet. On the other hand the Orchis is still (in some parts of Scotland and the north of England) called "long-purples," and as any one may observe, the tubers bear some resemblance to "Dead-men's-fingers." If I mistake not, Lightfoot was the first botanist who pointed out that the Orchis was, beyond all question, the "long purples" of our great poet.—*A. Craig-Christie.*

THE "LONG-PURPLES" OF SHAKSPEARE.—There can be little doubt that Shakspeare referred to the common species of orchis, such as mascula and morio, under the name of "Long-purples," or "Dead-men's-fingers." The two names are not obviously appropriate to any other common plant, and most popular names are obviously appropriate. *Arum maculatum* has a better claim by far than lythrum, though the two names would only fit two different varieties. As our greatest authority on the subject, the Rev. H. N. Ellacomb, points out in his "Plant-lore of Shakspeare," the name "Dead-men's-fingers" was given from the pale palmate roots of *O. maculata, latifolia*, and allied species.—*G. S. Boulger.*

"LONG-PURPLES."—I remember reading, but I do not remember where, that the plant alluded to by Shakspeare as "long purples" was really the cuckoo-pint (*Arum maculatum*), the spadix of which is purple in hue.—*Helen E. Watney.*

THE "LONG-PURPLES" OF SHAKSPEARE (No. 182, p. 45).—Shakspeare's own words, I think, afford the best proof that the plant he intended was *Orchis mascula*, L., the early purple orchis. It is not necessary to specify the "grosser names" by which shepherds of Shakspeare's day and the country people of the present day have called and still call the orchis. However, the synonym "Dead-men's-fingers" settles the question: Dead-men's-fingers, Dead-men's-hands, and Dead-men's-thumbs being still in use in various counties. These names are also applied to several other orchises, and no doubt the pale palmate roots of two of the species have given rise to the name. *Orchis mascula*, it is true, has not palmate roots, but little heed was formerly paid to minute distinctions, and its long purple spikes are more conspicuous than those of other species, so it would receive the name. *Orchis mascula* is called Dead-men's-fingers in Sussex. It is called Dead-men's-hands in Gloucestershire, Hampshire, Sussex, Warwickshire, and the Border Country; and it is called Dead-man's-thumb by Gerard, and still in the Border Country it receives the name. *Orchis Morio*, L., is called Dead-men's-fingers in Sussex, and *Orchis maculata*, L., and *O. latifolia*, L., are called Dead-men's-fingers in the Border Country. It is clear that Shakspeare alluded to some kind of orchis, and the adjective "long," applied to the purple spikes, points pretty conclusively to the species. *Lythrum Salicaria*, L., however, though certainly not Shakspeare's "long purples," is known by that name in Northamptonshire (*see* Sternberg's "Northamptonshire Glossary"), and it is, doubtless, the plant of Clare's "Village Minstrel," ii. p. 90:—

> "Gay long-purp'es with its tufty spike;
> She'd wade o'er shoes to reach it in the dyke."

I am unable to identify Tennyson's "long-purples of the dale."—*Robert Holland.*

THE "LONG-PURPLES" OF SHAKSPEARE.—In my opinion the "long-purples" of Shakspeare is the *Arum maculatum*, in proof of which in Hamlet, where the queen, informing Laertes of the death of her sister says:

> "There is a willow grows ascaunt the brook,
> That shows his hoar leaves in the glassy stream;
> Therewith fantastick garlands did she make
> Of crow-flowers, nettles, daisies and long-purples,
> That liberal shepherds," &c.

—*Jas. Thompson, Tintwistle.*

SOUTH LONDON MICROSCOPICAL AND NATURAL HISTORY CLUB.—In the January number of SCIENCE-GOSSIP is a paragraph, signed Stuart Taylor, asking for assistance in starting a club in South London for the study of natural history. As the South London Microscopical and Natural History Club has been in existence for nearly ten years, I shall be obliged by your calling the attention of your readers to it in your next number, as it fully answers all the purposes your correspondent wishes for.—*Edward Dadswell, Hon. Sec., S. L. M. & N. H. Club.*

WATER-CRESSES.—In answer to R. B. B.'s inquiry on the subject of the common water-cresses (*Nasturtium officinale*) formerly *Sisymbrium Nasturtium*, SCIENCE-GOSSIP, page 44. In the "Treasury of Botany" it states, "As a spring salad, the young shoots and leaves of water-cresses have been used from time immemorial. They are stated to have been eaten by the ancients along with lettuces, to counteract the coldness of the latter by their warmth and stimulating qualities; and at the present day they are to be found on almost every table, the popular belief being that, when eaten fasting, they possess the property of exciting the appetite, and acting as a powerful anti-scorbutic. The first attempt to cultivate water-cresses by artificial means in Europe, was made by Nicolas Meissner, at Erfurt, the capital of Upper Thuringia, about the middle of the sixteenth century. The experiment proved successful, and the water-cresses of Erfurt soon acquired that celebrity for their superior quality which they still maintain; most of the cities on the Rhine, as well as the markets of Berlin 120 miles off, being constantly supplied with them. In the neighbourhood of London, the mode of cultivating water-cresses was first introduced by Mr. Bradbury at Northfleet, Springhead, near Gravesend, particularly in localities favourably situated with regard to springs of water. Near Rickmansworth in Hertfordshire, Waltham Abbey in Essex, Uxbridge in Middlesex, and various other places, there are plantations many acres in extent, which are scarcely sufficient to supply the great demand for this popular salad herb during the season." Dr. M. J. Thornton, in his "Family Herbal" (2nd edition, published 1814), quoting from the author of the "Edinburgh New Dispensary," says: "Water-cresses act as a gentle stimulant and diuretic. They should be eaten at breakfast, also at dinner, and at supper, to experience benefit from the virtues of this herb." Haller says: "We have seen patients in deep declines cured by living almost entirely on this plant." It is reported, the same author adds, "that the juice of the water-cresses snuffed up the nostrils has cured a polypus of the nose. It enters into composition esteemed famous for curing the scurvy. Withering speaks of the water-cress as being universally used, as an early and wholesome spring salad. It is an excellent anti-scorbutic and stomachic, with less acrimony than the scurvy grass. In the fourteenth volume of SCIENCE-GOSSIP (page 42), there is an interesting note upon the water-cress also at page 45, there is a reference made to Mr. Shirley Hibberd's artificial growing of the water-cress; in the winter; for which the Royal Horticultural Society awarded him a medal. The creeping water-parsnip (*Sium noctiflorum*), is mentioned in Professor Martyn's "Letters on Botany," addressed to a young lady, as sometimes being mistaken for the water-cress, as when both are young, they are not unlike, and they frequently grow together, but the leaves are very different, and not often mistaken.—*E. Edwards.*

WATER-CRESSES.—In reply to R. B. B.—Water-cresses have been used as salad from very early times up to the present with the reputation of possessing numerous medicinal virtues, but chiefly diuretic and anti-scorbutic. Dioscorides said that they warm, and are diuretic eaten raw, and that they cleanse the face of spots and sores, applied at night and taken off in the morning. Matthiolus, in his "Commentary on Dioscorides," mentions other supposed virtues; and such like are to be found in the other herbals of the sixteenth and seventeenth centuries. They are not, however, worth repetition. Water-cresses were retained in the "Materia Medica" until the end of the eighteenth century. Under the genus *Sisymbrium*, Linnæus mentions "*Nasturtii aquatici.* Qual.: minus cochlearia acris. Vis: diuretica. Usus: scorbutus, obstipatio, polypus. Mat. Med. 1749." Dr. Woodville wrote: "Water-cresses obtain a place in the 'Materia Medica' for their anti-scorbutic qualities, which have been long very generally acknowledged by physicians. They are also supposed to purify the blood and humours, and to open visceral obstructions. Hoffman and Haller thought highly of their powers in this way: they are nearly allied to scurvy-grass, but are more mild and pleasant, and for this reason are frequently eaten as salad." Med. Bot. 1790. Water-cresses are not now included in the Materia Medica; and even Lindley in his

"Flora Medica" (1838) omits them, though he gives a very extended list of medical plants. The last account I have seen of the dietetic properties of water-cresses is by Mrs. Lankester, in the third edition of "Sowerby's English Botany" (1863), who says "that the fresh green leaves are a good anti-scorbutic."—*R. H. A.*

Can new Species originate by crossing?—An answer to E. A. Brunetti's letter would involve an exact definition of the terms genus, species, race, variety, which would, in effect, reopen the discussion which you terminated at the close of last year; and I would not again have addressed you on the subject, but that the evolutionists may assume that if Mr. Brunetti's letter be unanswered, it is because it is unanswerable. I quite agree with your answer to P. and others in the current number, that there seems no more likelihood of the opponents satisfying each other than of two parallel lines meeting. As the promoter of the discussion on "Intelligence in Man and Animals," allow me, however, to express a hope that it will not be fruitless, as many of the moot points of the subject have been fairly ventilated.—*H. D. Barclay.*

Misconceptions of Darwinism.— Though the views enunciated by Mr. Darwin are rapidly gaining adherents, these last are so much more remarkable for valour than for discretion, that the learned naturalist might well cry, "save me from my friends." Your February number contains several very un-Darwinian statements on Darwinian topics, which I take in order, using the word Darwinian to express that particular view of evolution, in which natural selection is considered a most important mode of change. Not only admitting, but being ready to maintain, that "The Origin of Species" is the greatest scientific work of the day by reason of its method, its array of facts, and its universal influence, I submit that it is an absurd misuse of terms, to call it a cyclopædia of science. At the most it only professes to deal with biology. It is equally absurd to say that Mr. Darwin has in any degree reduced variation to a law or even to a code. No one would be more ready to deny having done so than the great author himself. Indeed, if my memory mislead me not, he clearly says that of the causes of variation we know next to nothing, and that they concern not his subject, that of the fixing of variations into specific differences. No more unfortunate instance could be advocated than Mr. Palmer's of the cowslip and primrose. There are as many or more primroses on one stalk as there are cowslips, the difference between these two species being chiefly in the leaves, the length of the flower-stalk (generally very short in the primrose) or peduncle, and that of the pedicels (generally long in the primrose) the points of the sepals, the shape of the corolla, and the folds at the mouth of the corolla-tube. There can hardly be two more distinct species in one genus and all probability points to their having a common ancestry rather than to one as the ancestor of the other. Though Mr. E. A. Brunetti has read the "Descent of Man," his scientific training does not seem to have included any attempt at defining such all-important terms as "variety" or "species," nor a clear history of our views of evolution. Hybridism is not now considered an important mode of origin of species, nor is there any evidence in Mr. Brunetti's quotation that the Spikehorn-buck of the Adirondacks is a species originating from hybridism rather than from so-called casual variation. Domestic dogs, ducks and pigeons, belong almost exclusively to three species; so that the fertility of hybrids between their varieties proves little or nothing. A far more important case as against Mr. Barclay, is that of the Hybrid geese quoted from Mr. Darwin's letter to "Nature" on p. 40.—*G. S. Boulger.*

"Mealies" is merely the native name in Natal for maize or Indian corn. I gave a definition of the word twenty years ago in my "Commercial Dictionary of Trade Products."—*P. L. Simmonds*, 61 *Cheapside.*

Morbid Sensations.—I cannot agree with your correspondent, "A Common Man," that the objection to seeing serpents fed at the Zoological Gardens is necessarily a "morbid" feeling. I should rather incline to think that if, as a naturalist, a humane person wished to see the operation once or twice, he would no more desire to witness it habitually than to watch a cat playing with a live mouse. It is a "normal working of nature" for carnivora to eat human beings when they can get them; but one would not care to study a tiger's treatment of a "common man" in an Indian jungle. While it is quite true that the mere shrinking from the sight of pain is no proof at all of humanity, yet needlessly to witness its infliction, does not seem calculated to increase one's sensitiveness to the sufferings of others, whether they belong to our own race or to the dumb creation. Especially is this true as regards children. They would see nothing but cruelty in serpent feeding, and probably the same would be true of many grown-up but ignorant persons. —*Another Common Man.*

Unripened Figs.—On p. 281 of the last volume, the Rev. Z. J. Edwards requests information as to the cause of figs not ripening in the open air; perhaps the following remarks may prove of service to him. The fig is of extremely vigorous growth in ordinary garden soils, too much so in fact, for the strength of the plant is expended in the production of coarse foliage and shoots, which are too full of sap to be matured by our brief summer. The plant naturally requires a light calcareous soil, which must be prepared artificially if it cannot be otherwise obtained. The old trees should be taken up, freely shortening both roots and branches, a quantity of lime rubbish being mixed with the soil, and then replant the trees, confining the roots within a space of three feet from the main stem. The fig also requires all the sun-heat to which it can be exposed, even in the south of England, and if the tree mentioned by your correspondent "has a high wall on the south and east," it could not be in a worse position. If, however, it is planted on the south side of a wall, or in a warm sunny place, and the foregoing particulars as to soil are observed, there will be no difficulty in obtaining abundant supplies of ripe figs. Possibly the variety may not be well adapted to outdoor cultivation. Brown Turkey is the best for the purpose.—*L. Castle.*

Woodcocks or Goatsuckers.—In reference to the blunder which your correspondent T. A. B. supposes Chas. Kingsley to have made as to the habits of the woodcock, I will describe some of the habits of this bird which I have observed. In the summer of 1877, while staying at Carrbridge in Inverness-shire, I was in the habit of strolling along the outskirts of a dense pine-wood in the vicinity. I here noticed the following habits of the woodcock. The pine-wood is situated on a hillside, so that, standing on the moor below, one can see along the tree tops for a long distance. About 150 yards to the north of this hill on the low lying ground, there is a birch-wood plantation, along the north skirt of which runs the river Dulnain. After sunset, when the deepening twilight was beginning to render distant objects indistinct, I have seen the woodcocks rising from the dense part of the wood, and after sailing about for a short time, they would again settle among the trees. At other times they would come on steadily until the birch-wood was reached, when they would turn, fly back and alight in the wood. I have seen from forty to fifty birds in one evening. I shot two on the wing, so that I am certain as to their identity. Kingsley accurately describes their movement when he says, "they hawked to and fro," but their flight is slower and heavier, than that of the swallow. When disturbed in flying, they turn hurriedly, making a fluttering motion as if wounded, and then make for the depths of the forest with increased speed. Their cry when heard from a distance, has a croaking sound but when near at hand, a distinct chuckling sound is heard. Surely your correspondent has been thinking of the black-cock when he read Kingsley's evening scene "under the hunter's moon."—*Tom W. Ogilvie.*

Mortality of Shrewmice.—Though I cannot lay claim to the title of a "learned correspondent," I am able to quote from the works of one who can—the Rev. J. S. Wood. On page 433 of his volume on Mammalia, I find, after a notice of the fact mentioned by your correspondent, A. Malan, he says: "The presence of the animals is the more remarkable, because there are so many predatory animals and birds, such as cats, weasels, stoats, owls and hawks, which would be very likely to kill such small prey, but having slain them would be almost sure to eat them." Well-bred cats or terriers are very averse to eating a rat or mouse killed by other than themselves, which may account for their unmangled condition. A possible cause of death noticeable in autumn, is that they have delayed retiring to their long winter sleep, and have been taken by a sudden frost and chill to one still longer. —*C. J. W.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

To Anonymous Querists.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

The Curator of the Cambridge Botanic Garden (R. Irwin Lynch) will feel extremely obliged to gentlemen who will have the kindness to forward him seeds or plants of rare and choice British species. All will be carefully recorded and cultivated.

W. D. E.—The contents of the paper marked A, were not the excrement of insects, but small pupa-cases.

J. W. Harvey (Selhurst).—The specimen which you sent us, together with a photograph, is a sponge, a species of Halichondria.

T. G. H.—The specks on the Seville oranges you spoke of, are the empty pupa cases of *Cetraria citriperda.*

W. Gault.—We are much obliged to you for the interesting specimens of *Waldheima Hibernica* (Tate), from the Upper Greensand beds of the Zone, *Ostrea columba* (glauconitic sandstone), Collin Glen, near Belfast.

J. S. (Leigh).—The ferns enclosed were, No. 1, a variety of *Athyrium Filix-fœmina;* No. 2, probably a New Zealand species of *Polypodium* (Phymatodes) *pustulatum.*

J. A. C.—*Hydra fusca* may be known by the usually brown colour of its body, although the best means to distinguish it from *Hydra vulgaris* is to note its tentacles, which are several times longer than the body, whilst those of *H. vulgaris* are usually only the length of the body. "Swarm spores" is the name given to certain reproductive cells found only in cellular cryptogams, and which are endowed with remarkable spontaneous power of motion, usually in water. You will find an account of them in Thome's "Structural and Physiological Botany," edited by Dr. Bennett, chapter vi. p. 250.

A. E. Hunt.—The food of the Kentish plover is very much like that of the ring plover, consisting of worms and insects, as well as small shrimps, shore-hoppers, &c.

W. B. Scott.—You had better inquire in our Exchange column for specimens of the natterjack toad, and we have no doubt you will be able to obtain them.

J. Arthur Floyd.—Dixon's "Geology of Sussex," a new edition of which is now appearing, gives illustrations of the most characteristic of chalk fossils, whilst those of the greensand are figured in the volumes of Palæontographical Society. You will find good and ample descriptions of the commoner fossils of the chalk and greensand, in Dr. Mantell's "Medals of Creation."

J. M. V.—Get the "Saturday Half-Holiday Guide," which will give you all the information you want as to clubs, and places for natural history and geological exploration around London.

J. J.—The subject is to a very large extent still open to doubt.

J. S. (Ledaig).—We are sorry to say that we received your tin box full of small fragments of glass and a vile smell. The nudibranchs had disappeared that way. Can you send us others, more safely packed?

J. W. Bentley.—The best work on "Mineralogy," is by J. D. Dana. On Geology, consult Professor Greene's "Physical Geology," Ramsay's "Physical Geology of the British Isles," fifth edition, and Lyell's "Student's Manual of Geology." Nicholson's "Manual of Palæontology" is an excellent book. Penning's "Field Geology," and Woodward's "Geology of England and Wales" deal quite sufficiently with the practical part of this science.

H. M.—We cannot tell from this sketch the species of the insect you sent us, but it is, as far as we can judge, one of the Mantids, or leaf insects.

J. S. (Rotherham).—You will find a capital sketch of the Geology of New Zealand, by Dr. Hector, in Silver's "Handbook for Australia and New Zealand," published in London at about 2*s.* 6*d.* A paper on the Geology of New Zealand, with special reference to the drift of that country, is published in the "Proceedings of the Geologists' Association," vol. iv. No. 7.

Rev. H. H. S., and others.—Any reader of Science-Gossip can join the Botanical Exchange Club, by sending a fee of 5*s.* to defray the expenses of carriage, assortment, &c. We may add, for the benefit of intending and actual members, that it is now time this year's names and subscriptions were sent in to Mr. D. Bogue, 3 St. Martin's Place, Trafalgar Square, London, W.C.

M. L. D.—You had better forward your question to the Editor of the "English Mechanic," who will, we doubt not, give you a full and complete answer.

J. E. Westby.—The specimen of a boulder (as far as we can judge from so small a fragment), indicates that the rock is one of the highly metamorphosed sandstones, possibly from the altered Silurian rocks of the Highlands.

R. R. (Newcastle-on-Tyne).—It is a micro-fungus, one of the cluster-cups *(Æcidium).* See Cooke's "Microscopic Fungi."

J. P. (Norwich).—The spots on leaf sent to us were the result of a fungus—*Lecythea Rosæ.*

H. H. (Salford).—Unfortunately the lichens were much broken, hence undistinguishable; the larger one, much branched, is the common reindeer moss *(Lichen rangiferinus).*

C. E. S. (Channel Islands).—Thanks for excellent specimen, now we have no doubt we were correct; it is a good form of *A. lanceolatum-crispatum,* the colour of the frond is characteristic of lanceolatum.

J. S. (Bagot, Jersey).—The little red spots on the lichen are, as you judge, the fruit.

J. A.—No. 1, is *Melandrya caraboides,* one of heteromerous beetles, common in old wood; it flies in the hot sunshine; No. 2, *Otiorhynchus picipes,* a very common and destructive weevil; No. 3, *Phædon tumidulum,* a very common chrysomelid; No. 4, *Phyllobius argentatus,* a very abundant weevil. As an introduction, get Rye's "British Beetles," published by Lovell Reeve & Co.; as a descriptive manual, Cox's "British Beetles," published by Janson.

E. E. Edwards.—The leech you sent us is the *Hæmocharis piscium,* which is semi-parasitic upon such fishes as the pike and carp, &c. The best way to preserve it would be in glycerine. Get "Davis on Mounting," price 2*s.* 6*d.*, from D. Bogue, 3 St. Martin's Place, Trafalgar Square. This book will afford all the assistance a beginner needs in mounting microscopic objects.

Learner.—Get "Notes on Collecting Natural History Objects," price 3*s.* 6*d.*, from 3 St. Martin's Place, Trafalgar Square, London, where you will find full details concerning the collection and preservation of beetles and other insects. You may get a microscope from two guineas, upwards, suitable to your purpose from nearly all the makers who advertise in Science-Gossip.

Filius.—It is a form of *Parmelia ambigua* (Wulf); there are two species on same tree, we only state our opinion on the one.

N. B. C.—1, *Usnea barbata*; 2, *Parmelia saxatilis*; 3 and 5, no apothecia; 4, form of *Parmelia saxatilis*. The best book on the subject is "The Lichen Flora of Great Britain."

J. A. W. (Darlington).—No 4, *Lecanora vitellina*; No. 3, *Cladonia cervicornis*; No. 6, *Cladonia pyxidata*; we are unable with certainty to name the others, they bear no fruit (apothecia). We should recommend you Mudd's Lichens.

T. W. O. (Aberdeen).—We think they are—2, *Cladonia pyxidata*; 3, *Stereocaulon coralloides*; 4 and 7, *Parmelia saxatilis*; 6, Reindeer moss (*C. rangiferinus*).

J. Atkinson.—We will try to answer your queries next month.

EXCHANGES.

Wanted, Bell's "Quadrupeds," and Hewitson's "Oology," for stuffed birds or cash.—E. E. Evans, Brimscombe, Gloucester.

A quantity of foreign diatomaceous material, in exchange for well-mounted slide of *Uredo caries*, Dec., *Uredo fœtida* (Bauer), *Uredo segetum* (or the flour acarus), or *Trichina spiralis* (*Fasciola hepatica*), or *Cysticercus cellulosus* mounted. A. Smith, Chemical Laboratory, Essex Road, Islington.

A rectangular tube and prism, with Beale's camera, for drawing objects with the microscope in the erect position. Will fit a microscope with tube of 1 inch diameter. Wanted, cabinet for microscopic objects or cash.—Address, T. V. D., 33 Sloane Street, London, S.W.

Niagara River filterings, in exchange for other slides. Also filterings unmounted.—Herman Poole, Practical School, Buffalo N.Y., U.S.A.

Duplicates of the following good British land and fresh-water shells, offered in exchange for other desiderata—*Lim. Burnetti*, *L. involuta*, *S. oblonga*, *Vertigo pusilla*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. angustior*—desiderata, good foreign land shells, named, British birds' eggs, or several species of British land shells (locally common in many places) in quantity.—W. Sutton, Upper Claremont, Newcastle-on-Tyne.

Offered in exchange for Hincks' Hydroida or microscopic apparatus, 75 species of foreign ferns, some very rare. Particulars on application.—E. C. J., Foley Cottage, Hampton Road, Bristol.

Wanted, "Midland Naturalist" complete, any vols.* of Science-Gossip, except for 1877 and 1878, unbound preferred. "Popular Science Review" for 1871, or any works on Bryology; exchange, Dawson's "Origin of the World," Watson's "Reasoning Power of Animals," Cook's "Biology," all new, or cash.—J. R. Murdoch, 40 Leighton Lane, Leeds.

Wanted, a Crouch, or Swift's student's microscope, cheap; state lowest cash price.—J. R. Murdoch, 40 Leighton Lane, Leeds.

A number of well-mounted microscopic slides for exchange. Lists invited.—R. Hawkins, Hillside, Hastings.

Cassell's "Races of Mankind," bound in 2 vols. Wanted in exchange for the above, geological or zoological books or fossils.—J. Arthur Floyd, Alcester, Warwickshire.

Wanted, a well-mounted and perfect skeleton of the common frog.—Fred. James, Tovil, Maidstone.

Wanted, good specimens of the following British mosses, any species of Leskea, except sericea; also any of Gymnostomum with fruit. Exchange foreign or British fern roots or fronds.—Miss Ridley, Hollington, Newbury.

Wanted, catalogue, or parts 1 and 2 of "Marine Polyzoa," Busk, 1852. Good exchange.—A. Palmer, Lyme Regis, Dorset.

Scotch carboniferous fossils (good specimens), in exchange for fragments of British or foreign sponges. Send lists of sponges to J. Smith, 94 Dundas Street, Glasgow.

Brachiopoda from the Irish Cretaceous rocks, including *Waldheima Hibernica*, figured in Juke's "Manual of Geology," *Rhynchonella robusta* (these two rare species are peculiar to the Irish Cretaceous strata), *Rh. dimidiata*, var. *convexa*, *Rh. limbata*, var. *lentiformis*, *Terebratula Hibernica*, *Ter. obesa* (very fine), several rare varieties of *Ter. carnea*, and many other species, in exchange for brachiopods or sponges, from the Cretaceous beds of England and the continent. Send lists to Wm. Gault, 105 Westmoreland Street, Belfast.

Wanted, a triple nose piece, in exchange for Dent's dipleidoscope with compass and level, new.—W. Eyre, Swarraton Rectory, Alresford, Hants.

Sections of the corals of Devon for the microscope. Also various kinds of fossils, British shells and minerals, for large kinds of foreign shells, and good large specimens of double-reflecting span in cubes, or good specimens of Silurian fossils.—A. J. R. Sclater, Bank Street, Teignmouth.

Wanted, animal parasites in exchange for other good micro objects.—Thomas Curties, 244 High Holborn, London.

"Nature" for 1879, one number missing, and Blackwood's Magazine for 1879 complete, to be exchanged for good micro slides. Insect anatomy preferred.—T. E. Watson, 2 Clifton Place, Newport, Monmouth.

Will exchange 35 shilling parts of Goldsmith's "Animated Nature," also 40 of Cassell's "Natural History," now publishing, first volume bound in covers, for eggs, insects, minerals, shells, fossils, marine objects.—W. J. Richards, Hassel Street, Newcastle, Staffordshire.

Sparmania Africana, figured in last year's Science-Gossip. Flowers sent in exchange for any object of microscopic interest.—M. Medhurst, 1 Gladstone Road, Liverpool.

A few ferns in fructification, stained and mounted transparent, for selected diatoms or pure gatherings.—H. S. Tarrant, Palatine Road, Didsbury, near Manchester.

Wanted, setting-boards from 1 inch to 5½ inches, corked and papered. Must be in good condition, and 14 inches long. Part exchange birds' eggs and cash.—J. M. V., 16 Merrion Square, South Dublin.

Two vols. of the "Naturalist's Note Book," 1868–69, cost 6*s*. each, for Stainton's "Manual of British Butterflies and Moths," or Rye's "British Beetles."—R. McAldowie.

For slide of carboniferous sponge spicules, very large specimens, send slide of recent sponge spicules, spicules or wheels of sea-cucumbers, or spicules of sea-urchins, to J. Smith, 94 Dundas Street, Glasgow.

For exchange a capital collection of British fossils, also interesting series of rock specimens and some minerals. Wanted, one or two cabinets to hold 1000 or 500 micro-slides each, recent and fossil foraminifera, rock sections, rock cutting, and sediments.—E. Wilson, 18 Low Pavement, Nottingham.

First-class slides of picked and rare diatoms, in exchange for deposits from Ile of Tür (Denmark), Bermuda, and others. Will give quite splendid slides for very rare deposits.—J. Tempère, 249 Moss Lane, Manchester.

I have some beautiful Indian butterflies and beetles, I wish to exchange them for side-blown British birds' eggs, or books on natural history. Newman's "Moths" especially wanted.—R., 44 Blenheim Street, Newcastle-on-Tyne.

Well-mounted diatom deposit exchanged for picked diatoms or pure gatherings.—P. Z., Lilly Villa, Victoria Park, Manchester.

Wanted, "Journal of Botany," half price and postage.—W. W. Poole, Mechanics' Institute, Winchester.

Golden Eagle parasites, also several other species both rare and common, in exchange for British butterflies or offers,—H. J. P., 81 Bridge Street, Manchester.

First-class micro material wanted in exchange for well-mounted slides of injected kidney of porpoise, double injected liver, foraminiferous shells, 730 fathoms from St. Vincent Harbour. State offers before sending.—James Simpson, 48 Arthur Street, Queen's Park, Edinburgh.

Slides of platinocyanide of Yttrium, in exchange for well-mounted slide or unmounted object of interest.—D. W. G., 9 Mincing Lane, E.C.

Blue and yellow selenite wanted, exchange red and green selenite or in slides. Stage micrometer and stage forceps to exchange for slides, material, or accessories.—E. Clover, Springfield, Sudbury, Suffolk.

Wanted, euplectella or Venus's flower basket, exchange foreign lepidoptera.—J. Bates.

Wanted, microscopic accessories, or magic lantern slides, will give in exchange side-blown British birds' eggs, or land and fresh-water shells.—James Ingleby, Eavestone, near Ripon.

Well-mounted microscopic slides in exchange for small fish, plants, &c., for aquarium.—Thomas Shipton, The Terrace, Chesterfield.

BOOKS, ETC., RECEIVED.

"The Story of the Earth and Man." By Dr. Dawson, F.R.S., 6th edition. London: Hodder & Stoughton.

"Chapters from the Physical History of the Earth." By Arthur Nicols, F.G.S. London: C. Kegan Paul & Co.

"Midland Naturalist." February.

"Land and Water." February.

"Journal of Applied Science." February.

"American Naturalist." February.

"American Journal of Microscopy." February.

"Boston Journal of Chemistry." February.

"Feuille des Jeunes Naturalistes." February.

"Ben Brierley's Journal." February.

&c. &c. &c.

Communications received up to 10th ult. from:—G. C. D.—M. W. N.—G. M.—C. F. W.—T. W.—W. D. E.—F. S. L.—C. J. W.—C. W. W.—A. P.—M. M.—F. G.—E. D.—J. A C.—W. E.—J. S.—W. H.—W. G.—R. W.—M. R.—S. H.—T. H.—L. C.—E. E.—A. J. R. S.—H. T.—J. S.—G. H.—W. C. H.—W. J. H.—W. G.—J. B.—G. C. G.—V. C.—J. F.—B. H.—R. E. L.—B. H.—F. J.—A. G.—A. E. H.—R. L. H.—J. A. F.—G. C.—R. H.—H. G. W.—W. B. S.—W. H. N.—A. S.—E. E.—J. R. M.—H. P.—J. S.—S. C. H.—C. J. A. C.—H. D. B.—S. T.—E. M. C.—T. J. L.—E. E. E.—T. V. D.—W. D. S.—W. S.—E. C. J.—G. T. B.—E. S. W. K.—M. D.—E. W.—J. I.—J. S.—D. J. S.—R. A.—E. C.—G. H. G.—H. J. M.—F. W. P.—J. T.—R.—W. J. R.—W. W. P.—J. B.—J. W. B.—T. W. D.—P. Z.—R. McA.—O. O.—T. G. R. D.—J. M. V.—H. H. S.—A. C. C.—R. B. L.—H. T. P.—T. C.—J. S.—J. L. H.—H. S.—W. S.—H. M.—J. S.—D. W. G.—J. B.—J. F. U.—R. H. A.—W. H. J.—V. G.—J. J.—J. S.—G. S. B.—A. H. W.—J. M. W.—E. E. E.—T. S.—T. W. O.—M. M.—J. S.—J. T. T.—J. N. D. T.—G. E. M.—&c.

A GOSSIP ABOUT NEW BOOKS.

WE are glad to notice some of the books which have been lying on our table until the present opportunity. A new book by Professor Huxley is sure to excite the attention of all earnest students of biology. Few naturalists have at the same time so successfully devoted themselves to original investigation, and the genuine popularisation of science, as this author. The book which we have now the pleasure of noticing is a remarkable illustration of this capacity. *The Crayfish: an Introduction to the Study of Zoology*, by T. H. Huxley, F.R.S. (London: C. Kegan Paul & Co.), will be welcomed by all naturalists. It forms one of the well-known volumes of the International Scientific Series, and as the illustrations are all original, and in the highest style of wood-cutting art, it is really a very handsome book. Professor Huxley shows that the careful study of one of the commonest and most insignificant of animals may lead us from every-day knowledge to the widest generalisation, and the most difficult problems of biology. By the aid either of a crayfish or a lobster, to be dissected as the student progresses with this volume, a very complete structural knowledge may be worked out. It is impossible too highly to recommend a work like this, at once so luminously, simply, and yet scientifically composed. It suggests the profoundest sympathy with the student, for whose sake it has been written.

Illustrations of the British Flora, by W. H. Fitch, F.L.S., and W. G. Smith, F.L.S. (London: L. Reeve & Co.) This well got up little volume is composed of the very clever wood engravings from the illustrated edition of Mr. Bentham's "Handbook of the British Flora." The woodcuts were originally drawn by the above-named gentlemen, which is a quite sufficient guarantee for their excellency. There is a very copious index of genera and species of British plants, but no letterpress beyond the names of the 1306 illustrations. We are sorry, however, to notice that these names are often grossly misspelt, and we feel certain that neither Mr. Smith nor Mr. Fitch could be guilty of the carelessness that is here displayed; we have corrected something like fifty errors of this kind in our copy. With this exception, which we hope will be seen to in the next edition, we have nothing to say of the book except what is commendatory, and we have purposely pointed out the defects in order that their rectification may enhance the value of the work.

Chapters from the Physical History of the Earth: an Introduction to Geology and Palæontology, by Arthur Nicols, F.G.S., F.R.G.S. (London: C. Kegan Paul & Co.) This is a very pleasantly written and well illustrated little book, which ought to take a good place as an introduction to the fascinating study of geology. The author shows himself to be acquainted with the latest discoveries in palæontology and physical geology, and he is familiar with the latest views on these subjects as held by our most distinguished scientific men. The book is separated into two divisions, one dealing with stratigraphy and physical geology generally, and the other with palæontology, in which the life of the globe is viewed as an evolutional whole. We think the value of this book would have been enhanced by a good index.

The Story of the Earth and Man, by Dr. Dawson, F.R.S., &c., *Sixth* edition. (London: Hodder & Stoughton.) The fact that this work (which we had the pleasure to notice favourably on its first appearance) has reached its sixth edition, practically removes it from the sphere of criticism, and we can only express our congratulations to the author that the public have had the good sense thus to take his work under their patronage. We cordially say thus much, because we cannot agree with the author in his sometimes too severe denunciation of the theory of Evolution, although we sympathise with a man who so conscientiously endeavours to be as orthodox in science as he evidently is in theology.

A Text-Book of Field Geology, by W. H. Penning, F.G.S., Geologist, H.M. Geological Survey of England and Wales. We are very pleased to welcome this, the *second* edition of Mr. Penning's valuable work. It occupies a unique place in the varied literature of geology. This new edition has been revised and so considerably enlarged that it is almost twice the bulk of the first edition. It is now a perfect and complete manual and text-book of all that relates to every department of physical geology. The section on palæontology, written by Mr. A. J. Jukes-Brown, F.G.S., adds very considerably to the value of this important work.

A Monograph of Silurian Fossils of the Girvan District in Ayrshire, by H. Alleyne Nicholson, F.G.S., and Robert Etheridge, jun., F.G.S. (Edinburgh and London: William Blackwood & Sons.) This is the second fasciculus of the work undertaken by these two well-known palæontologists on the above subject, having special reference to the Silurian fossils of the "Gray Collection." It is occupied wholly with the Silurian crustacea, dealing very fully with the various genera of trilobites. The five plates which illustrate this part contain some exquisite lithographs of trilobites and allied crustaceans. This work, when completed, will be a very valuable addition to the palæontological literature of the older rocks.

Erasmus Darwin, by Ernest Krause. (London: John Murray.) We regard this work as a complementary contribution to the literature of Darwinism. The fact that a life of the grandfather of the author of the "Origin of Species" should after all this lapse of time have his biography written first by a German, indicates the deep interest which Germany takes in the Darwinian philosophy. Until the last few years we were better acquainted with Dr. Erasmus Darwin as the writer of certain lengthy poems, such as the "Loves of the Plants," &c., which are now very little read, but Herr Krause has here shown by the frequent reference and review of Erasmus Darwin's books, which is included in this biography, that many of his speculations were allied to those of Lamarck. Indeed, we may say that in his "Zoonomia" we find the undoubted germs of the doctrine of Evolution. If so, Dr. Charles Darwin stands in the position of having inherited many of his peculiar views. It should be understood, however, that the theory of natural selection is entirely due to the latter. The present biography contains a preliminary notice by Mr. Charles Darwin of his grandfather, which extends to such a length that Dr. Darwin may be said to be a chief contributor to the volume. This part is exceedingly pleasant reading. Mr. W. S. Dallas has translated from the German all the part written by Ernest Krause with his usual ability.

The Field Naturalist's Handbook, by the Rev. J. G. Wood and Theodore Wood. (London: Cassell & Co.) A work of this kind has been very much wanted, and we therefore welcome Mr. Wood's handbook with much pleasure. In its compilation he has been assisted by his son. The book contains "general hints" for each month's collecting, and then we get arranged under each month a catalogue of the insects which are out and of their food plants, as well as lists of eggs, the plants in blossom, and the localities where they are to be sought.

Botany for Children, by the Rev. George Henslow, M.A., F.L.S. (London: Edward Stanford.) Here is just such an elementary text-book of botany as might be put into practical use in schools, without the slightest doubt that children would take to it. The lessons are so arranged as to be illustrated by the dissection of some common plant selected from each natural order. The style of teaching here exhibited reminds us strongly of the zealous father of the author, the late Professor Henslow.

The Great Frozen Sea, by Capt. A. H. Markham, R.N. (London: C. Kegan Paul & Co.) This is the *fourth* and cheaper edition of the authoritative account of the Arctic Expedition of 1875–6, Captain Markham being commander of the "Alert" on that occasion is consequently a first-rate guide to, and commentator upon, the incidents of the voyage. The book is very pleasant reading, and we are glad to see it appear in its present cheap and attractive form.

Fourteen Months in Canton, by Mrs. Gray. (London: Macmillan & Co.) The authoress of this interesting book is the wife of Archdeacon Gray, whose work on China, in two volumes, published two years ago, excited so much interest. It consists of a series of letters written home during a fourteen months' residence in the city of Canton, and they are of a very bright and chatty nature, frequently sparkling with shrewd intelligence, and the work of a highly intellectual woman.

Ethnology; or, the History and Genealogy of the Human Race, by John Thomas Painter, jun. (London: Baillière, Tindall, & Cox.) The author of this somewhat pompous title has a great deal to learn of ethnology as a science, and this little book looks more like a very literal commentary upon the earlier part of the book of Genesis, flavoured with a little reference to Assyrian, Babylonian, Greek, and Chinese history. We would earnestly recommend him, before writing any more, to acquaint himself with the various well-known manuals on the subject.

Youth, its Care and Culture, by J. Mortimer-Granville. (London: David Bogue.) We heartily commend this little work to all those who have to deal with the training of the young. It is full of cheerful wisdom and earnest sympathy for those in whose interests it has been written.

THE NATURAL HISTORY OF THE TOAD.

By J. Arthur Eisdell.

No. II.

The colours of the toad are liable to some variation: the upper parts are of a dirty lurid colour, blackish or brown, with sometimes a slight greenish tinge. You will notice the greenish tinge in the under skin from which the external cuticle has been removed; its under parts are of a dirty yellowish white colour, sometimes spotted with black. Its head is flat on the top, its brain being small; you will be able to see that there is but little room for its development. Above the eyes there is a slight protuberance studded with pores, this protuberance is a large collection of the follicular glands before mentioned. The toad has no teeth. Its quickest movement is an imperfect leap, but its usual pace is a kind of crawl. On being alarmed or threatened with danger it stops, swells its body, and on its being handled the arid secretion before mentioned exudes from the follicles, and a discharge of limpid water out of the vent takes place.

The toad is a voracious creature, feeding upon slugs, worms, grubs, and insects of various kinds, and for this reason is very useful in gardens. Bell says that the toad refuses food which is not living, and will only take it at the moment when it is in motion.

When about to feed the toad remains motionless with its eyes turned directly forward upon the object and the head a little inclined towards it, and in this attitude it remains until the insect moves, when, by a stroke like lightning, the tongue is thrown forward upon the victim which is instantly drawn into the mouth. This tongue is very soft and fleshy almost throughout, and has its base at the entrance of the mouth in the concavity of the interior edge of the anterior part of the lower jaw. The tongue when at rest and when the mouth is shut has its free extremity in the back part of the mouth, the tip pointing down the throat, but when the toad puts it forth it is considerably elongated, the under surface of the tip being embued with a viscid mucous secretion, the insect is secured by its adhesive quality. When the prey is taken it is slightly pressed by the margins of the jaw, but as this seldom kills it, unless it be a soft tender larva, it is generally swallowed alive.

Like the other amphibia and the reptilia generally, the toad sheds its skin at certain intervals, the old cuticle coming off and leaving a new one which has been formed underneath in its stead. Mr. Bell having often found amongst several toads which he was keeping some of brighter colours than usual, and with the surface moist and very smooth, had supposed that this appearance might have depended on the state of the animal's health, or the influence of some peculiarity in one or other of its functions. On watching carefully, however, he one day observed a large one, the skin of which was particularly dry and dull in its colours, with a bright streak down the mesial line of the back, and on examining further he found a corresponding line along the belly. This proved to arise from an entire slit in the old cuticle which exposed to view the new and brighter skin underneath. He soon observed that the two halves of the skin thus completely divided continued to recede further and further down from the centre, and became folded and rugose, and after a short space by means of the continual twitching of the animal's body it was brought down in folds on the sides. The hinder leg, first on one side and then on the other, was brought forward under the arm which was pressed down upon it, and on the hinder limb being withdrawn, its cuticle was left inverted under the arm, and that of the anterior extremity was then loosened and at length drawn off by the assistance of the mouth. The whole cuticle was thus detached and was then pushed by the two hands into the mouth in a little ball, and swallowed at a single gulp. Mr. Bell says that he afterwards had repeated opportunities of watching this curious process, which did not materially vary in any instance.

And now we will examine the toad internally. There is a maxim that the more carnivorous an animal is, the shorter and the less flexuous is its intestinal canal, a fact which is well illustrated by the toad, and in fact by the suborder to which the toad belongs. For whereas in the tadpole, which is herbivorous, we found this canal so many times the length of the creature's body, here in the grown toad we find the canal about once and a-half the length of the whole body.

The toad's liver generally consists of three lobes, but sometimes of two only. A fatty matter, in shape something like two four-fingered hands, and generally of a yellowish colour, is deposited or secreted in the toad, its use is supposed to be a provision for the support of the animal during its torpid hybernation in the cold months.

I think that I have been fortunate enough to see the action of the toad's heart, though I should think that the action I saw was very imperfect. As I was dissecting a toad, and had its stomach open before me, I fancied I saw (and it rather startled me, I confess) its heart move, so I watched and in a short time the heart appeared to be convulsed, shrank up, turned pale, and then expanding, resumed its red colour; this it did several times at intervals of about twenty seconds.

The respiration of the toad is both pulmonary, i.e. by means of lungs, and cutaneous, i.e. by means of the skin. The former function, that of breathing by lungs, is effected not by successive alternations of contraction and dilatation—a movement which, as the toad possesses no ribs, or at least but rudimentary ribs, is impossible—but by the act of swallowing air, the deglutition of air. The air is inhaled through the nostrils by the dilatation of the pharynx, the œsophagus being closed to prevent its passing into the stomach; then the posterior opening of the nostrils being also closed by the application of the tongue the pharynx is contracted and the air forced into the lungs.

The lungs are of considerable size, lying on each side of the vertebral column; they consist of large cells separated by the most beautifully delicate diaphanous parietes. From this peculiarity in the respiration, it follows that it can only be performed when the mouth is closed; and that if the mouth be gagged open the animal would soon perish from the cessation of pulmonary respiration. The respiration of the toad is, as I said before, cutaneous as well as pulmonary; this cutaneous respiration of the toad is the power, possessed not only by the toad but indeed by the batrachians generally, which the surface of the skin possesses of effecting those aerated water. On trying the effects of submersion under stagnant water frequently renewed they lived two months and a half, and then died from accidental neglect of changing the water.

The results of placing them under running water were similar. In this case they were confined in a sort of cage and sunk in the river.

Such is a slight glance at the results obtained with reference to the cutaneous respiration carried on through the medium of aerated water; and those connected with the atmospheric respiration of the same surface are no less conclusive. Another experiment was performed by the total excision of the lungs, and of three frogs thus treated two died on the thirty-third and one on the fortieth day. The toads, too, have been kept alive for months in nets sunk under running water at a low temperature without any direct access to atmospheric air.

Fig. 48.—Common Toad *(Bufo vulgaris).*

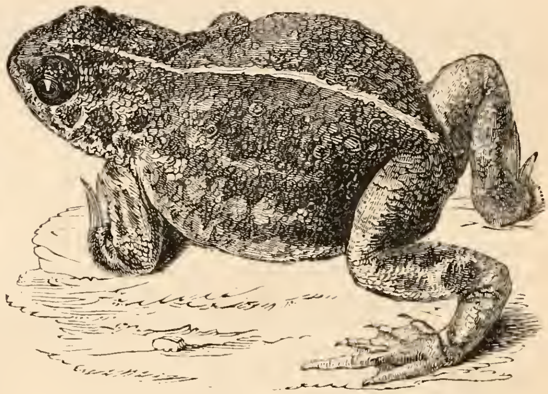


Fig. 49.—Natterjack Toad *(Bufo calamita).*

changes in the blood which are usually performed by the lungs or branchiæ. Dr. William Edwards, of Paris, entered upon the inquiry into this subject. I regret that he made his experiments on frogs instead of toads, but as both animals possess the power of cutaneous respiration, and are closely related, the results would most probably be much the same. The existence of cutaneous respiration in the frog (whose relation to the toad is very close) was proved by the simple experiment of tying a piece of bladder over the head so tightly as to prevent the possibility of communication with the lungs, so as indeed to produce complete strangulation. The frogs were then placed under water, and on examining the air contained in the vessel after an hour or two a sensible quantity of carbonic acid was detected. On placing frogs in vessels filled respectively with river water and with water which had been deprived of air by boiling, and inverted over the apertures contained in the shelf of a pneumatic trough, containing about ninety-eight pints, those in the latter lived on the average little more than half as long as those in the

The results of other experiments have proved that pulmonary respiration alone is not sufficient to support life without the aid of that of the cutaneous surface.

It is very clear that this important function cannot be carried on unless the surface be constantly kept in a moist state. The branchiæ of fishes and of crustacea and the lungs of all pulmoniferous animals equally require that the respiratory surface in every modification should be humid; for as soon as it becomes dry its function ceases and the animal speedily dies. But as the toad is frequently exposed to a dry atmosphere it is essential that there should be some provision made for a constant supply of moisture to the skin, which has just been shown to be a respiratory surface.

This is effected precisely as in other surfaces which perform this function, namely, by a secretion of fluid from the surface itself. The extent of the skin is, however, so great that the whole internal moisture of the animal would speedily be exhausted unless a reservoir were provided for an extraordinary demand; and now we shall see what this reservoir is and by what means it is replenished. When a toad is hastily seized, or even quickly pursued, it often voids a considerable quantity of water which is generally but erroneously supposed to be the urine. This water is limpid and pure, containing no traces of the usual component elements of the urinary secretion. I have tasted it and found it to be like pure water. It is contained in a sac, which has also been mistakenly believed to be the urinary bladder. This is the reservoir to which I have alluded. When, therefore, the toad is happily placed in a damp atmosphere, or in water, the skin absorbs a quantity of water which there is every reason to believe is secreted in the bladder just mentioned, where it is kept in store until the dryness of the skin requires a supply for the purpose of respiration, when it is again taken up and restored to the surface by which it had been first absorbed.

(*To be continued.*)

THE EARLY HISTORY OF THE DIATOMACEÆ.

By F. Kitton, Hon. F.R.M.S.

The study of the minute forms of animal and vegetable life appears to have been enthusiastically pursued by the philosophers who lived during the latter half of the seventeenth century. The names of Leeuwenhoek, Swammerdam, and Hooke are still "household words" with the microscopic student, but the very imperfect microscopes of that period rendered it impossible for them to discover the nature of those minute forms of life which we now call diatoms.

According to Ehrenberg the first diatom observed was *Synedra ulna* (Leeuwenhoek in "Philosophical Transactions," 1703, pl. 1, fig. 8, and again detected by Joblot in 1714-16, and figured in his "Observations faites avec le Microscope). We have referred to the paper * and figures of the former writer, and are unable to find any figure or description that agrees with that genus, or indeed with any diatom. Joblot's work we have never seen. A few pages further on is a paper (author not given) entitled "Remarks on M. Leeuwenhoek's Observations on Green Weeds and Animalcula."

In this paper is the following paragraph:

"In my observations on these stalks (roots of Lemna, called by the writer *Lens palustris*), I often saw adhering to them, and sometimes separate in the water, many pretty branches composed of rectangular oblongs and exact squares, which were joined together as in fig. 19 (our fig. 50), which I drew as exactly as I could from one of them. There are often twenty or more of these figures in one branch, which generally adheres at one end to the stalks of the plant, and I think it remarkable that these rectangular parallelograms are all of the same size, the longest side not exceeding one-third of a hair's breadth, the squares being visibly made up of two parallelograms joined lengthwise. They seem very thin, and the texture of every one is nearly the same."

This description is almost sufficient to enable a diatomist to recognize not only the genus but the species, and the figure which we here reproduce leaves no doubt that the above form is the same as that now known as *Tabellaria flocculosa* (fig. 50). It is somewhat surprising that Ehrenberg should have overlooked this figure; possibly he found the reference to *Synedra ulna* in Joblot's treatise, and had not seen the Transactions. We have been unable to discover any figure or description of any other species of diatom until the year 1745, when William Arderon detects the "oat-like animal" associated with his "hair-like insect" (Oscillatoria). Both are described with considerable minuteness, and illustrated by several figures in Baker's "Employment for the Microscope." This "oat-like animal" was undoubtedly a Navicula, probably *N. sphærophora* or *N. amphisbæna.*

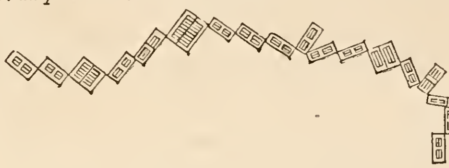


Fig. 50.—*Tabellaria flocculosa,* about 130 diameters.

The few forms of Diatomaceæ observed up to the end of the eighteenth century were considered to be either infusory animalcules or confervæ.

Although many papers appeared from time to time in various scientific publications, no work solely devoted to the Infusoria appeared until 1766, when Müller's work was published. More than fifty years had elapsed when D. Christian Gottfried Ehrenberg published his great work, "Die Infusionsthierchen als Volkommene Organismen. Ein Blick in das Tiefere organische Leben der Natur," 1838, in 2 vols. folio: one of text containing 547 pages; the other of plates, of which there are 64 beautifully engraved and coloured. The text consists of: (1) The Dedication to Frederic William, Crown Prince of Prussia; (2) a long and interesting preface, in which are given complete directions for obtaining and preparing the Infusoria for observation. This is followed by the description of the various genera and species (in Latin, French, and German) of Infusoria, seventy-six pages and nine plates being devoted to the Diatomaceæ.

Professor Ehrenberg included in his family Bacillaria not only some of the Desmideæ, but also some forms of Animalcula. This may be accounted for, as he to the last contended for the animality of the

* "Concerning Green Weeds growing in Water, and some Animalcula found about them." By M. Leeuwenhoek, 1703.

desmids (in part) and diatoms, and in his latest publication ("Fortsetzung der Mikrogeologischen Studien," 1875) he adheres to the name Polygastrica, in which he includes the diatoms. The position of the Diatomaceæ in the vegetable kingdom is now generally admitted, although there are some few writers who think that they really occupy a neutral position.

Although many of Ehrenberg's views are now known to be erroneous, and his figures are incorrect, owing to the imperfect objectives he used, and the want of sufficient magnification, his labours will always be of value to the micro-biological student, particularly to those who make the diatoms their study. We therefore hope that this brief account of his first great work (his second is the "Mikrogeologie," 2 vols. folio, pp. 493, plates 40, 1854), and the following *résumé* of his introduction to the Bacillaria will be of interest to the diatomist.

The Bacillaria.

The first form belonging to this family was probably discovered by Leeuwenhoek in the year 1702, and Joblot in 1716, and which they named *Vibrio Bacillus;* it does not, however, appear to be distinct from *Synedra ulna.* Baker in 1754 detected what was perhaps *Navicula fulva* and *Acineta tuberosa* (the latter, I need scarcely remark, is not a diatom, nor at all like one—F. K.). O. F. Müller observed in 1773 as a distinct member of this family *Gomphonema truncatum*, which he described under the name of *Vorticella pyraria*, and confused it with Carchesium. Schrank in 1776 appears to have intended by his *Chaos infusorum*, *Navicula fulva*. O. F. Müller described in 1779 *Achnanthes brevipes* as the pubescence of his *Conferva hirta*, which he had discovered at Pyrmont. In the year 1782 he detected in the water from the Ostsee that wonderful Bacillaria composed of many little staves sliding on each other, which he describes in 1786 as *Vibrio paxillifer.*

This form was the first that gave special physiological interest to this family.

Professor Hermann of Strassburg had previously to this (1784) published some observations on two Enchelys (*Nav. gracilis* (?) *N. phœnicenteron*), and a Vibrio (*N. librile*), all of which belong to this family, but the figures are imperfect. Müller in 1783 described a Fragilaria and a Gaillonella as plants under the name of *Conferva pectinalis* and *armillaris.* In his posthumous work ("Animalcula Infusoria Fluviatilia et Marina quæ detexit, systematica descripsit et ad vivum delineare curavit," 4to, 50 plates, Hauniæ, 1786) he places among the Protozoa his *V. paxillifer*, *V. bipunctatus* (*Synedra ulna?*) *V. tripunctatus* (*N. gracilis*) as synonyms of Professor Hermann's Enchelys; he also figures an Acineta as *Vorticella tuberosa.*

Colombo ("Osservaz. microsc. in Giornale per servir alla stor. raggion della medicina," t. iv. Venez. 1787, p. 1, afterwards translated at Leipzig, 1793, t. i. f. 4) described in 1787 the before-named *G. truncatum* as a plant-like animal. Gmelin (1788) considered Müller's jointed Bacillaria a distinct genus (*Bacillaria paradoxa*), and placed it in the animal kingdom. Vahl, in the "Flora Danica," and the editor of the "English Botany," describes many of the Bacillaria as plants, but Schrank (1797) placed a number of these forms with the Protozoa; he also described two Navicula under the names of *Vibrio turrifer* and *fuscus*, and *Cocconema* as *Kolpoda luna.*

Kammacher also figures (1798, in Adams's "Micrographia") a Navicula (gracilis) as an animal. Since the year 1797, a number of important innovations have been made in this study, by Girod Chantrans, who supported them by his laborious but uncritical observations, and affirmed that many of the moving Algæ produced animals, that these animals again became torpid motionless Algæ, and that Conferva were Polypstems (Polypenstöcke). That the Naviculæ originated from Oscillatoria, and that their ova produced the *Byssus flos aquæ*, &c. This was detailed very fully by him in 1802. Since then only Ingenhousz has published similar information, asserting that the moving or animal-like condition of these little bodies became transformed into motionless plant-like organisms, and with more or less decision maintained that in these forms, not only was their animal or plant-like nature very undecided, but even that they belonged to the mineral kingdom. Roth, Decandolle, Dillwyn, Draparnaud, Grateloup, Hornemann, Thore Agardh, and Hooker designated the forms of this family as plants. Decandolle, in 1805, gave the name diatoma (which Loureiro had previously given to a phanerogamic plant) to two generically different forms, Striatella and a Fragilaria. Achairus in 1805 designated the radiating threads of ova belonging to some aquatic insect, *Echinella radiosa*, considering it to be an Alga.

In 1802 Agardh published the new generic name, Gloionema. In the important researches of Nitzsch, published in 1816–17, he placed the Diatomeæ, prismatic Vibrios, and the related Conferva of the botanist (and which had previously constituted the older genus Bacillaria) in the animal kingdom. He was of opinion that some forms were wholly vegetable and others wholly animal.

In 1819 Lyngbye constructed the genera Bangia and Fragilaria, the first partly, and the second entirely belonging to the Bacillaria, and extended the limits of the genus Echinella. Link (1820) published two genera of plants Hydralinum and Lysigonium, which probably correspond with the genera Schizonema and Gaillonella, but they are very imperfectly described. In 1822 Bonnemaison introduced two new genera of plants, Vaginaria and Spermogonia, and which are, perhaps, also species of Schizonema.

About this time Bory de St. Vincent added the new genera Achnanthes, Nematoplata (Fragilaria) and Styllaria (Cocconema) to his family of Arthrodiées, which he intended as a connecting link between plants and animals. He also added the genus Navicula to the family Bacillarées, which he placed with the Infusoria, and for which he intended his family Psychodées, although he does not mention it in his "Review of the Infusoria."

Nees v. Esenbeck in the year 1823 separated the Oscillatoria and some other forms, and constituted a middle class between the Fungi and Algæ, under the name of Hydronemata. Schrank again opposed the theory of the Bacillaria being animals, and distributed Müller's genus Vibrio among Bacillaria, Oscillaria and Vibrio. Gaillon of Dieppe in 1823, apparently misled by Girod Chantrans, through his mistaken idea of the breaking up of Marine Algæ into Naviculæ, and the union of Naviculæ (*Vibrio bipunctatus*) through mere juxtaposition with Algæ (*Girodella* (*Conferva*) *comoides*), created a family of Nemazoaires as Conferva, but which were really Monads or Naviculæ collected together. Bory de St. Vincent created in 1823 his genus Gaillonella, which he placed in the family of Conferva.

Agardh, in 1824, formed out of the Bacillaria an order of Algæ, which he called Diatomeæ, and placed the genera Frustulia, Meridion, Meloscira (Gaillonella), Schizonema (Girodella), Desmidium and Gomphonema in it. He also placed in the order Nostochinæ the two genera Echinella and Gloionema, both of which had previously belonged to the Diatomeæ.

Link, in 1824, approved of this arrangement, but placing the two last genera in the Diatomeen, and continued D. Leo's (confirmed by Girod Chantrans) observations, and considered the Oscillatoria as mother forms of Naviculæ. Treverarius, Steudel, Fries, and Sprendel, speak of the Bacillaria as plant-like organisms. Fries brought forward the crystalline, or mineral theory. Blainville (1825) took up Gaillon's researches in detail (which had hitherto been but little known) and published the results in the "Dict. d'Hist. nat.," art. Nemazoaires. Bory de St. Vincent (1825) founded, in the Arthrodien, a new natural kingdom, the *Doppelseelen* (twofold nature); Psychodus (it ought properly to be called Dipsychica), the members of which became by turns, plants and animals. Agardh (1827) separated the genera Micromega, Licmophora (Echinella Homœocladia?), and Oncobyrsa, and placed them in the family of the Diatomeæ, and removed the Micrasterias to the Ulvaceæ. Leiblein (1827) also approved the placing the Bacillaria with the Algæ, and placed the genus Closterium with the Diatomeæ. Greville, in 1827, constructed his genera Exilaria (Echinella), Monema (Naunema), and Berkeleya (Naunema). Turpin repeated, at Dieppe and Havre, Gaillon's observations, but without confirming them; he, moreover, asserted *Girodella comoides* (Schizonema Grevillei) to be simply a plant, and the enclosed animals (the navicular bodies) some kind of vegetable matter (Globuline) which he called Naviculine. Sprengel (1827) contended that Achnanthes, Frustulia, Meridion, and Gloionema, were the eggs or young of animals, and the genus Diatomeæ which he had formerly placed, together with Fragilaria and Schizonoma, with the plant he now considered to be equivocal (zweideutig).

(*To be continued.*)

RESEARCHES IN POND LIFE.

I MADE a discovery in my tank on the 17th of February which I think worth bringing under the notice of your numerous readers, in the hope that it may lead to some further remarks by those engaged in observations and research in pond life.

Having promised to exhibit a few living specimens at an inaugural meeting of a new microscopical society, I was searching my tank for Stephanoceros, Vorticellæ, &c., and fished up from the bottom a small piece of filamentous Algæ, upon which I observed some minute organisms, and supposed them to be a colony of Floscules. Such a lucky catch I hardly expected, and bottled them up accordingly as beautiful objects to exhibit; but upon placing them under the microscope I found they were a cluster of the singular organism called the Acineta, attached by their stems all along the filament, as shown in fig. 51.

Now this organism is one, I believe, to which some interest attaches, from its being but rarely met with. It is figured and described by Mr. Gosse in his admirable work, and he states it to be a stage in the life-history of the Vorticellæ, but I must say I have had some doubt upon the point, for hitherto I have never found it associated with any of the species of Vorticellæ that have come under my observation during the many years I have devoted to researches in pond life in most of the suburbs of London. In this case, however, it seemed to bear out Mr. Gosse's statements, for, to my great surprise, on one filament of the Algæ I found a group of Vorticellæ of the Epistylis species, attached by its stem and branching out in the form of a tree. The stem and branches of this species are rigid, and on the tips of some of the branches were the cup-shaped Vorticellæ with the fringe of cilia round the mouth, and on others the Acineta, as shown at fig. 52.

This to me was a singular and striking discovery, and fortunately I had taken the specimen to show my friend, Mr. Badcock of the Royal Microscopical Society, and we spent some time in closely examining it, for, as above stated, previously to the discovery of this group we had noticed that the Acineta were attached singly along the filament, and that at intervals there were two or three Vorticellæ grouped together and attached to the weed also (see fig. 51 *a*), they appeared to be of the species figured in Pritchard's "Infusoria," and named the *Vorticella microstoma*, being rather long in the cup and not so large round the mouth as the ordinary Vorticellæ. They were clearly a distinct species from the tree form just mentioned, could it be that they also were in any way allied to the Acineta? After carefully observing this Epistylis group for some time, and speculating upon the probability of the Acineta being a stage in the development of the Vorticellæ, or *vice versâ*, we noticed a peculiarity which seemed to throw some doubt on that theory, as the stems of the Acineta appeared more clear and of a somewhat different appearance to the stems to which the Vorticella were attached, and upon still closer observation the stems of the Acineta all seemed attached to the side of a Vorticellæ stem rather than a continuation of the tree-like stem of the Epistylis.

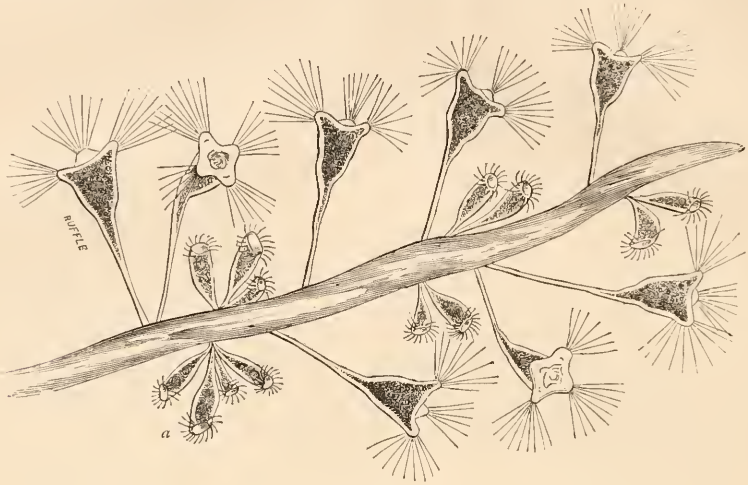


Fig. 51.—Cluster of Acineta.

Fig. 52.—Group of Vorticellæ of the Epistylis species, with Acineta.

Now, if my observations are correct, is it not possible that the Acineta stems were attached parasitically to the stems of the Epistylis or Vorticellæ? I am the more inclined to take this view of it from some further observations subsequently made, which seemed very strongly to confirm their parasitic attachment. On another filament of the weed I fortunately found a group of Vorticellæ of the species called *Carchesium polypinum*, also a beautiful tree form with much larger bells and having contractile stems and as is well known a tap on the microscope stage causes the whole cluster to immediately contract closely together. Upon this group were also two or three of the Acineta, and when the contraction took place, the Acineta with their stems stood out rigid, thus clearly showing that the stem of the Acineta formed no part of the contractile stems of the Carchesium, and again I also found a fine specimen of the Ophrydium, and upon this also were attached several of the Acineta.

There is another circumstance I ought to mention, and that is that this Alga was taken out of a pond in the Victoria Park by my friend Mr. Badcock last autumn, and he then discovered that it was covered with patches of a gelatinous-looking substance which probably was a rudimentary condition of the Acineta, upon being placed in a cell and left quiet for a few minutes on the stage of the microscope, it threw out those fine radiations or pseudopodia, very much resembling an aurora borealis (see fig. 53) precisely the same as from the corners of the more perfectly developed form, and I presume it is from this rudimentary condition that all these perfect individuals I have now discovered have developed, as I turned the Alga into my tank after examining it, where it has remained undisturbed to the present time. These Acineta very much resemble the Floscula, but there is hardly any perceptible movement in them, and there is no visible opening or mouth into the interior; they are also destitute of any gelatinous case or envelope.

W. G. COCKS.

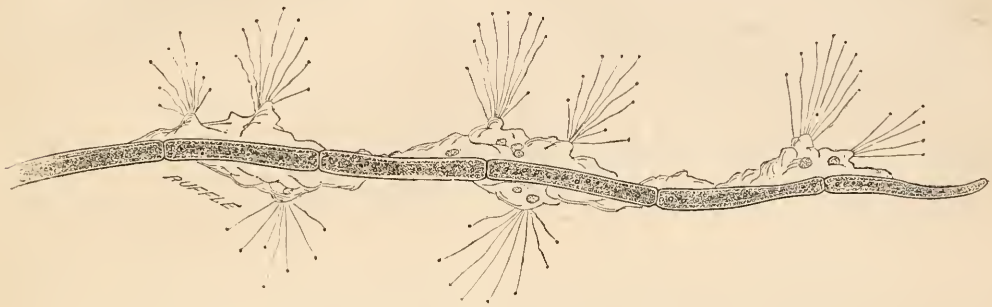


Fig. 53.—Probable rudimentary condition of Acineta.

ON THE PRESERVATION OF CRUSTACEA FOR THE CABINET.

THERE are few objects so interesting and yet so comparatively scarce as a good collection of Crustacea. No doubt the scarcity of such collections is partly owing to the comparative difficulty attending the drying and preservation of these animals, and with this idea I wish to explain in a few words a method which, although capable of improvement, is one that I have found to answer the purpose fairly well. In the first place, it is necessary that the specimen should be operated upon as soon as possible after death; but where this is almost impossible, much of the setting up can be attended to afterwards, so long as the internal structure is taken out and the specimen packed away in a dry place under the conditions which I will now attempt to describe. Let us take for example a specimen of the Norwegian lobster (*Nephrops Norwegicus*); lay the specimen on a board in its natural extended position, and with a sharp knife sever the abdominal segments from the carapace. When this is done the internal structure can be entirely removed, and great care should be taken to do this as thoroughly as possible, without injuring the external skeleton. The carapace should also be removed, in order to cut away the gills from between it and the inner calcareous wall. After this has been carefully done sprinkle the damp parts with fine powdered alum, which will assist in drying the remaining particles. With small specimens enough has now been done as regards removing the soft parts, but where the forceps or pincers are at all large, they too must be freed from their internal matter, and this can be done by either removing them altogether and withdrawing the contents by means of a flattened iron hook, or by making a hole on the under side of the limb and inserting the hook through that. When all the parts are thus skeletonized, they should be set up separately on a piece of soft pine board and the legs and antennæ held in suitable positions by means of long pins, and it is very necessary to keep the several parts of each specimen together, in order to avoid the ludicrous mistake of fixing the abdomen of one to the carapace of another which may be of different size or sex. The dissected parts must now be slowly dried; and now is the period when a great risk is run of entirely spoiling the specimens, for if they be exposed to the glare of a hot sun or to too fierce a heat from a fire, they will either bleach, or, in most cases, turn a brilliant red; but if care is bestowed on this part of the preparation they will be ready after a few days' exposure to what is best of all, a drying *draught* of air, provided the weather is favourable, to set up for the cabinet. As regards the setting up, the best lesson in this is to be learnt by going and looking at a live crustacean and following as nearly as it is possible to do the attitude of the animal when standing motionless, and by a few judicious placings of the antennæ, legs and forceps a specimen can be made to look far more life-like than any specimen of lepidoptera or coleoptera in a cabinet. For readjusting the dissected portions gum tragacanth is perhaps the best, as of course it is desirable that no adhesive matter should be visible after the creature is set up. If the specimen has a sufficiently transparent carapace it will be found advantageous to insert cotton wool coloured in such a way as to bring the appearance of the external skeleton as nearly as possible to that of its living comrade; for instance, black wool in the carapace of an *Astacus fluviatilis* will often render its outward appearance much more natural than if it remained empty. For the treatment of crabs the carapace should be carefully removed and the foregoing method proceeded with; but in the case of the very small Crustacea they may be set up and dried as they are, but it is as well to bear in mind that wherever it is possible the whole of the internal structure should be removed. In conclusion I would recommend that while this is being done, Professor Huxley's splendid work on the cray-fish should be open, and by attempting to make out the various structures by aid of it, what is often a disagreeable part of the preparation of Crustacea is thus turned into a very interesting and highly instructive operation. I can only say that I should be very pleased to offer any suggestions or assistance on the above subject to any one desirous of working the Crustacea, and I should be still more pleased to receive any suggestions or assistance myself.

Holly Mount, Croydon. EDWARD LOVETT.

OUR MOUNTAINS, AND HOW WE CAME BY THEM.

By the REV. J. CLIFTON-WARD, F.G.S., &c.

HAVING in thought a series of papers upon "Nooks and Corners of the Lake District," I propose to introduce the subject by some general considerations upon the origin of our mountains as a whole. Many years' residence and work among the hills of Cumberland and Westmoreland have led me to see how very little mountain structure and mountain origin are understood by the visitors to this beautiful district, and as my former duties in connection with H.M. Geological Survey have given me opportunities of knowing the country as perhaps few can know it, I feel it in great part a duty as well as a pleasure to do what I can to give the traveller and happy resident in the district an insight into the history of the Cumbrian hills. I do not purpose to write scientific essays on the subject; those who want such I would refer to the early papers by Sedgwick and others, and to my more recent official "Memoir on the Geology of the Keswick District" (or northern part of the English lake district), and Papers communicated to the Geological and other Societies; but I desire to bring forward in a popular, yet true manner, the leading facts bearing upon the question of the mountain history.

I find two very common notions prevailing among the unscientific public with regard to mountain origin. Some, who really give the matter no thought, and are but little wont to use their minds, look upon hill and vale as having come into being just as we see them, springing, as it were, into existence by an Almighty fiat. Others talk learnedly of the stupendous upheavals by which this mountain or that mountain group have been produced, and can think of nothing grand in nature but as the result of catastrophes and cataclysms. The few look inquiringly on the mountain scarp and rugged or smooth outline, and wonder longingly whether all this beauty is the result of powers working quickly or slowly, at one time or at all times, or whether the carving and fretting of nature's sculpture is not even now going on; such, seeking truth from Nature, one of the revelations of the Great Unseen, approach the subject with humility and earnestness, and to them many of the mysteries of nature are unveiled. In such a spirit we will make our mountain study, sure that:

> "Nature never did betray
> The heart that loved her."

First let us glance at the district as a whole. It is but a small one. You may start early on a summer's morning from the northern end of the mountain group, and ere nightfall have crossed on foot the whole district, coming out of the mountains about Coniston or Windermere. Or again, starting from the eastern side, in the Haweswater valley, the whole district might be crossed with ease, on foot, to the western limits of the mountains, in a couple of days.

On the north, one group of mountains, of which Skiddaw and Blencathra are chief, stands out alone, being separated from the main mountain district by the comparatively broad Keswick Vale. The Helvellyn range forms a long north and south mountain axis, lying a little east of the true centre of the district as a whole; and a less regular east and west axis, of which Scafell Pikes form the highest point, divides the country, shedding its water northwards from that shedding southwards. In a general way the whole district may be compared to a low dome, the outline of which may be constructed by joining together the mountain summits, which dome is furrowed by deep and narrow valleys radiating to almost all points of the compass, but the country draining northwards is on the whole clearly separated from that draining southwards by a more or less distinct east and west axis or water-shedding line.

In many parts the valleys are so near to one another that no sooner has the traveller climbed one mountain side and gained the summit, than the descent begins abruptly into the next valley; in fact, the outline in such parts may be represented by a zigzag line. Here it will be seen that the matter required to fill up the valleys is about equal to that forming the mountains; we have only to turn such a figure upside down, and we shall see that the valleys answer just as well for mountain outlines, and the mountains then appear as valleys. There are indeed, in some parts, broadish plateaux, but, on the whole, the district is characterized by its mountain concentration, and I suppose there are few countries of equal area showing so many mountain ridges and peaks and such frequent valley systems. We have here, indeed, a mountain miniature of exquisite finish and detail, and it is this fact which lends so great a charm to the district, for the traveller finds he has never to pass over long wearisome uninteresting tracts between one point of beauty and another, but that at every turn some new beauty meets him, each seeming more attractive than the last, as the eye becomes accustomed to Nature's plan. And here I should like to remark that no one need fear to come from other more exalted mountain areas to our humble Cumbrian group of hills. If he be a true lover of Nature, his Alpine or Scotch ramble will lead him to understand and therefore appreciate the English mountains all the better, and the longer he studies them, the more he will find to study; each day, each changing aspect of nature, each season will reveal new beauties to him, and as a true friend becomes more loved and trusted in the longer known, so will Cumbria's hills endear themselves to those who live or stay for a while amongst them, and the better known the better will they be loved.

But how have we come by these mountains? What is their origin? What their history? Are they bosses and ridges pushed up out of an original level area, each mountain or ridge upheaved separately, the intervening valley bottoms representing something of the original level? Let us test this idea, which certainly in some form prevails in the minds of many. The first possibility may be illustrated thus: pastry in the process of baking is upheaved into ridges and mounds; examine these, and the layers of paste are seen to slope away from the summit in every direction, the original flat beds or layers having been upheaved or thrown into domes or long arches. Now a large proportion of the rocks in our Lake District are distinctly bedded; they have been thrown down, many of them beneath the waters of a sea, in more or less horizontal layers. If the mountains are due, then, directly to upheaval, these layers or beds will be found thrown into arches or curves, the outline of which will correspond to the general outline of the mountain upheaved. But experience proves this not to be the case; indeed, I know of but one good instance of a mountain summit at all corresponding in outline to the convex (or anticlinal) curve of the strata forming the mountain, and this is in the case of Grasmoor, overlooking the foot of Crummock Water, see fig. 54. In most cases, indeed, the beds of rock forming mountain summits lie in basin-shaped (or synclinal) curves, as will be clearly seen by examining the sheets of horizontal sections showing the geological structure of the country, published by the Survey (see also fig. 55). This being so, we must clearly give up the idea that the mountains are individually due to the raising of the originally horizontal beds into arched curves corresponding to the mountain outline.

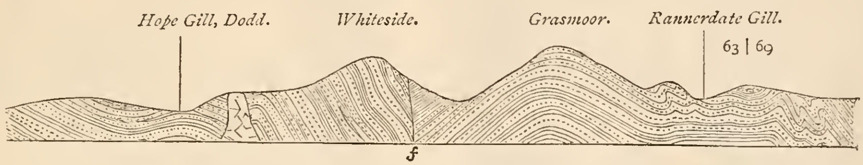


Fig. 54.—Horizontal Section of the Geological Structure of Lake District. Scale 1 inch to 1 mile. *f*, fault.

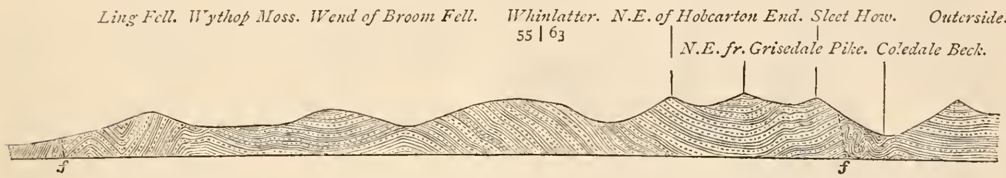


Fig. 55.—Horizontal Section of the Geological Structure of Lake District. Scale 1 inch to 1 mile. *f*, fault.

Another possibility may be thus stated. May not the mountains be produced by igneous matter being forced up from below, the matter itself either forming the mountain protuberance, or carrying upwards, on its back, as it were, the overlying rocky beds? Examination again proves that this theory will not hold, for in the first place there are but a few rocky knobs or low hills—such as Castle Head, Keswick—wholly formed of igneous rock, and there is no evidence that the surface of the higher mountains or ridges are all of them immediately underlaid by intrusive rocks of igneous origin, or indeed that igneous and granitic rocks more generally underlie the mountain masses than the intervening lower ground; in fact the exposures of granite that do occur are for the most part in valley bottoms and not on mountain summits. Hence our general conclusion, thus far, is that the individual mountains or mountain ridges, not being upheaved domes or arches of bedded rock, and not being protuberant masses of igneous rock, must exist as mountains by reason of their separation or the removal of the surrounding matter, that is to say, the valleys must be either wide gaping fissures, or caused by the carrying away of matter through some process of denudation.

NOTES ON SOME OF OUR SMALLER FUNGI.

By G. E. Massee.

No. II.

[*Concluded from page* 7.]

One of the commonest, and at the same time most beautiful of our smaller fungi, *Nectria cinnabarina*, presents itself under the appearance of bright pink or coral-like pustules, about half the size of a split pea, bursting through the bark of dead branches; this fungus illustrates the very common phenomenon of dimorphism, or alternation of generations.* If a few twigs bearing this parasite be examined the greater number of plants will probably be more or less pink and perfectly smooth. Mixed with these are sometimes a few of a deeper red or brown and wrinkled surface. Sometimes a pustule may be met with presenting the characters of the two apparently distinct plants, which are now known to be conditions of one of the same plant. If a section be made through one of the pink, smooth tubercles it will be found to consist of a pale yellow nucleus from which spring a number of branched threads forming a pink zone. These threads give origin to

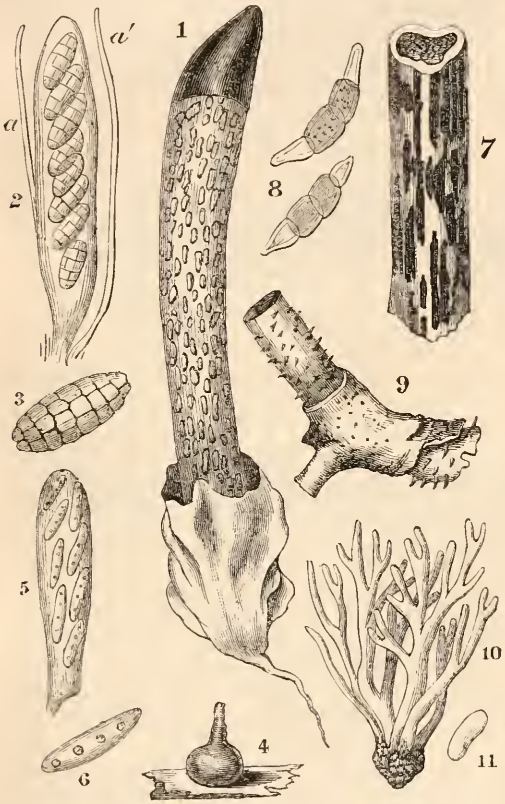


Fig. 56.—Illustrations of small Fungi. 1, *Cynophallus caninus* (natural size); 2, Ascus containing sporidia of *Sphæria herbarum*, *a*, *a*, paraphyses (magnified); 3, Sporidium of *Sphæria herbarum* more highly magnified; 4, Perithecium of *Sphæria rostellata* (magnified); 5, Ascus and sporidia of *Sphæria rostellata* (magnified); 6, Sporidium of *Sphæria rostellata* highly magnified; 7, *Dothidea filicina* (natural size); 8, Sporidia of *Dothidea filicina* (highly magnified); 9, *Sphæria rostellata* (natural size); 10, *Calocera viscosa* (natural size); 11, Spore of *Calocera viscosa* (highly magnified).

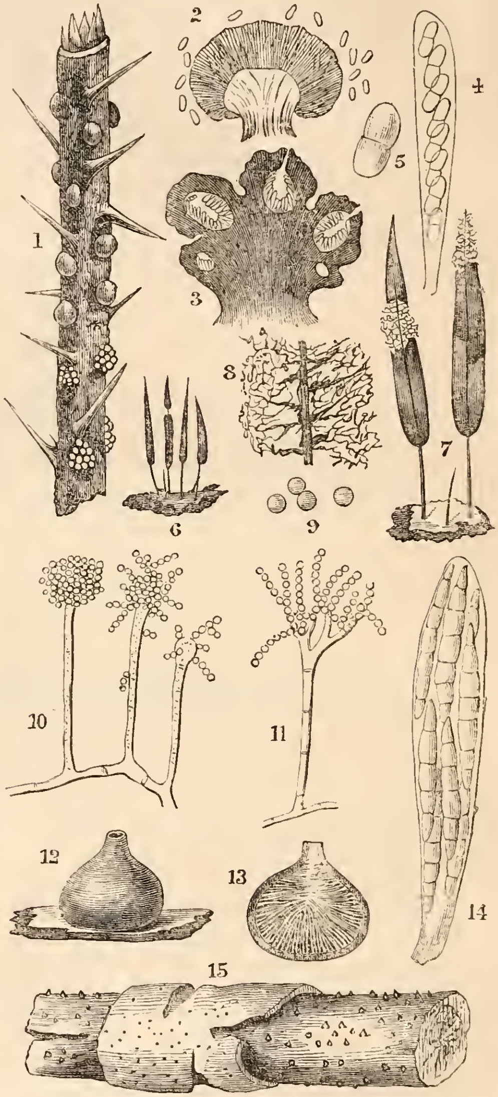


Fig. 57.—Illustrations of smaller fungi. 1, *Nectria cinnabarina* (natural size); 2, Section of conidia of *Nectria cinnabarina*. 3, Section of ascophore of *Nectria cinnabarina* (magnified); 4, Ascus and sporidia from *Nectria cinnabarina* (magnified); 5, Sporidium (highly magnified); 6, *Stemonitis fusca* (natural size); 7, *Stemonitis fusca* (magnified); 8, Portion of network springing from stem (magnified); 9, Spores (magnified); 10, *Aspergillus glaucus* (magnified); 11, *Penicillium crustaceum* (magnified); 12, Plant of *Sphæria acuta* (magnified); 13, Section of *Sphæria acuta* (magnified); 14, Ascus and sporidia from *Sphæria acuta* (highly magnified); 15, *Sphæria acuta* (natural size).

* See Science-Gossip, p. 78, 1879.

minute, colourless, simple cells called conidia, which are easily detached and float in the water in which the section is immersed. A section of one of the brown and wrinkled tubercles shows quite a different structure: there is a common stem or receptacle, called a stroma, containing several hollow sacs, or perithecia, each communicating with the exterior by a narrow neck, and containing the sporidia, which are developed in narrow, elongated, transparent sacs, the asci; each ascus contains eight semi-setate sporidia. In this example the two stages classed according to the fruit would belong respectively to the two primary divisions of fungi; the first or conidia stage, producing naked fruit, would belong to the sporifera; the second, or ascophore, to the sporidifera, characterised by having the sporidia contained in asci. It may be well to explain that the term "spore" is restricted to those germ-cells which are not contained in sacs or asci, "sporidia" to those which originate from the breaking up of the contents of asci in which they remain enclosed until mature. The sporidifera contain two families, *Ascomycetes*, characterised by the sacs springing from a basal collection of cells—the hymenium—and each ascus containing a definite number of sporidia, generally eight, illustrated by the genus *Nectria*. Another genus, *Sphæria*, including nearly two hundred British species, also belongs to this division; they are all minute and appear under the form of black rounded bodies terminating in a more or less elongated papilla, or neck, through which the sporidia escape. The globular receptacle, or perithecium, containing the asci, is frequently quite immersed in the branch or leaf on which the plant grows, the projecting neck affording the only evidence of the presence of the parasite. This genus is separated from *Nectria* by the absence of a stroma; the latter, therefore, may be considered as a compound Sphæria. The accompanying figures will render evident the relationship and differences between the two genera. *S. acuta*, common on dead-nettle stems, has a smooth, conical perithecium with a short thick neck, or ostiolum, sporidia fusiform, with many septa or divisions in the endochrome, slightly curved and arranged more or less in two rows in the ascus. A plant differing in structure is equally common in the same situation, the perithecia rounded, ostiolum long and cylindrical; a section will reveal, in place of numerous asci, a mass of very minute free cells, or spermatia. This is not now considered as a distinct species but a form of the preceding, *S. acuta*, and is another illustration of polymorphism in fungi. The form containing spermatia is known as the spermogonia, while ascophore indicates the state producing asci. It must not be presumed that two stages or forms only are to be met with. In some species of Sphæria five different conditions have been described; the functions of the germ-cells are but little known, the ascophore is looked upon as producing the complete and perfect fruit. *S. herbarum* common on herbaceous stems, is recognised by its multicellular sporidia. *S. rostellata* flourishes on dead rose and bramble stems, perithecia covered by the bark, which is pierced by the long neck, sporidia arranged in two rows, each with four nuclei.

In addition to asci, the hymenium of the ascomycetes gives origin to linear or club-shaped bodies termed paraphyses, which are generally looked upon as abortive asci. Another fungus belonging to this division is very common on the stalk of the bracken, forming long black lines which sometimes nearly cover the surface; the sporidia are triseptate, the two central cells larger and filled with greenish granules, the apical cells acute and hyaline; this is *Dothidea filicina*. *Cynophallus caninus* represents the order Phalloidei, in which the deliquescent hymenium is at first enclosed in a volva or universal covering, composed of three layers, the middle one being gelatinous; in the present plant when the hymenium approaches maturity the volva is ruptured, and a long pitted, pale orange-coloured stem is rapidly developed; the hymenium is greenish and slimy, and, mixed with the spores, is either washed off by the rain or devoured by flies, who appear to regard it as a dainty morsel. Most of the plants belonging to this order are remarkable for their fetid odour, the one under consideration being the least so. The genus *Stemonitis* is known amongst Myxomycetes by the dark stem passing through the plant and giving origin to an intricately-branched capillitium, or web, which is covered with spores; the investing skin, or peridium, is very delicate and disappears early. *S. fusca* is not uncommon on rotten wood; it resembles the reed-mace in miniature, crowded, and springing from a permanent *hypothallus* or membranous expansion. *Calocera viscosa* is the very abundant much-branched, viscid, golden-yellow fungus, growing on fir stumps or prostrate fir trunks, the spores are white. *Aspergillus glaucus* is the ubiquitous blue or glaucous green-mould, met with wherever damp organic matter is to be met with. I had this plant in view when I described *Mucor mucedo* as "the sage-green mould, common on jam, bread, &c." In Aspergillus there is a creeping septate mycelium, from which spring erect fertile threads, which terminate in rounded heads, from these heads the spores are produced in chains, which are at first arranged in a compact ball and white; afterwards the chains become isolated and radiate, at the same time assuming a glaucous hue. *Penicillium crustaceum*, to the unaided eye, is indistinguishable from the Aspergillus, and affects similar situations. On examination the fertile threads will be found more evidently septate, and the top, instead of being globose, terminates in several branchlets, from which spring the strings of round spores, which are not so crowded as in Aspergillus. The free terminal spore is always the oldest when they are formed in chains, the new ones being developed at the base or fixed end of the chain; contact with water causes the spores to separate from each other, and to break away from their point of attachment, so that in the examination of moulds it is necessary to ascertain the mode of attachment and arrangement of the spores before water is applied.

(*To be continued.*)

MICROSCOPY.

The New Cross Microscopical and Natural History Society.—We have received the seventh annual report of this society. It contains an abstract of their monthly meetings, which appear to have been very productive, and Mr. Martin Burgess's (President) address, printed in full.

Cause of Cholera in Fowls.—M. Pasteur has recently read a paper on this subject before the Academy of Sciences, Paris, entitled "On Virulent Maladies, and Particularly on the Malady commonly called the Cholera of Fowls." The small organism (or *microbe*) which causes this malady can be well cultivated in a broth composed of fowls' muscles neutralised by potash, and sterilised by a temperature of 110° to 115°. Inoculation of guinea pigs with it causes only abscess, but fowls inoculated with the contents of the abscess die. Fowls or rabbits living in company with the guinea-pigs having abscess become ill and die. The microbe multiplies in the intestines of fowls that have taken it with food, and the infected excrement is fatal to fowls inoculated with it. Repeated culture of the microbe by transference of minute drops from liquid to liquid does not weaken the virulence, but by a certain mode of culture M. Pasteur can weaken it. If twenty out of forty fowls be inoculated with the very virulent virus, they nearly all die; but if the other twenty be inoculated with the attenuated virus, they all become ill, but very few die; inoculation of those that recover with the very infectious virus does not kill them. The novelty here is the preservative effect of inoculation in a disease caused by a living organism (in the virus of small-pox, &c., no life has been proved). The cholera of fowls may be prevented from becoming fatal, and M. Pasteur describes the return to health of a fowl inoculated in the large pectoral muscles. He expresses the hope of obtaining artificial cultures of all kinds of virus, and notes the encouragement obtained for the search of vaccine virus of virulent maladies.

Portfolio of Microscopic Objects.—We have received No. 2 of the "Portfolio of Drawings, and Descriptions of Living Organisms" (animal and vegetable), illustrative of freshwater and marine life which have been sent out with the living specimens by Mr. Thomas Bolton, F.R.M.S., 17 Ann Street, Birmingham. It contains, in the vegetable kingdom: *Hydrodictyon utriculatum*; in the animal kingdom, *Spongilla fluviatilis*, *Peridinium tabulatum*, *Ophrydium versatile*, *Stentor Barretti*, *Carchesium spectabile*, *Hydra vulgaris*, *Leptodora hyalina*, *Hyalodaphnia Kahlbergensis* (*Daphnia Bairdii*), *Sida crystallina*, *Diaptomus Castor*, *Carcinus Mænas*, in the Zœa stage, *Cristatella mucedo*, *Lophopus crystallinus*, *Spirorbis nautiloides*, circulation in the egg of trout and young salmon. It gives us great pleasure to see Mr. Bolton succeeding so well with his scheme of a natural history studio. His weekly bottle is a great aid to naturalists, &c., who have not the time or opportunity to obtain the objects themselves.

The Postal Microscopical Society.—We have received from the Hon. Secretary (Mr. A. Allen) the Annual Report of this Society for 1879, whose sixth annual meeting and dinner was held on November 10, at the Holborn Restaurant, Dr. H. Franklin Parsons, President, in the chair. When the Report had been read by the Hon. Secretary, the President delivered an address on "The Microscope in its Applications." We are pleased to see the healthy state of this society, and our interest in it is in nowise lessened, when we remember that it originated through a discussion in our columns (Science-Gossip, vol. x. 1874).

The Quekett Microscopic Club.—We have received No. 42 of the "Journal" of this well-known society containing, amongst other matter, the inaugural address of the President, Dr. T. S. Cobbold, F.R.S., &c., and articles "On Collecting and Mounting Spiders' Webs," by George Hind; "On the Germination of a Seed," by A. Martinelli; "On the Embryology of *Achimenes picta*," by T. S. Cobbold, M.D., F.R.S.; "On a New Universal Motion Stage and Object-holder," by R. G. West; and a "Description of a 'Growing Slide' for Minute Organisms," constructed by Julian Deby, C.E., &c.

Meeting of the Manchester Microscopical Society.—This society held its "Inaugural Soirée," last February, the evening passing off very satisfactorily. About fifty microscopes were exhibited, most of them binocular, by various members. Dr. Tatham, M.D., the President, delivered an address on "The Microscope," in which he said it was an instrument known to Aristophanes. Amongst the slides shown were some exquisitely mounted specimens of marine algæ, contributed by Miss E. H. Bowing. The society now numbers ninety-three members, and there is every reason to believe the number will be doubled before next February.

Doncaster Microscopical Society.—We are glad to announce that a microscopical society has been formed in Doncaster under the above title. The society is in a very prosperous condition, as appears from its syllabus. Among the papers to be read during the present season are the following:

—April 17, F. Milner, "The Origin of Chalk as shown by the Microscope." May 5, J. M. Kirk, "Animal Life in its Lower Form." June 2, W. Walker, M.R.C.S., "On the Structure of the Organs of Locomotion in Man."

New Fluid for preserving Organic Substances.—In the "English Mechanic," No. 780, an account is given of a fluid for the preservation of animal and vegetable tissues, which is unique in its excellency. It was invented by M. Wickersheimer, of the University of Berlin. The fluid may be injected into the veins of the object to be preserved by it, or the entire object may be immersed in it; in either case the elasticity of the tissues, and flexibility of the joints, are preserved. All sorts of vegetable organisms may also be preserved in this fluid. A colony of exquisite water Algæ, which had been in the fluid for a year, appeared to be growing in the water. The formula for the preparation is as follows: In 3000 grammes of boiling water dissolve alum, 100 grammes; common salt, 25 grammes; saltpetre, 12 grammes; carbonate of potash, 60 grammes; arsenious acid, 10 grammes. After cooling and filtering, add to every 10 litres of the solution, 4 litres of glycerine, and 1 litre of methylic alcohol. Anatomical preparations that are to be preserved dry, are immersed in the fluid from six to twelve days, according to their size, and then dried in the open air.

Microscopical Society of Liverpool.—The third ordinary meeting of the twelfth session of this Society was held at the Royal Institution, on Friday evening, March 5, 1880; Dr. J. Sibley Hicks, president, in the chair. Mr. Stuart, of Messrs. Ross & Co., London, exhibited and explained the principle of their new patent microscope, the chief advantage of which consists in a firm thin stage and swinging substage. The paper of the evening was by the president, Dr. J. Sibley Hicks, on "The Eyes of the Arthropoda." Dr. Hicks briefly described the condition of the eye in some of the Thysanura, pointing out that in two of the genera of that order the eyes consist only of dark pigment. After describing the conglomerate eye as seen in the common millipede, he proceeded to give a more detailed account of the eyes of spiders. He showed that the disposition of the eyes in these harmless and much despised little creatures, although uniformly symmetrical, is extremely varied. Referring to their colour and structure, he described the eyes of some spiders as being of the most brilliant hues, each eye a brilliant little shining hemisphere, and the tiny cluster of eyes grouped in front of the head in some of the Salticides sparkling and glistening like polished gems, vying in colour and lustre with the emerald and other precious stones. The structure of these eyes, although in a somewhat rudimentary condition, is the same as that which exists in the higher animals. The most important part of the paper was that which referred to the compound eye which belongs alike to the insect and crustacean. These animals have two compound eyes placed one on each side of the head, and each of these eyes when examined under a low power is seen to be divided into vast numbers of facets which in some instances are square, and in others hexagonal; the eye of the common house-fly having as many as 4000 of these facets, and in some beetles the number being as great as 25,000. Dr. Hicks proceeded to minutely describe the internal structure of these compound eyes, showing that they are composed of numbers of cones and rods closely packed together, each rod and cone corresponding to a facet. Dr. Hicks combated the statement which is so frequently made in books, that each of these facets represented a distinct eye, maintaining that such statements were not in accordance with recent microscopic investigation. After referring to the manner in which the retina of the higher animals is developed, he said no one could fail to be struck with the similarity and agreement in the fundamental plan of structure that exists between the layer of rods and cones of the retina (Jacob's membrane) and the arthropod eye. He showed by a series of diagrams the rods and cones of the fish, the bird, the amphibian, and the mammal, the similarity between these structures and the rods and cones of the compound eye being very striking. To his mind there was no question but that the rods and cones of the vertebrate eye have been originally derived from the crystaline cone and nerve rod of the arthropod eye. At the conclusion of the paper, a hearty vote of thanks was accorded to Dr. Hicks for his valuable paper, special mention being made of his admirably executed diagrams. The usual conversazione terminated the meeting.

Synapta and the Frost.—The very severe frost that occurred during the winters of 1877 and 1878 seems to have destroyed the Synapta that were formerly readily procured in the mud banks off Holywood, on Co. Down side of Belfast Harbour. There is great difficulty in getting good specimens now, but we hope the coming summer will help to restore this interesting family. I have a few duplicate slides and will be glad to supply any of my former correspondents who were disappointed last exchange.—*William Gray, Belfast.*

Painting on Satin.—Your correspondent, S. G. R., will find, if he uses white of egg instead of water when painting on satin, that it will make it easier for the colour to adhere. When the painting is finished and dry, paint it all over with the white of egg, which for both purposes should be slightly liquid.—*L. F. R.*

ZOOLOGY.

Destruction of the Phylloxera.—M. Pasteur has recently suggested that the destruction of the *Phylloxera* might be accomplished by inoculation with some microscopic fungus, and the Academy of Sciences, Paris, have invited the attention of naturalists to this subject.

A Natural History Society for the Isle of Man.—We are glad to see that an attempt is being made to organise a natural history society in the Isle of Man. A nucleus has already been formed, with Mr. E. Birchall, F.L.S., the well-known entomologist, as President. There is no better British locality for the pursuit of natural history generally than this little island, so well known to naturalists as the birth-place of Professor Edward Forbes.

The Deal-Fish.—We have been informed by a correspondent that a specimen of the deal-fish (*Trachypterus arcticus*), the occurrence of which on the Norfolk coast we noticed in our February number, has been obtained near Whitby. The specimen, which was left by the tide among the rocks, was about 16 feet long. Dr. Fleming describes several which were cast up at Sanda, Orkney; they were about 3 feet to 4½ feet in length. These fish are very rare, keeping out in deep water; they only approach the shore in Iceland, where the bottom is sandy, and not steep. The deal-fish are provided with ventral fins (contrary to the old opinion), but these are very delicate, and when the fish is captured they are usually destroyed. Their absence, from this cause, led naturalists for a long time to imagine the ventral fins were wanting. The body is compressed, or sword-blade-like throughout more than half of its own length. There are two species of this genus found in the Mediterranean.

Skin Preserving.—In the paper on this subject, published last month, for "arms" (p. 54, col. 1, par. 3, line 5; and par. 4, line 1,) read "anus," and for "back" (p. 54, col. 2, par. 3, line 4), read "beak."

The Needle-tailed Swift.—Mr. G. B. Corbin in the "Zoologist," reports that a specimen of this rare bird was shot in Hampshire, July 27, 1879. This is only the second time that it has been found in Western Europe; the first time it was also seen in England, at Great Horkesley, near Colchester, in July 1846.

Air-bladders in Fish.—A paper on this subject has been read before the Cotteswold Naturalists' Field Club, by Mr. Francis Day, F.L.S., F.Z.S. Mr. Day remarks that few among the organs in fishes have been the cause of so much discussion as the air-bladder, which is a single or variously divided sac, situated beneath the vertebral column and the kidneys, and placed above the centre of gravity. As the air-bladder is sometimes present or absent in species of the same genus, it is evident it is not entirely indispensable to the fish's existence. It originates as an offshoot from the stomach, which offshoot elongates and then enlarges at its extremity into what is termed the air-bladder. In the Dipnoids the air-bladder communicates with the œsophagus during life, and the functions of the air-bladder are analogous to those of lungs. In Amia, a ganoid fish, it has also a lung-like function, but in Acipenser it is used merely for hydrostatic purposes. The air-bladders, however, are not considered as lungs in most fishes, since the blood is supplied to them from the adjacent arteries, and in many cases returns as venous blood into the circulation. In Lepidosiren, however, in consequence of the non-development of gills on the two inferior branchial arches, the blood is not arterialised there, but passes on to the air-bladder for this purpose. The Lepidosirens doubtless are the highest known form of living fish, forming a transitional link between amphibia and fishes. The chief use of the air-bladder in Teleostean fishes is: (1) Hydrostatic; (2) Acoustic; it being partially, or entirely, employed for hearing by means of various modes of connection with the internal ear. In the Physoclisti or Physostomi the air-bladder occurs as a closed sac. In the marine forms of these orders, a tubular prolongation itself passes forward to the anterior portion of the skull to establish an auditory communication, but in the freshwater species the connection is formed by a chain of auditory ossicles. In conclusion, Mr. Francis Day says the air-bladder in fishes is the homologue of the lung of the superior vertebrate forms, and that in some of the higher sub-classes it serves as an accessory respiratory organ.

BOTANY.

Respiration of Plants.—I have been somewhat bewildered by a paragraph on the above subject which I have met with in Sach's "Text-Book of Botany," and which upsets all my preconceived notions on the subject. The paragraph in question will be found at page 644 of the English edition, and runs as follows: "The respiration of plants consists, as in animals, in the continual absorption of atmospheric oxygen into the tissues, where it causes oxidation of the assimilated substances, and other chemical changes resulting from this. The formation and exhalation of carbon dioxide—the carbon resulting from the decomposition of organic compounds—may always be directly observed; the production of water at the expense of the organic substance in consequence of the process of respiration is inferred from a comparison of the analysis of germinating seeds with the composition of those which have not yet germinated.

Experiments on vegetation show that growth and the metastasis in the tissues necessarily connected with it, only takes place so long as oxygen can penetrate from without into the plant. In an atmosphere devoid of oxygen no growth takes place ; and if the plant remain for any time in such an atmosphere it finally perishes. The more energetic the growth and the chemical changes in the tissues, the larger is the quantity of oxygen absorbed and of carbon dioxide exhaled ; hence it is especially in quickly germinating seeds and in unfolding leaf and flower buds that energetic respiration has been observed ; such organs consume in a short time many times their own volume of oxygen in the production of carbon dioxide." Is not this experiment of placing a plant in an atmosphere devoid of oxygen somewhat delusive ? As all the carbon contained in the atmosphere exists in the form of carbon dioxide, I do not quite see how it would be possible to deprive an atmosphere of all its oxygen without eliminating the carbon also, and as it is now supposed that plants derive all their carbon from this source, of course this would be fatal to the growth of the plant in itself. On the other hand, if the carbon dioxide remained, and the experiment were conducted in sunlight, we may be quite sure that the plant, if it contained chlorophyll, would absorb the carbon dioxide and would constantly liberate oxygen, so that if the atmosphere contained no free oxygen at starting, it would not long remain in that condition. That the tissues of every plant contain plenty of free oxygen is well known, but I imagined it was equally well known that this oxygen was derived, chiefly at all events, from the decomposition of compounds containing oxygen, such as water, carbon dioxide, and many other compounds contained in the plant. In the case of germinating seeds and flower-buds, every one knows that they absorb oxygen and exhale carbon dioxide, but I always thought it was universally conceded that this is caused by the conversion of starch into sugar, and is in fact a kind of combustion, a part of the carbon contained in the starch uniting with the oxygen of the air to form carbon dioxide, and not connected in any way with the phenomenon of respiration. Besides, in these parts of the plant assimilation of carbon is not going on, at least I have hitherto thought not. They are expending their substance, not producing it, whereas, if I understand Sach aright, he means to tell us that this process is continually going on in the leaves side by side with the contrary process of assimilating carbon from the air ; in other words, that leaves of plants are continually engaged in taking in carbon dioxide and giving out oxygen, and in taking in oxygen and giving out carbon dioxide at one and the same time, which seems to me a curious conclusion to arrive at. I should be much obliged if you or some other botanist would kindly enlighten my ignorance on this point.—*Colonel Dickins, Winchester.*

Specific Names of British Plants.—There are many specific names, which are nouns in the genitive singular or plural, as *Capsella Bursa-pastoris* (purse of the shepherd), *Dipsacus fullonum* (the teasle of the fullers), *Convolvulus sepium* (convolvulus of the hedges), *Vicia sepium* (tare of the hedges). The genus Campanula has examples of all the three genders ; thus, *Campanula patula*, *C. trachelium*, *C. rapunculus.* How is this ? It is against some of our school rules, though of course there are exceptions to every rule, and after all the great master (Linne) may be right.—*J. F. R.*

The Naturalised Plants in South Australia.—Dr. Richard Schomburgk has recently published a small pamphlet on this subject. Among the plants mentioned are the following European species : Common Fumitory (*Fumaria officinalis*), Common Shepherd's-purse (*Capsella Bursa-pastoris*), Hedge Mustard (*Sisymbrium officinale*), Common and Narrow-leaved Pepper-wort (*Lepidium sativum*), Watercress (*Nasturtium officinale*), Common Winter Cress (*Barbarea vulgaris*), Chickweed (*Stellaria media*), Thyme-leaved Sandwort (*Arenaria serpillifolia*), Common Mouse-ear Chickweed (*Cerastium vulgatum*), Corn Spurry (*Spergula arvensis*), Oleraceus Purslane, Heron's Bill (*Erodium cicutarium*), White Clover (*Trifolium repens*), Common Clover (*Trifolium pratense*), Small-flowered Melilot (*Mehlotus parviflorus*), Lucerne (*Medicago sativa*), Toothed Medick (*Medicago denticulata*), Common Vetch (*Vicia sativa*), Common Fennel (*Fœniculum vulgare*), Scotch Thistle (*Onopordon Acanthium*), Variegated Thistle (*Carduus Marianus*), Goatsbeard (*Tragopogon porrifolius*). Chicory (*Cichorium Intybus*), Common Groundsel (*Senecio vulgaris*), Golden Corn-flower (*Chrysanthemum segetum*), Sow-thistle (*Sonchus asper*), Rough-leaved Sow-thistle (*Sonchus oleraceus*), Cornfield Sow-thistle (*Sonchus arvensis*), Red-flowered Pimpernel (*Anagallis arvensis*), Corn Gromwell (*Lithospermum arvense*), Blackberried Nightshade (*Solanum nigrum*), Common Henbane (*Hyoscyamus niger*), Ribgrass (*Plantago lanceolata*), Knotgrass (*Polygonum aviculare*), Sheep's Sorrel (*Rumex Acetosella*), Common and Small Nettle (*Urtica urens* and *Urtica dioica*), Black Oat (*Avena sativa*), Darnel Grass (*Lolium temulentum*), Wild Oat-grass (*Avena fatua*), Early flowering Hairgrass (*Aira præcox*), Sweet-scented Spring-grass (*Anthoxanthum odoratum*), Cocksfoot Panic (*Panicum Crus-galli*), Creeping Dog's-tooth Grass (*Cynodium Dactylon*), Annual Meadow-grass (*Poa annua*), Rye-grass (*Lolium perenne*), Rough Cocksfoot (*Dactylis glomeratus*), Floating Foxtail-grass (*Alopecurus geniculatus*), Wall Barley (*Hordeum murianum*), Small and Great-spiked Quaking-grass (*Briza minor* and *Briza maxima*), Barren Blooming-grass (*Bromus sterilis*), Downy Rye (*Bromus commutatus*), Soft Brown Grass (*Bromus mollis*), Hard Fescue-grass (*Festuca durius-*

cula and *Festuca bromoides*), Small Canary-grass (*Phalaris minor* and *Phalaris canariensis*), and Cat's-tail Kœleria (*Kœleria phleoides*).

RANUNCULUS OPHIOGLOSSIFOLIUS.—Should not *R. Ophioglossifolius* be omitted from our lists of British plants? St. Peter's Marsh, Jersey, where it was found by Professor Babington, no longer exists: it was drained some years back. A friend, residing at St. Helier's, tells me that he watched the last patch of the plant growing smaller and smaller till it finally disappeared altogether. I believe it has never been found elsewhere in the Channel Islands. On the other hand, should not *Centaurea paniculata* be added to our lists? It appears firmly established on the west coast of Jersey, growing, with *C. aspera*, on low sandy hillsides, between St. Owen's Pond, and the northern extremity of the bay.—*W. H. J.*, *Uppingham.*

BRITISH ROSES.—We hope to give a paper on this subject in the May number, with illustrative species in each of Baker's groups.

BISEXUAL CATKINS OF SALIX CAPREA.—In my rambles the early part of last year, I found a small tree of *Salix Caprea* with the whole of the catkins bisexual. The like may have been observed by botanists, but I believe it is not of frequent occurrence.—*A. Carr.*

ON ALTERNATE DEVELOPMENT IN ADOXA.—During the spring of 1879, when making observations on the sequence of the ripening of anthers, a number of plants of Tuberous Moschatel (*Adoxa Moschatellina*) were kept on hand, in order to note any peculiarity in the development of the flowers. The inflorescence of this species is capitate, on a long peduncle, and consists typically of one terminal floret and four lateral ones, the latter arranged symmetrically round the axis, and are inferior to the former. Occasionally one or two minute florets are inserted between the lateral ones, and slightly superior to them. Several hundreds of plants, from various localities, were at different times kept under observation, from which it was found that the order of development in all cases is uniform, and that it has some analogy to the alternate development of anthers, of which a brief account appeared in the March number of SCIENCE-GOSSIP. The terminal floret invariably opens first, and afterwards the four lateral ones expand in alternate order. Accordingly the order of expansion of the five florets that make up the inflorescence, may be expressed thus $4\ \overset{2}{\underset{3}{1}}\ 5$ or $5\ \overset{3}{\underset{2}{1}}\ 4$, and so far as could be observed there is no instance of a successive development which might be expressed by the formula, $2\ \overset{3}{\underset{5}{1}}\ 4$. The anthers are in four or five pairs, or probably the filaments are bifurcate, and bear a peltate, one-celled anther on each branch; but the ripening of the anthers was in such rapid succession that it baffled one's efforts to note the exact order in which it occurred. Possibly the development of the terminal capitulum of *Petasites vulgaris*, which always expands first, may be analogous to the fact that the axial flora in Adoxa opens before the lateral ones. As the season is rapidly approaching when the tuberous Moschatel will again be in blossom, some of the readers of SCIENCE-GOSSIP may possibly be interested sufficiently in the matter to note the development for themselves. The plant is not rare, although probably often overlooked because it is so inconspicuous. It is abundant in south Bedfordshire and north Hertfordshire, where it is usually found on the outskirts of woods, in small plantations, and by old hedgerows. Its time of blossoming is April and May.—*J. Saunders.*

THE BUTTERFLY ORCHIS.—I should like to call the attention of your botanical readers to the arrangement of the pollen in the pollinia of this flower. The pollen mass is a spiral spring, and within its folds the pollen is secreted. It is easy to draw this spring out to a considerable length, and on letting it go again the pollen falls out in showers. As I have not seen this fact mentioned in any of the smaller works on botany, I think it possible that many of your readers may not be aware of it.—*C.*

LIST OF "LOCAL FLORAS" OF THE BRITISH ISLES.

[*Continued from page* 59.]

Devon.

Mosses of, and Cornwall. Lichens and scale mosses of ditto, both by E. M. Holmes, F.L.S. Plymouth Nat. Hist. Soc. Trans.

Kent.

Lichens of, by E. M. Holmes, F.L.S. Hepaticæ of, by the same, may be obtained from the author, 30 Arthur Road, Holloway, London, W.

Tapton Elms, Sheffield. BERNARD HOBSON.

GEOLOGY.

GEOLOGICAL AND GEOGRAPHICAL SURVEY OF THE UNITED STATES TERRITORIES.—We have received Nos. 2 and 3, vol. v. of the "Bulletin of the United States Geological and Geographical Survey of the Territories," which contain, amongst other matter, articles on "The Laramie Group of Western Wyoming and Adjacent Regions," by A. C. Peale, M.D.; and "On the Extinct Species of Rhinoceridæ of North America and their Allies," by E. D. Cope; also "Palæontological Papers," as follow: Remarks upon certain Carboniferous Fossils from Colorado, Arizona, Idaho, Utah, and Wyoming, and certain Cretaceous Corals from Colorado, together with descriptions of New Forms, by C. A. White, M.D.

ARTIFICIAL DIAMONDS.—A short time ago we gave a brief notice of Mr. Mactear's unsuccessful attempt to produce artificial diamonds. In spite of Mr. Mactear's failure another attempt has been made (also at Glasgow) by Mr. J. B. Hannay, and this time with a more or less successful result. Professor Story Maskelyne (to whom Mr. Hannay's artificial diamonds were submitted for examination), says, that from the results of the tests he applied he has no doubt that they are genuine diamonds. There is no doubt whatever that Mr. Hannay has succeeded in solving this problem and removing from the science of chemistry an opprobrium so long adhering to it. Mr. Hannay's process involves the simultaneous application of enormous pressure, probably many tons to the square inch, and a very high temperature. As the process is an exceedingly expensive one, jewellers need not for the present be alarmed as to the result, as it costs more to make them than they are worth.

DISCOVERY OF DIATOMS IN THE LONDON CLAY.—The discovery of diatoms in the London clay by Mr. W. H. Shrubsole, F.G.S., which when first announced was received with some incredulity, has now been fully confirmed. Blocks of clay with the diatoms *in situ* have been exhibited at meetings of various societies, and have also been submitted to some of the most eminent microscopists, who have all reported favourably. Mr. F. Kitton and several other gentlemen are rendering valuable assistance in examining the diatoms. The bulk of these interesting objects are filled with iron pyrites, so that they can only be examined as opaque objects. When viewed by reflected light with one-inch objective and B or C eyepiece, they appear like beautiful golden medallions. Among the lighter particles of the clay are found whole and broken valves, that have had but a film of pyrites deposited upon them ; to these the highest powers can be applied with good effect. By careful treatment with dilute acid, the pyrites can be removed, so that the silicious framework is left translucent. This result is so far satisfactory, as it demonstrates that the silex has not been replaced by ferric sulphide but only covered and obscured. Unfortunately the valves get somewhat broken up in the process. About twenty species have already been identified : the genus Coscinodiscus being abundantly represented by large and beautiful forms belonging to several species. Arachnoidiscus occurs rather sparingly. There are some new species, and for the first that was observed Mr. Kitton suggests the name of *Actinocyclus Eös*. Many other new forms will probably be detected. Besides diatoms, Polycystina, Xanthidia, and some curious forms whose affinities are unknown, have also been found. Mr. Shrubsole reports that he has traced the diatomaceous zone for many miles, and that he is still pursuing the inquiry.

NOTES AND QUERIES.

FALCONRY.—In reply to the query of P.M.K., I think that "Falconry in the British Isles" (1855), by Salvin and Broderick, 21*s*, is perhaps the best modern work on the subject. I cannot say where the hood, jesses, and complete furniture of a falcon may be obtained.—*F. W. Philips.*

VIPERS AND THEIR YOUNG.—On October 25 of last year, my brother killed a female viper, when to his great astonishment eleven fully developed young ones, about six inches long, came tumbling out of the breach made by the blow (about eight inches from the head), and tried to make their escape, they had all the appearance of having seen daylight before. The question naturally arises—had they on seeing danger approach, sought refuge in the interior of the dam? The Rev. Gilbert White, in his "Natural History of Selborne," relates a somewhat similar circumstance. He says :—"On August 4, 1775, we surprised a large viper which seemed very heavy and bloated as it lay in the grass, basking in the sun. When we came up to it we found that the abdomen was crowded with young, fifteen in number ; the shortest of which measured full seven inches in length, and were about the size of full grown earth-worms. . . There is little room to suppose that this brood had ever been in the open air before, and that they were taken in for refuge, at the mouth of the dam, when she perceived that danger was approaching ; because then, probably we should have found them somewhere in the neck, and not in the abdomen." In a letter addressed to Thomas Pennant, Esq., he says :—"Several intelligent folks assure me that they have seen the viper open her mouth and admit her helpless young down her throat on sudden surprise." The Rev. J. G. Wood, in his "Illustrated Natural History," says :—"It is asserted that when danger threatens, the female viper opens her mouth and permits her brood to hide themselves, but this is by no means an ascertained fact." I am told that Dr. Frank Buckland has offered a reward of £20 to any one who can prove that such is the case. A farmer with whom I am intimately acquainted says that when he was a young man, he came suddenly upon a viper, and was utterly dumfounded at seeing five young ones spring down her throat ; he was quite indignant if any one doubted it, and declares that he had never before heard nor read of such a thing. Another farmer informed me the other day that his brother saw a similar circumstance some years ago, and called his attention to it, they went immediately to the spot and killed the viper, finding the young in it. It is not at all likely that so many people would make such assertions, if there were no grounds for them. If any of the readers of SCIENCE-GOSSIP have seen such an interesting phenomenon, perhaps they would communicate the fact.—*J. J.*

GULLS INLAND.—Several gulls have lately been seen in the immediate neighbourhood of Cambridge. A goosander also paid us a visit a short time ago, but I regret to have to report that it met with the inhospitable reception usually accorded to all uncommon feathered visitants—being ruthlessly shot. The same fate also, I am sorry to say, befel half-a-dozen of the gulls.—*Albert H. Waters, B.A. Cambridge.*

Ants and their Pupa.—Can any one who has watched the movements and habits of ants inform me whether they compete with each other for the honour of carrying their pupa (sometimes erroneously called ants' eggs) to and fro between the interior and the exterior of the nest? Eminent naturalists have told us that they bring their larva and pupa out into the sunshine frequently, and with incredible labour, and I am desirous of knowing if the labourers appear eager or otherwise for this work.—*Emmet.*

Query about Eggs.—As a young collector, I want to know whether any of your readers would be so kind as to inform me of the names of two eggs. One is white about the size of a robin's, slightly mottled with red, with a bright red band across the top, and found in a hedge. The other is a blue one, slightly mottled with red, long and rather bigger than a green-finch's, with a bright red band round the top. If any person would be so kind as to let me know, I should be much obliged.—*J. G. R. D., Suffolk.*

Wren's Nest at Christmas.—Were the eggs fresh, or was it a last season's nest with forsaken ones?—*J. Steel, Greenock.*

Can Flowers while drying be prevented from losing their Colour?—I shall be much obliged if any of your correspondents will inform me how to prevent flowers while drying from losing their colour, or of any work on the subject.—*R. B. L.*

Works on Falconry.—In reply to the inquiry by P. M. K. in the January number of Science-Gossip respecting falconry, the best work on the subject is "Falconry in the British Isles," by Salvin and Brodrich, published by Van Voorst, Paternoster Row.—*S. C. H.*

Noise made by Water Snails.—I think if C. F. P., Weymouth, will observe closely, he will find that the noise he mentions is caused by the snail drawing the shell against the glass as he moves up the sides of the aquarium; I have known several similar cases.—*S. C. H.*

Ages of Stags.—The antlers give a very fair idea of the age of stags; they never increase much in weight after seven or eight years of age. At about twelve years the horns begin to diminish in weight. I have known several stags look very old at fifteen or sixteen years, and they have generally died before they have reached the age of twenty years. Fallow deer do not live so long.—*S. C. H.*

Cuckoos denuded of Feathers.—About ten years ago an intimate friend of mine, living in Somersetshire, reared up a young cuckoo, which was taken from the nest of a dunnock (*Accentor modularis*). Early in September its cage was found open, and all search for the prisoner proved futile. One day, however, about the middle of winter, when moving the rubbish from an unoccupied room, the fugitive was discovered huddled together in a corner surrounded by its own feathers, which had been shed, the bird itself being covered only with a kind of down. Soon after being disturbed it succumbed to the demands of Mors.—*T. J. Lane.*

To preserve Birds'-Eggs.—With reference to E. P.'s query in Science-Gossip for January last, relative to the preserving of birds'-eggs, I would mention the following as at least equal to, if not better than any other with which I am acquainted: The shells being emptied of their contents, and the interiors well washed with water, should be rinsed out with a saturated solution of perchloride of mercury (Corrosive sublimate) in spirit of wine, then placed near a fire till perfectly dry. Now take the albuminous portion of a fresh egg, and with a camel's hair pencil apply it as a varnish to the whole of the outside, excepting a small space on which it may rest whilst drying, in order that it might not become cemented to the material on which it is placed to dry. When quite dry the hole or holes should be covered by means of thin gummed paper. They are now ready for the cabinet, and if placed in a moderately dry locality, will both escape mould and retain their colour much more perfectly than when unvarnished. Some eggs, such as those of the Falconidæ, Strigidæ, and Laridæ, require a second coat, the former one being absorbed through the loose texture of the shells. Care should be taken not to allow the mercurial solution to run over the exterior, or the colour will be destroyed.—*T. J. Lane.*

Curious Freak.—A neighbour showed me the other day a white bantam hen which is about five years old, lays regularly, and has brought up chickens; this year it has moulted like a cock and crows. You could not observe any difference between it and a cock of the same species. I have seen a duck with drake plumage.—*S. A. B.*

Popular Names.—In the interest of beginners, like myself, I should like to see more frequent use made of the popular names of plants and animals in the pages of Science-Gossip. It is always easy to add the scientific name in parenthesis, and the papers are then intelligible to outsiders as well as the initiated. I appeal more particularly to our able botanical contributors, for surely it is in every sense a loss when we bid farewell to the old familiar names of our country's flora, many of which are so poetic, others historic, but all expressive, and full of pleasant associations. Numerous articles on botany can only be understood by a beginner at the cost of laborious reference, simply because the English names are not quoted. True, such reference is first-rate educational exercise, but everybody has not the inclination for it, and the general reader cannot be expected to attempt it. Moreover, I think, that the use of the scientific and popular names side by side is more likely than anything else to impress upon the mind the individuality of the plant.—*Sciolist.*

Fleas in Hedgehogs.—I have read with some interest the various remarks concerning fleas in hedgehogs. I have repeatedly noticed these creatures are infested with them, and the last one I found and brought home was literally swarming with these parasites, and the handkerchief I carried him in must have had a dozen at least left on it when I took the hedgehog out. The creature was perfectly healthy, but it was unpleasant having him even in a garden, and I was only too glad early to restore him to the hill-top where he was found.—*Hamilton James.*

How to mount Mosses.—Could any bryologist furnish a short account as to the best mode of mounting mosses for the Herbarium, other than those given by Dr. Braithwaite in "Notes on Collecting and Preserving Natural History Objects?"—*J. R. M.*

Dissolving and thickening Dyes.—I have been trying to make some ink to use with the Chromograph (alias Polyautograph, &c.) from aniline dye. With mauve I have succeeded, but with red my attempts have been an almost complete failure. I merely added water to the dyes. The mauve would take sixty copies, but the red and green dyes did not seem sufficiently soluble in water. Can you tell me what I ought to dissolve them in, and, moreover, whether I ought to add sugar or gum to thicken the ink?—*York.*

YEW BERRIES.—I trust that no reader of SCIENCE-GOSSIP will venture to eat yew berries, although Dipton Burn says they can be taken with impunity, for the poison is in the seeds, not in the pulp of the fruit; and if the seeds are swallowed, and the shell of any get between, so that the gastric juice can act on them, the consequences will most probably be very serious.—*Helen Watney.*

THE LARGEST TREE IN THE WORLD.—In Nelson's "Scientific and Technical Reader," there is an account, abridged from Hutching's "Scenes and Wonders in California," of a grove of trees, at least one of which exceeds the tree quoted in your last number in height, and several of which exceed it in diameter. I extract the following from Nelson's "Mammoth Tree Grove:" —This grove is situated on the watershed between the San Antonia branch of the Calaveras River, and the North fork of the Stanislaus River, in lat. 38° and long. 120° 10′ west, at an elevation of 4370 feet above the sea level, and at a distance of ninety-seven miles from Sacramento city and eighty-seven from Stockton. From specimens of the wood, cones and foliage, Professor Lindley, England, considered it as forming a new genus and named it "*Wellingtonia gigantea*," but Mr. Lobb, who had spent several years in California, and had devoted himself to this branch of study, decided it to belong to the "Taxodium" family, and referred it to the old genus "*Sequoia sempervirens.*" It is now generally known as *Sequoia gigantea*, popularly called "Wellingtonia," and by the Americans "*Washingtonia gigantea.*" Within an area of fifty acres, there are 103 large trees, twenty of which exceed 25 feet in diameter, and are consequently over 75 feet in circumference. The "Father of the Forest," the largest of the group, lies prostrate and half buried in the soil; it measures at the root 110 feet in circumference, is 200 feet to the first branch, and from the trees which were broken by its fall is estimated to have been 435 feet in length; 300 feet from the roots it is 18 feet in diameter. The "Big Tree" was bored off some years since with pump augers and then wedged down; the stump, which stands 5½ feet above the soil, is sound to the core, and has been used as a ball room. This tree was 96 feet in circumference at the ground, and 302 feet high. The "Mother of the Forest" was stripped of its bark in 1854, for exhibition in the New England States, and now measures, without the bark, 84 feet in circumference, 70 feet up it is 39½ feet (also without the bark), its height is 321 feet. The "Burnt Tree," prostrate, is estimated to have been 300 feet high when standing, and is 97 feet in circumference, it measures 39½ feet across the roots. "Hercules" is 95 feet in circumference, and 320 feet high. The "Pioneer's Cabin," broken off 150 feet from the ground, measures 39 feet in diameter, but owing to its being hollow, and its surface uneven, its average is not quite equal to that. Fourteen other trees average 291 feet high, and 78½ feet in circumference. It is estimated, from the number of concentric layers of wood in these trees, each layer of which is supposed to be the growth of a single year, that their age is almost 3000 years, considerably younger than the one on exhibition. This grove is also described in an amusing manner by T. W. Hinchliff, M.A., F.R.G.S., in his "Over the Sea and Far Away," 1876. From his account, the trees occupy a belt 3200 feet long, and 700 wide, which contains from 90 to 100 sequoias of large size, the highest is 325 feet, and the diameter of one (which I think must be the "Big Tree") is 27 feet. At 6 feet from the ground, he says, the survey party counted the rings of this section, and found the number to be 1255: this tree, he thinks, is one of the finest in the grove. It is probable that "Old Moses" is one of this group, or at any rate a "Wellingtonia," and that the "New York Herald" has got his age a little too "big."—*Thomas Winder, Sheffield.*

THE GEOLOGY OF HAYES COMMON.—In reply to the query of J. R. S. C., in SCIENCE-GOSSIP, No. 181, with reference to the remains of British pit-dwellings at Hayes, I beg to say that he is wrong in his supposition that they bear any resemblance to "Dane holes." The remains of pit-dwellings are sometimes called hut circles, since they are probably the sites of wooden huts which have been encircled by a low mound of earth excavated from the floor of the hut. These circles at Hayes Common are numerous and well-defined circular depressions varying in diameter from 7 feet to 24 feet, and in greatest depth from 4 inches to 2 feet. The number has been roughly estimated at about 150. Scattered around these hut circles I have found several worked flint implements, which clearly indicate that this neighbourhood at some time was the residence of our primitive ancestors. The presence of these flints is all the more remarkable from the fact of no chalk flints, such as those of which the implements are formed, occurring naturally on Hayes Common (see SCIENCE-GOSSIP, No. 178, p. 217). At the same time we have no evidence that this was the site of a very extensive settlement. We are told by Strabo that temporary buildings were erected by the Britons for themselves and their cattle, and such a settlement this may have been at Hayes, yet from its vicinity to the British Camp at Holwood Park, Keston, and also from the discovery of many wrought flints of beautiful workmanship in the adjoining parish of West Wickham, it may be that the British settlement on Hayes Common was more important than we might at first suppose. In reference to J. R. S. C.'s remarks respecting the use of the so-called "Dane holes," I certainly fail to see the probability of his supposition that they served either as habitations or as hiding-places. If they had been intended as habitations they would not require to be so deep as they are often found to be; while if they were made by the Britons merely for hiding-places from their enemies I question if so much care would have been taken as to line the shaft with squared stone blocks, even if time had allowed. To my mind the use of these deep pits has yet to be explained: at the same time I can easily imagine some of them to have been dug by some of our earliest ancestors, for the purpose of obtaining fresh flints from the chalk—an indispensable material for the manufacture of the better class of flint implements. It has also been thought—and with some probability—that these "Dane holes" may have been used as underground granaries in which corn and other valuable commodities were kept during the winter. There can be little doubt that in many cases the shaft was the only entrance to the subterranean chamber, and descent must have been made by means of a rope or ladder of some sort. The idea of descending a smooth shaft 50 or 60 feet deep without some such apparatus could not for a moment be entertained. Since the article on this subject appeared in SCIENCE-GOSSIP (October, 1879), I have been favoured with particulars of a well-boring on Hayes Common by Lord Sackville Cecil. The well was sunk in 1874, and is 156 feet deep. From the section exposed it appears that the strata above the chalk are about 100 feet in thickness, and the pebble-beds proper are about 80 feet thick.—*Geo. Clinch.*

WATER-CRESS.—Galen is said to have recommended this plant, Bonet, Ponteau, Schröder, and Ettmüller have likewise spoken highly of it in their writings as an antiscorbutic, and now it is used in domestic practice with very good effect by persons of a lymphatic temperament.—*Helen Watney.*

LARVÆ OF THE CADDIS-WORMS.—The larva of the caddis-fly is usually supposed to be a vegetarian. I have, however, seen it noticed that it sometimes makes a meal of fish eggs; it may, therefore, be of interest to some of your readers to learn that I have seen one of these animals feeding on a spider, and have fed several others upon beef, mutton, and fish, both raw and cooked.—*G. C. Goody.*

HINTS FOR A MARINE AQUARIUM.—Having now kept a marine aquarium for some time and with wonderful success, I would be pleased to add a little of my experience to that of Mr. Dymond, but at the same time I would not suggest that a tall glass aquarium is the correct, or even a good vessel to keep marine creatures in, especially as it is very far from imitating nature; for in nature there is only light obtained from the surface of the water, and not from all sides as in a globe. Such a quantity of light marine animals always more or less shun, as is proved by the fact that such as can move, do move to the more shady side of the vessel, or behind and under stones. If, however, a globe must be used because of its cheapness or such like, I would suggest that, besides being in a northern aspect, the portion nearest the window be covered by some screen. But if possible, I would urge all those interested in watching the life and mode of living of those wondrous organisms of the deep, to procure for themselves a slate aquarium, with only plate glass for the front, and with a shelving false bottom, which can be bought for £3. My aquarium, 3 feet long, by 2 feet wide, and 1 foot 6 inches deep, costs no more. The slate bottom lies at an angle of about 30 degrees and thus gives a very pleasing effect for the erection of rockwork, and you can see all things at a glance. Again, there is then a very large quantity of water always in the dark, which keeps the whole cool and pure, for no algæ will grow there, and only one half the water is exposed to light; by having a hole in the corner the water behind can be drawn up and syringed to the front, thus keeping up a sort of circulation at times. I shall be pleased to give the address to any one who would like one made like mine, at any time. To raise the effect and usefulness of the shelving bottom, I have made high ridges with Portland cement (about 1 to 1½ inches high), on this I put the sand, shingle, and stones, it then looks like a thorough rocky shore. As to the aërating of the water, I prefer syringing it with a large glass syringe to any other mode, for it does not disturb the sediment at the bottom, and more finely divides the particles of water than by pumping air through a tube from the bottom of the aquarium. Feeding anemones with raw beef I do not think will answer well for long, being much stronger and more likely to putrify if any is ejected and lost sight of. I think an oyster cut into fine pieces and washed in fresh water is the best possible food for anemones, or anything likely to be kept in a private aquarium. I agree with Mr. Dymond in his remark, that we should imitate nature as nearly as possible. For pleasant reading and instruction I think Mr. J. E. Taylor's book, and Mr. P. H. Gosse's are the two best, for they both seem to go heart and soul into the matter.—*F. W. H.*

URTICATING MOTHS.—As an addition to the notes which have appeared in SCIENCE-GOSSIP on the urticating properties of certain moths, allow me to state that I am not affected in the slightest degree by the hairs of Auriflua or Chrysorrhœa. I have allowed the larvæ to crawl on my hands, face, and neck, and not the least irritation was produced. It would be interesting to know the various ways in which persons are affected in a more or less degree.—*W. H. Newberry, Exeter.*

INSECTS AT BOURNEMOUTH.—Last year I spent my holiday at Bournemouth, so I give a short account of some of the insects I took there, as it may be of interest to some of your readers. I was there the last week in July and the first fortnight in August. *L. Ægon* was very common, in fact it was the only Lycæna I saw except Alexis, of which I caught but one specimen. *Cœnonympha pamphilus* and *Epinephile Tithonus* and *Janira* were to be found in abundance; *H. sylvanus* was also common, and of Linea I caught two. *V. cardui* appeared on the 3rd of August, and was to be seen sparingly till the 14th, when it appeared suddenly in hundreds all over the district, especially in the West Cliff, where I could have caught any quantity by just standing still and waving my net to and fro. Simultaneously with the Cardui appeared an immense swarm of *P. gamma*, and it is rather underrating it (if anything) to say that they were in thousands everywhere; quantities were on the shore drowned; in fact on the 14th of August there was scarcely any other insect to be seen except these two, and the commons resounded with their hum. From the diary of a friend living at Teignmouth, I see that there was also a large swarm of *P. gamma* and *V. cardui* there in August, 1879, and I had sent me from there in October about a dozen larvæ of *V. cardui*, all of which I succeeded in rearing, the last imago coming out on the 13th of December. They remained in the pupæ state sixteen or seventeen days. I kept them in a well-warmed greenhouse, as they so frequently die when allowed to hybernate. But to return to Bournemouth, I caught a few fine specimens of *S. Semele*, but they were not so common as the above. On the 12th of August I was in the New Forest, but as I was driving I did not make many captures, I caught one *L. Sibylla*, and saw several which we disturbed as we drove along: how very handsome they look flying on the outskirts of the woods. I only saw one Paphia there and that was a very fine specimen. Agrotis, Putris, and Porphyrea, I caught sparingly. *Hadena monoglypha* was also to be found. *Anarta myrtilli* was not uncommon. *Nemoria viridata* was common, so was *Pseudopterpua cythisaria*, the two latter being found more commonly on the West Cliff than elsewhere. I obtained one specimen of both *Acidalia straminata* and *imitaria*. *Phasiane palumbaria* was very common among the heather. *Fidonia attomaria* were to be caught plentifully. *Nomophila hybridalis* was common. I obtained one specimen of *Crambus Warringtonellus*, also one of *Phycis palumbaria*, both of which were scarce. *Endotricha framialis* was to be found plentifully on the common bordered by Talbot Wood. The larva of *Saturnia* *pavonia* was particularly common. Here at home I have seen one *V. Io;* I have not come across any Urtice or Atlanta though I have usually found them. *P. gamma* was also abundant.—*George T. Baker, Hagley Road, Edgbaston.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

To Anonymous Querists.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

For full instructions how to prepare the cyanide for butterfly, &c., killing, see "Notes on Collecting and Preserving Natural History Objects," page 58.

J. R. Neve.—The sketch you enclosed us of the discontinuity in strata on the Dorset coast, indicates the occurrence of one of those dislocations known to geologists as "faults."

W. Roberts.—It is uncertain when the next part of Dr. Carrington's "British Hepaticæ" is likely to be issued.

Ernest Jones.—We are aware of the paper you name, but we believe that the real merit of producing flint implements after the manner mentioned in the paragraph of Science-Gossip, is due to Dr. John Evans, the author of "Stone Implements of Great Britain," who manufactured an implement after the manner described before some of the learned societies, ten or eleven years ago.

J. D. Stuart.—The drawing you sent us of a water mite, is *Arrenurus maculator;* it is figured and described by Koch in his great work on "German Mites," &c. The genus Arrenurus (Duges) is of the family Hydrachnea, order Acarina. We do not know whether *A. maculator* is figured or described in any English work.

S. K. A. (Stafford).—The fungi you sent us were the pretty scarlet cups of *Peziza aurantium.*

S. M. Hubbard.—For a full discussion on the word "Culverkeys," see the preceding volumes of Science-Gossip. The fruits or flowers to which this name has been applied are 1, The fruit of *Fraxinus excelsior;* 2, *Aquilegia vulgaris;* 3, *Scilla nutans;* 4, *Primula veris*—found in Kent, where the wine made from it is called Culverkey wine; 4, *Orchis mascula.*

Nosboh.—We have received the slab of limestone shale you sent us from India. There can only be one opinion respecting the nature of the seaweed-like objects impressed on the surface. They are the dendritic crystals of the oxide of manganese. Such shrub-like crystallisation are very common in some rocks, notably slates, especially in North Wales, where they are exceedingly beautiful, and are known to the quarrymen as "fossil seaweeds."

V. G. (Waltham Cross).—All the lobelias possess an acrid property. The plant however you allude to as being so poisonous, is the *Isotoma longiflora,* a native of the West Indian Islands; you need not fear any evil effects from the mere cultivation of the pretty garden lobelia.

C. U. (South Hackney).—It is the *Lycopodium Selaginoides.* Many thanks for the pretty object for microscopic slide.

M. S. (Brentford).—We will give you names next month.

C. B.—For directions how to preserve mosses and fungi, see "Notes on Collecting and Preserving Natural History Objects," containing a chapter on Mosses, by Dr. Braithwaite, F.L.S., &c., and one on Fungi, by Worthington G. Smith, F.L.S., published by D. Bogue, 3 St. Martin's Place, Trafalgar Square, W.C.

H. G.—We do not remember having received the specimens you mention, but if you will send us others, we will endeavour to name them.

J. F. (Brechin).—Thanks for note on mosses. *Hypnum cæspitosum,* and *Orthodontium gracile* shall shortly be forwarded.

W. Kirkley (Leeds).—We have addressed two letters to you on the subject you mentioned, by post, but both have been returned to us through the Dead Letter Office. There can be no doubt as to the larger seed being *Ervum Lens:* the others are the well known "red lentils."

J. A. W.—Get Lindley's "Botany," published by Bradbury & Evans. Write to Messrs. Hunter & Sands, 20 Cranbourne Street, Leicester Square, for their catalogue of secondhand microscopes, and you will see their prices, and be able to get one that will suit you.

J. M. Ward.—The protuberance on the carapace of the shrimp is due to the encystment of a parasitic crustacean called *Bopyrus crangorum,* or "shrimp parasite," which is a retrograded type of crustacean. See Taylor's "Half Hours at the Sea-side" for figures of male and female of same.

A. H.—Get M. P. Edgeworth's work on "Pollen," illustrated by 438 figs., second edition, price 7*s.* 6*d.*, published by D. Bogue, 3, St. Martin's Place, Trafalgar Square, London.

W. E.—The specimen of the "Rose of Jericho" came duly to hand, for which accept our best thanks. It expanded fully after about an hour's insertion in water, and again contracted after a night's drying.

J. W. C.—We can confidently recommend any or all of the firms of microscope makers who advertise in Science-Gossip for microscopic lenses. If you write to them they will send you all the information you require. It would be invidious for us to mention any one in preference to the rest.

Oscott.—The objects you sent us from near the roots of oak trees are barnacle galls produced by an insect *(Cynips corticalis).*

J. Laing.—The "sponge insect" you found in East Indian sponge must have got in after the sponge was dried ashore, for it is one of the pseudo-scorpions, called *Chelifer Latreilli.*

N. C. Haring.—See the chapter on "Bones" in "Notes on Collecting and Preserving Natural History Objects," price 3*s.* 6*d.*, published by D. Bogue, 3 St. Martin's Place, Trafalgar Square, London.

Alpha.—We do not exactly know which species you refer to under the name of the "English Diamond Beetle," unless it be *Rhynchites auratus,* which is of a variable shining copper colour, and about a quarter of an inch in length. If it be this species it is not common, except in some parts of Kent. The best plan would be to detach the elytra, or wing-covers, and mount them dry.

EXCHANGES.

Thirty-four numbers of "English Mechanic," numbers 229, and from 255 to 288 in succession; for an equal number of Science-Gossip, from No. 1 to 94. Address, J. K., 7 Gibraltar Terrace, Chatham.

Science-Gossip from January 1874 to October 1879, at half-price (12*s.*), or exchange for standard books.—Mr. Marshall, Bruce Grove Post Office, Tottenham.

Wanted, a second-hand cabinet for 1000 slides. Will give well-mounted transparent coal-plant slides in exchange, or partly slides and partly money. Address, Z., Post Office, Stretford, near Manchester.

Wanted, by the end of the year, good specimens of Charas. Date, place, and county collected in to be given. Will give rare dried or living British plants for the above.—A. Bennett, 107 High Street, Croydon.

For exchange, three polished deal microscopic object cases, each to hold three dozen objects, to lie flat, for really well-mounted and interesting slides.—Joseph Anderson, jun., Chichester, Sussex.

Wanted, to exchange Huxley's "Crayfish" (new), for McAlpine's "Biological Atlas" (4to.) second-hand, but in good condition.—Fred. James, Museum, Maidstone.

Many species of British marine, land and fresh-water shells offered for foreign land shells or Derbyshire crystals.—Miss Jessie Hele, Fairlight, Elmgrove Road, Coltham, Bristol.

Quercifolia, Promissa, Lucipara, Albulalis, Munitata, Myrtilli, Belgaria. Desiderata many, especially large, showy insects.—T. Ovenden, Frindsbury Road, Strood, Kent.

Exotic Lepidoptera, chiefly Indian and African, in exchange for good books on Coleoptera or Hymenoptera, for other foreign insects, or for an entomological cabinet.—F. W. Savage, University School, Hastings.

Wanted, diatomaceous earth, various, for cash or exchange. —M. Johnson, 14 Whitefriars. Chester.

Old Transactions of the Microscopical Society wanted for a consideration.—J. H. M., 17 Walham Grove, St. John's, Fulham.

Wanted, to purchase, a few live specimens, male and female, of the natterjack toad.—W. B. Scott, Chudleigh, Devon.

A small compound microscope in mahogany case (cost 18*s.* 9*d.*), is offered in exchange for micro slides; or what offers in cash? Address, T. Swepson, 31 Shaw Street, Ashbourne Road, Derby.

Collection of dried fronds, named, of exotic ferns, collection named mosses, seaweeds, &c., and other natural objects, exchange for coins or rubbings of monumental brasses, or any antiquities.—F. Stanley, Margate, Kent.

For exchange, two fine articulated skulls of the porpoise, also jaws and backbone of shark, geological exchange preferred. Other exchange entertained.—J. McKenzie, Birkby, Huddersfield.

About thirty good specimens and 100 imperfect specimens of British and foreign beetles, in exchange for British Lepidoptera. —W. Bentley, jun., Stakehill, Castleton, near Manchester.

For exchange, very perfect specimens of fish, clupea and spaniodon from Lebanon (only a few); also beautiful white and black ammonites from the Lias, *Ostrea acuminata*, from fuller's-earth, *Pentacrinus Briareus*, and other British fossils. Wanted fossils from the chalk, or other offers.—F. Summer, Merton College, Oxford.

PREPARATIONS of the large water beetle (*Dyticus marginalis*), and house cricket (*Acheta domestica*), prepared ready for mounting, in exchange for good unmounted material brittle stars, Ophiocoma, and fragments of *Hyalonema mirabilis* required most. Will also exchange good mounted objects. English ¼ in. objective.—W. White, 7 Warden Place, York Street, Nottingham.

WANTED 1437, 1453, 1457, 1529, 1545. Offered *Carex axillaris* and other plants.—F. H. Arnold, Emsworth.

FOUR hundred odd duplicates of British Wild Plants as per 7th ed. London Catalogue. Some very rare lists exchanged.—B. M. O., 76 Trafalgar Road, Old Kent Road, London.

A CHEMICAL balance and quantity of apparatus and chemicals for sale cheap.—Thomas Steel, Lorne Place, Gourock. By Greenock.

WANTED, *Trichina spiralis*, *Uredo caries*, *U. fœtida*, *U. segetum*, *Puccinia graminis*, and *Cysticercus cellulosus*, or other objects of interest, for sugar mites (*Acarus saccharus*), perfect micro-sugar crystals (mounted), Kiselguhr infusorial earth, Caledonian canal infusorial earth, *Gomphonema geminatum*, *Epithemia alpestris* (mixed), Sebacic acid, Benzoic acid, Post-pliocene foraminiferous material, &c.—Thomas Steel, Lorne Place, Gourock, by Greenock.

BABINGTON'S "Manual of British Botany," date 1851, third edition. Ure's "New System of Geology," containing 7 plates and 51 woodcuts, date 1829, and vol. 2 of Roget's "Animal and Vegetable Physiology, third edition, date 1840. Wanted offers, books on butterflies and moths, also Parts 2 to 17 of "Cassell's Moths."—J. T. Brown, Stanstead, St. Margaret's, Herts.

HERBARIUM or microscopical specimens of British and foreign mosses, Algæ (marine), zoophytes, also West Indian marine soundings. Wanted British and foreign mosses, Algæ, zoophytes and ferns for herbarium, also micro slides and good diatomaceous earths.—B. B. Scott, 24 Seldon Street, Kensington, Liverpool.

BRITISH marine and land shells, for exchange—*Pandora rostrata*, *Lucinopsis undata*, *Psammobia ferroensis*, *Scrobicularia piperata*, *Anomia ephippium*, *Venus fasciata*, *Rissoa ulvæ*, *Limneus stagnalis*, *Bulimus acutus*, *&c. &c.* Wanted British marine and land shells, lists exchanged.—Richard Ley, St. Leonard's Lawn, Exeter.

DUPLICATES of the following good British land and freshwater shells, offered in exchange for other desiderata. *Lim. Burnetti*, ditto var. lacustris, *Suc. oblonga*, *Vertigo pusilla*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. angustior*. Desiderata—good foreign land shells, named British birds' eggs, or several species of British shells (in quantity) principally *H. obvoluta*, *Acme lineata*, *Q. testacellas*, *P. ringens*, *L. involuta* and others.—W. Sutton, Upper Claremont, Newcastle-on-Tyne.

LYELL'S "Student's Manual of Geology," Page's "Advanced Text-Book of Geology," and Woodward's "Manual of the Mollusca," in exchange for books on chemistry. Dr. Wormley's "Micro Chemistry of Poisons" wanted.—W. F. Lowe, Cambrian View, Chester.

WANTED, *Silurian trilobites*, will exchange good Aviculopecten, Goniatites, Orthoceras, Inoceramus from marine coal shale.—A. D. H., 53 Sheriff Street, Rochdale.

WANTED, pupæ of Quercifolia, Ilicifolia, Lanestris, Carpini, *B. trifolii*, *B. rubi*, *S. ocellatus*, *S. tiliæ*, in exchange for the first 12 Nos. of Cassell's "European Moths and Butterflies," and first 4 Nos. of Martin's "Microscopic Objects."—H. Ullyett, Folkestone.

WANTED, microscopic material and appliances for store boxes, setting boards and insects.—F. S. Lyddon, 32 High Street, Warminster.

WANTED, good fossils in exchange for 13 numbers of Goldsmith's "History of the Earth and Animated Nature."—H. C. Quilter, 25 Waring Street, Leicester.

WANTED, roots *Gymnogramma leptophylla*, or good fronds of it, also of *Woodsia alpina*. Exchange foreign fern roots.—Miss Ridley, Hollington, Newbury.

LEPIDOPTERA in exchange for side blown British birds' eggs.—F. J. Rasell, 30 Argyle Street, St. James' End, Northampton.

FOR (unmounted) leaf petals and calyx of *Deutzia scabra*, with exquisite hairs, send object of interest.—W. H. Skan, 15 Brownlow Street, W.C.

FOR fine slides of Carboniferous Polyzoa, send slides of diatoms, desmids, or sponge spicules (recent or fossil), to J. Smith, 94 Dundas Street, Glasgow.

FOR a small quantity of bramble brand, (micro fungi), send unmounted object, also a few slides of two species of podura scales mounted, including the test one, Curvicollis, in exchange for other slides of interest.—T. Forty, Well Street, Buckingham.

WILL C. E. S. (Channel Islands), or any other inhabitant of them, kindly put me in the way of getting some shells for making flowers? I want specially pholas, white limpets, and a round pink bivalve, apparently a tellen. I will give anything I can in exchange, or a reasonable price in money.—Julia Colson, Swanage, Dorset.

WOULD like to exchange *Zonites fulvus*, *Z. glaber*, *Z. excavatus*, and var. vitrina, *Helix lamellata*, *Helix aculeata*, *Vertigo substriata* for British marine shells, *Pinna rudis*, or any of Terebratulas or other rare shells.—J. Whitwham, Cross Lane Marsh, Huddersfield.

MOUNTED and unmounted micro material, including clean gatherings of recent diatoms, slides of synapta, zoolite, mosses, &c., for good slides.—William Gray, Mount Charles, Belfast.

WILL exchange Cassell's "Popular Natural History," four volumes, unbound, and White's "Natural History of Selborne," for British Lepidoptera or stuffed birds.—A. Foster, Rodger Street, Anstruther, N.B.

MOSSES.—Good specimens, with fruit, of *Leucobryum glaucum*, *Orthotrichum Sprucei*, *Leptodon Smithii*, *Myrinia pulvinata*, &c., offered for L. C. of Mosses, Nos. 38, 97, 100, 102, 107, 108, 110, 124, 134, 229, 236, 254, 255, 256, 270, 302, 303, 324, 330, 331, &c.—H. H. W., Holwell Rectory, Sherborne, Dorset.

WHAT exchange in entomological apparatus for Statham's "Boys' Own Chemical Laboratory" (slightly imperfect) and Bidlake's "Text-book of Elementary Chemistry?—J. M. V., 16 Merrion Square, South Dublin.

MOUNTED slide of Chinese pith plant and other slides for exchange.—Lists to J. B., 36 Windsor Terrace, Glasgow.

WELL-CUT sections of South American and other woods in exchange for good microscopical objects, list sent.—H. L., 6 Upper Phillimore Gardens, Kensington, W.

"MONTHLY Microscopical Society's Journal," complete in 18 vols. cloth, cost £9 9s., offered for Hassall's "Freshwater Algæ," Smith's "Diatomaceæ," or Ralf's "Desmidiæ.—J. W. P. Edwards, 90 Watergate Flags, Chester.

WANTED, Philips's "Geology of Yorkshire" (particularly mountain limestone part).—Harry Muller, Rawdon, Leeds.

WANTED, small air-pump with receiver in exchange for handsome elm cabinet, six drawers, to hold 144 objects, and good camera lucida.—Rev. J. S. Williams, Mysore Cottage, Welshpool.

WANTED, live ova or young of sand lizard, common snake, smooth snake, edible frog and natterjack toad. Other reptiles or natural history specimens in exchange.—J. M. Campbell, Kelvingrove Park, Glasgow.

COMPLETE set, 15 vols. (6 bound) of SCIENCE-GOSSIP, wanted Jeffrey's "British Conchology" or offers.—Thos. H. Hedworth, Dunston, Gateshead.

SEAWEEDS in fructification, beautifully prepared on 3¼ glasses for magic lantern slides, in variety, or in packets for micro-mounting, ready to put into balsam, or as Herbarium specimens, &c. Also a very large assortment of interesting marine micro-material, cash or exchange, in first class micro or lantern slides. Portrait lens by Ross or other good maker, gun, gold fish, or spawn of same, &c.—T. McGann, Burren, Ireland. (Parcels of material sent on approval.)

DUPLICATES, *Flavicornis*, *dispar*, *pilosaria*, *nupta*. Desiderata. *Aurantiaria*, *certata*, *imbutata*, *falcula*, *ziczac*, *glandifera*, *oo*, *rufina*, *dentina*, *glyphica*, *ænea*, and offers in Coleoptera.—T. Wood, 5 Selwyn Terrace, Jasper Road, Upper Norwood.

BOOKS, ETC., RECEIVED.

"Fossil Men and their Modern Representatives." By Dr. Dawson. London: Hodder & Stoughton.

"Proceedings of the Winchester and Hampshire Scientific Society," 1879.

"Proceedings of the Belfast Naturalists' Field Club," 1877–78, 1878–79.

"North Staffordshire Naturalists' Field Club," 1879.

"The Study of Mosses." By R. Anslow.

"The Antiquary." March.

"Observations on Noxious Insects." Report 1879.

"Midland Naturalist." March.

"Land and Water." March.

"Les Mondes." March.

"Ben Brierley's Journal."

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—C. T. M.—H. H. S.—R. A. B.—B.—F. G. H.—E.—W. A. F.—MRS. B.—T. L.—S. S.—C. F. G.—M.S.B.—M.S.—J.P.—J.A.K.—J. F. R.—J. R.—T. B. W.—T. W.—A. B.—W. G. C.—F. J.—J. W.—E. J.—B. H.—J. A.—J. F.—G. L. B.—N. H.—J. H.—J. O.—H. G.—H. B.—F. M. S.—S. R.—W. H. N.—B. H.—M. J.—J. S.—H. L.—W. D. T.—W. H. J.—R. L.—W. J.—C. C.—L. C. R.—W. B. S.—J. G. B.—H. W.—G. C.—W. G. R.—B. M. O.—B. B. S.—T. S.—F. H. A.—W. W.—W. T. K.—F. S.—J. S.—J. McK.—A. D. H.—F. S.—F. K.—B. B. L. T.—W. C.—J. S.—A. C.—W. R. B.—E. A. B.—T. F.—J. C.—M. R.—F. J. R.—J. W. C.—W. G.—J. C. I.—J. W.—J. M. V.—H. H. W.—C. L.—H. W. R.—A. F.—J. B.—H. L.—W. H. S.—J. W. P. E.—H. E. Q.—H. P.—J. S.—R. H. M. B.—W. G.—J. M. C.—A. W.—H. S.—T. H. H.—H. C. C.—J. S. W.—J. M. W.—J. R.—T. McG.—N. C. H.—H. J. G.—H. B.—C. W. B.—M. H. S.—J. C.—H. B.—J. F.—H. M.—J. W. C.—T. W.—J. W.—C. P.—&c.

NOTES ON A NEW SPECIES OF CATERPILLAR-FUNGUS (TORRUBIA).

By JOHN AITKEN, F.G.S., &c.

HAVE you a short space in which I may draw attention to a species of fungus belonging to the genus Torrubia, which does not appear to have been hitherto described, and whose habits are so remarkable as to warrant my request? The plants were collected in Ceylon, by Mr. Daniel Morris (now director of the Botanical Department in Jamaica) during his residence in the first-named country, and brought to England during the autumn of last year. This fungus which is found in certain parts of the coffee districts of Ceylon, takes root in the head of a grub-like caterpillar, and developes an erect slender stem some two or three inches in length, slightly clubbed at the end which appears above the ground to the extent of one to one and a half inches. The tops are brownish-red in colour during their earlier stages, resembling at first glance the fructification of a moss, but gradually assume a darker hue as the plants increase in age, becoming nearly black in their mature state, when the spores are ready to be discharged. The plant is propagated by spores, which are developed in the elongated expansions at the top of the stem in great numbers. When the spores are ripe the capsules rupture, allowing them to escape, when they are readily disseminated in all directions by the action of the wind, and by other agencies.

The most singular circumstance however connected with the development of this fungus (a peculiarity which seems to apply to most of the species belonging to this genus of plants) relates to the strange position selected by it as the habitat for its growth. Amongst the many devastating pests to which the coffee plants are subjected, rendering the coffee crop of recent years in Ceylon one of the most precarious character, may be mentioned one, which for its destructive effects, ranks only second to the dreaded Hemileia itself; viz. the prevalence over large tracts of country, of a caterpillar about three-quarters of an inch in length, known to planters as the white grub. This caterpillar burrows in the ground, and feeds upon the young and tender rootlets of the coffee trees, thus limiting their productiveness by cutting off the supply of nourishment, and sapping the vitality of the plants.

This noxious insect is the larvæ of various species of Melolonthidæ to which the cockchafers belong. Into the interior of these larvæ the spores of the Torrubia by one means or another effect an entrance, and there vegetate, pushing their way invariably through the head of the insect, and thus developing into full grown plants, drawing their support from the tissues and juices of their hosts, whose destruction they eventually accomplish. In the Dolosbage district the Torrubia is very commonly seen under the coffee trees, and it can be taken up with the body of the insect attached without difficulty, and it is worthy of note that this district experiences a comparative immunity from white grub, the reason for which is attributed to the destruction to the insect caused by the action of the Torrubia in the manner described. The rarity of the grub in this district is so marked as to have attracted the attention not only of planters, but that of scientists also, and it has been suggested as an interesting experiment worthy of adoption to propagate the fungus in districts severely affected by grub by distributing the surface soil from Dolosbage, which no doubt contains spores and filaments of the fungus, over districts where these larvæ are known to exist, by which means it is argued the increase of the grub may be arrested, and their destructive effects much mitigated.

The means by which the spores enter the body of the insect is not easily determined; it may, however, be accomplished either by their passing through the spiracles on the back of the grub, or by being taken in along with the food, but assuming their lodgment in the body to have been effected, either in the mode suggested or by some other means, it is very singular that the plant should invariably spring from the head of the insect, rather than from any other part of the body. In some countries the plants belonging to the genus Torrubia attain to much larger dimensions than those in Ceylon, one has been found in New Zealand which takes root in the larvæ of the hawk moth and grows to a height of from six to eight inches, whilst another example occurs in China of similar size, and we have it on the authority of Professor Moseley, that the larva with its attached fungus is made use of by the Chinese and other eastern nations as an article of food, being esteemed a delicacy in soups and in other ways.

Several species of Torrubia are known as occurring in various parts of the world; ten species have been figured and described in that admirable work on Fungi, "Selecta Fungorum Carpologia" by Carolus Tulasne, vol. iii., amongst which is one closely resembling the forms exhibited, described under the name of *Torrubia entomorrhiza* (Dicks), but which nevertheless appears to be quite distinct from the Ceylon specimens. I have reason for believing that these last are a new species and remain up to the present time undescribed; specimens are however now in the hands of Dr. M. C. Cooke, the well-known fungologist, who will doubtless shortly determine their true character and position in the great family of Fungi to which they belong.

THE NATURAL HISTORY OF THE TOAD.

By J. Arthur Eisdell.

[*Concluded from page* 77.]

THE organs of the voice in the toad are only put in action, generally speaking, at the season of reproduction, and then principally by the males; their croakings and cries seem intended to make the one sex sensible of the presence of the other.

Toads may be rendered very tame, and be made to distinguish those who feed and are kind to them.

Mr. Bell possessed a very large one which would sit on one of his hands and eat from the other. A tame toad of which an account is given by Pennant in his "British Zoology," lived for more than forty years, and died at last, as was supposed, from injury caused to it by a raven. So great an age, however, does not appear to be the rule, for Cuvier says that the common toad lives upwards of fifteen years, and has young at four.

It becomes torpid during the winter, and chooses for its retreat some retired and sheltered hole, a hollow tree, or a space amongst large stones, or some such place, and there remains until the return of spring calls it again into a state of life and activity.

And now we will consider the reproduction of the toad.

In our climate the early part of spring is the season when this takes place, when the toads of both sexes quit the localities of their late hibernation and their ordinary haunts, and move instinctively to those stagnant waters which are proper for their purpose and where they are collected in swarms.

The impregnation of the female toad is effected in a very remarkable manner; for the application of the vivifying fluid to the ova takes place during the passage of the eggs from the body of the parent. During the cohesion of the two sexes, the female commences the deposition of the spawn, which is fecundated during its passage. When first expelled it consists of numerous minute globular bodies enveloped in a glutinous mass. This latter substance soon absorbs a large quantity of water.

And now having arrived at our starting-point, namely, the egg, we will consider one or two questions about the toad.

And first the question as to the venom, as it is sometimes called, of the toad.

There seems to be a deal of evidence on this point, evidence almost all in favour of its not being highly poisonous; but we will hear it and judge for ourselves.

Mr. Bell, whom I have already quoted, and who is one of the best authorities (though perhaps rather an old one) upon British Reptiles says: "The opinions formerly entertained of the properties of the toad were eminently absurd. It was highly poisonous, and this not only from its bite (you remember I said that it has no teeth); its breath, and even its glance, were fraught with mischief or death. The only circumstance (Mr. Bell goes on to say) which can be said at all to favour the bad character which attaches to this animal, is that there are situated upon the back and sides numerous secreting follicular glands, the secreted matter from which is somewhat fetid, and of an acrid quality. Dr. John Davy (Mr. Bell continues) was I believe the first who minutely examined into its true nature. He found that the thick yellowish fluid, which on pressure exudes from the follicles of the skin, and on evaporation yields a transparent residue, very acrid, and acting on the tongue like extract of aconite, was neither acid nor alkaline; and since a chicken inoculated with it received no injury it did not appear to be noxious when absorbed and carried into the circulation. Dr. Davy thought that the principal use of this poison was to defend the creature against the attacks of carnivorous animals." Cuvier says: "They are animals, the saliva of which has been erroneously considered venomous, as also their supposed urine, and even the moisture which exudes from the skin." However, he does not mention the follicular glands mentioned by Mr. Bell.

Mr. Wood says: "The skin certainly does secrete an acrid humour which at all events defends it from dogs, who can seldom be induced to bite a toad a second time." But the "British Medical Journal," in an article quoted in the SCIENCE-GOSSIP magazine for May 1868, is quite strong on the subject, and says: "The toad does in reality possess a venom capable of killing certain animals and injuring man. This poison is a sort of epidemic, cutaneous secretion, which acts powerfully if the skin be abraded at the time of contact. Dogs which bite toads soon give voice to howls of pain. On examination it is found that the palate and tongue are swollen, and a viscous mucus is exuded. Smaller animals coming under the influence of the venom, undergo true narcotic poisoning soon followed by convulsions and death. Experiments made by MM. Gratiolet, Cloez, and Vulpian, show that the matter exuding from the parotid region of the toad becomes poisonous when introduced into the tissues. The venom exists in somewhat large quantities on the toad's back. Heated with ether it dissolves, leaving a residuum; the evaporated solution exhibits oleaginous granules. The residuum contains a tonic powder sufficiently strong, even after complete desiccation, to kill a small bird."

I have seen no later authority on this point, I have stated how the question stands, and we may take which side we like, i.e., the mild view taken by Mr. Bell and Dr. Davy, or the strong view taken by the "British Medical Journal."

And now for another question of perhaps greater interest than the last. I mean the stories of toads, antediluvian toads as they were once called, found in the substance of trees, and in hard rock where they were supposed to have existed for some time deprived of the possibility of access to either food or air, though when found they were alive and vigorous.

These stories, although they do not rest wholly on the doubtful hearsay evidence of uneducated persons, are still, I fear, of rather ancient date; and that is the worst of them, and of the experiments also.

Smellie, in his "Philosophy of Natural History," alludes to the account in the Memoirs of the Academy of Sciences for 1719, of a toad found alive and healthy in the heart of an old elm, and of another discovered in 1731 near Nantes in the heart of an old oak without any visible entrance to its habitation. He adds that in the many examples of toads found in solid rocks exact impressions of their bodies corresponding to their respective sizes were uniformly left in the stones or trees from which they were dislodged. Again, in the "Magazine of Natural History," vol. vi. p. 459, it is stated that a toad was discovered in a solid piece of iron-stone, which on exposure to air exhibited symptoms of animation, and being put into water lived about three weeks, growing to nearly double its size when first relieved from its confined cell. Unfortunately, this discovery was made by some miners at the Rough Hills Colliery, Shropshire, in the year 1823.

Dr. Buckland observes: "The evidence is never perfect to show that the reptiles were entirely enclosed in a solid rock; no examination has ever been made until the reptile is first discovered by the breaking of the mass in which it was contained, and then it is too late to ascertain without carefully replacing every fragment whether or not there was any hole or crevice by which the animal may have entered the cavity from which it was extracted. Without previous examination it is almost impossible to prove that there was no such communication." The same author remarks that the young toad, as soon as it has left its tadpole state and emerged from the water, seeks shelter in holes and crevices of rocks and trees. An individual which when young may have thus entered a cavity by some very narrow aperture, would find abundance of food by catching insects which like itself seek shelter in such cavities, and may have soon increased so much in bulk as to render it impossible to go out again through the narrow aperture at which it entered. A small hole of this kind is very likely to be overlooked by common workmen. Dr. Buckland commenced his experiments in November 1825. A live toad was placed in each of twenty-four cells, twelve cells made in a block of oolitic-limestone and twelve cells smaller than those in a block of siliceous sandstone, and a double cover of glass and slate was cemented down over each cell by a luting of clay. The weight of each toad was ascertained, and noted as it was immured. The blocks were buried in Dr. Buckland's garden three feet deep in earth. On December 10, 1826, these blocks which had remained unopen since they were buried were examined. Every toad in the smaller cells of the sandstone block was dead, and so much decayed, that they must have been dead for some months. The greater part of those in the larger cells of the oolitic block were alive. Strange to say, two of them had increased in weight. Dr. Buckland observes that the glass cover of the cell of one of these two was slightly cracked, so that minute insects might have entered; but none were found therein. As the luting of the cell of the other of these two toads was not attentively examined, Dr. Buckland observes that it was probable that there was some aperture by which small insects found admission.

The other toads had decreased in weight, and all the small ones were dead. The large ones died also before the end of the second year; they were examined during that time through the glass covers of their cells, but without removing them to admit air; they appeared always awake with open eyes, and never in a state of torpor, but at each successive examination they became more and more meagre, till at last they were found dead. At the same time that Dr. Buckland enclosed these toads in stone he placed four other toads in three holes cut on the north side of the trunk of an apple-tree. These were carefully closed with plugs of wood, so as to exclude access of insects, and were apparently air-tight. Every one of the toads thus pegged in was found dead and decayed at the end of the first year. Dr. Buckland concludes from the experiments generally that toads cannot live a year totally excluded from atmospheric air; and from the experiments made in the larger cells in the oolite that there is a probability that those animals cannot survive two years entirely excluded from food.

In Vol. III. "Magazine of Natural History," it is related that a toad was placed upon a bed of flinty gravel with full three feet of gravel over it, and without any apparent means of obtaining food, and that after remaining in that situation for three years to the very day, it was removed from its dormitory alive, but wasted and shrunk in some measure. It was then put into a hole in the ground about six inches deep, and shaded from the sun; in this state it lived seven days, but it died on the eighth day after it was taken out of the ground.

At the same time that this toad was buried four others were put alive under two flower-pots, two under each pot; these were also buried three feet below the surface in a dry soil. But here a very different result was met with, for after removing the earth and turning up the flower-pots not a vestige could be seen of the four toads put under three years before. After searching the earth over which the pots covering the toads had whelmed, all that could be found in the soil belonging to the animal kingdom were the antennæ, legs, and elytra of beetles. The only solution then presented as to the removal of the toad carcasses, was that the larvæ of the beetles or the insects in a more perfect state had effected their removal by devouring them.

Our old author, Mr. Bell, says: "Upon the whole it appears to me that whilst the many concurrent assertions of credible persons, who declare themselves to have been witnesses of the emancipation of imprisoned toads, forbids us hastily to refuse our assent or at least to deny the possibility of such a circumstance, it must be confessed that we still want better and more cautious evidence to authorize an implicit belief in these asserted facts. The truth probably is that a toad may have lain hid in the hollow of a tree during perhaps a whole autumn and winter, and found itself on the return of spring so far enclosed within its hiding-place as to be unable to escape. As this animal requires but little respiration, and consequently but little food to support life, especially when in a state of entire inactivity, the smallest opening would be sufficient to admit the requisite passage of air and even the occasional ingress of small insects; and afterwards, when the tree was cut up, the toad may have been found enclosed, and the opening may have escaped detection. To believe that a toad enclosed within a mass of clay or other similar substance will exist wholly without air or food for hundreds of years and at length be liberated alive, and capable of crawling on the breaking up of the matrix, now become a solid rock, is certainly a demand upon credulity which few would be ready to answer." The result of all this seems then to be that though the toad cannot live in trees and stones for the enormous time some people seem to have asserted, yet they are capable of living for some short time in very close quarters.

The other British species of the toad is the natterjack (*Bufo calamita*) which has been found to be pretty abundant in some parts of England and the south-west of Ireland, chiefly in the vicinity of the sea; it much resembles the common toad, but is of a yellowish-brown colour, clouded with dull olive, a bright yellow line passing along the middle of the back. The under parts are yellowish with black spots; the legs are marked with black bands. It has a disagreeable smell. Its motion is more like walking or running than the crawling of the common toad. It is most probable that its reproduction and all the stages of its development resemble those of the common toad. It resorts only to the water for the purpose of breeding.

FERN VARIETIES.

NO department of British Botany will repay our labour of quiet investigation so well as the division often called Pteridology, and no season of the year is so favourable for this work as the early spring months, because the roots may then be removed without danger. We believe about 150 varieties or forms of the common hart's-tongue fern have already been named, and probably an equal number may still be discovered by patient research. These forms when distinct, or in any way remarkable, are most valuable, and often realize high prices; we know of one which was sold to a nurseryman for £10. Surely this is a fair inducement, apart from the pleasure and delight afforded by a ramble amid the dells and ravines of Old England.

On this occasion we notice a few varieties of the hart's-tongue (*Scolopendrium vulgare*) only, and merely expressing our willingness to aid any collectors in naming any variety they meet with, if a dried frond is sent through the Editor of SCIENCE-GOSSIP.

(*a.*) Is the type, or normal frond of the common hart's-tongue fern (*Scolopendrium vulgare*, Sm.) which is broadly-linear, entire, tapering off to a point at the apex, cordate at the base.

(*b.*) *S. vulgare, bifidum.* This is a very common form, though it is seldom found with all the fronds bifid. The frond is divided at the apex into two lobes, or divisions; it occurs frequently in fine or well-grown roots.

(*c.*) *S. vulgare, lobatum.* Somewhat like the last form, only the frond is divided at the tip into several flat lobes.

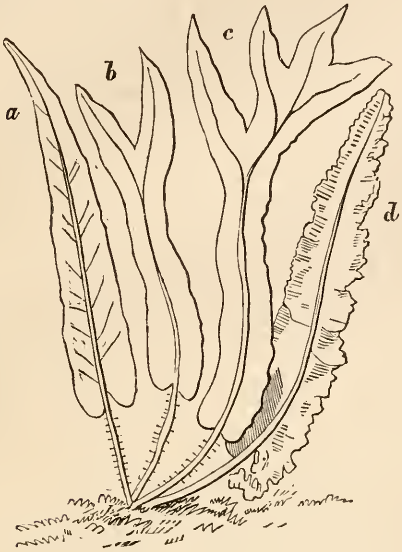


Fig. 58.—Varieties of Hart's-tongue Fern.

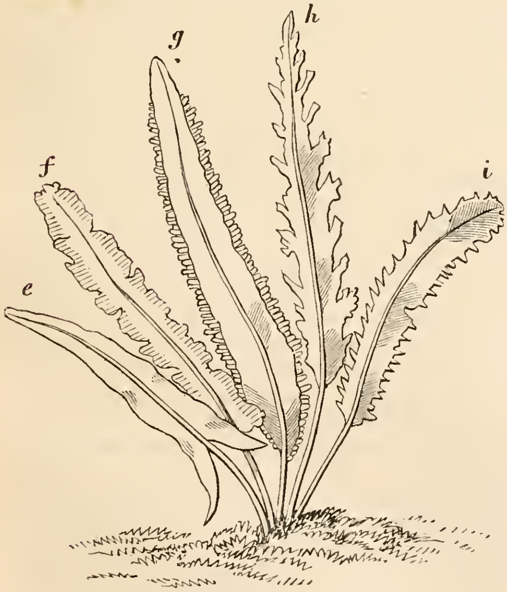


Fig. 59.—Varieties of Hart's-tongue Fern.

(*d.*) *S. vulgare, crispum.* A frequent, but very handsome variety. Fronds strap-shaped, the margin undulated, usually barren.

(*e.*) *S. vulgare, sagittatum.* Fronds very dwarf, about three inches long, basal lobes, tapering each to a divergent point. Rare.

(*f.*) *S. vulgare, polyschides.* Fronds linear, the margin distinctly lobed, and irregularly crenate; fertile. Rare.

(*g.*) *S. vulgare, marginatum.* A beautiful variety. The epidermis or under surface developed into a lobed excurrent, or free membrane, all the margin incise-lobate.

(*h.*) *S. vulgare, macrosorum.* Much broader than polyschides, the margin frilled, "with an undulate series of blunt teeth," and deeper occasional incisions, base truncate. We have met with three forms of this plant, which appears to be met with chiefly in the southern counties.

(*i.*) *S. vulgare, fimbriatum.* This is a remarkable variety, about four inches in length; the fronds are narrow, and strongly marginate, with deeply toothed

Fig. 60.—Varieties of Hart's-tongue Fern.

margin, forming a strongly frilled edge. It has been found in Guernsey, Devonshire, and Westmoreland.

(*j.*) *S. vulgare, cornutum.* This is more a curious freak of nature than otherwise, for the rachis (midrib) runs about two-thirds up the frond, then abruptly becoming excurrent on the upper surface, in the form of a ram's horn, or not unlike a pastoral crook, in outline. It is very constant, if a good root can be obtained; it seldom varies in a state of cultivation. The frond is bluntly rounded at the apex; it has been gathered chiefly in Yorkshire and Lancashire.

(*k.*) *S. vulgare, supra-lineatum.* Frond thick, coriaceous, and dark green. This varies so much that it is difficult to give a correct description; the margin is cut and dentate, whilst the epidermis on the upper side is wrinkled, giving it a withered appearance. Lancashire, Scotland, and Wales, not unfrequent.

(*l.*) *S. vulgare, laceratum.* A fine variety, giving the whole plant an exuberance seldom seen in cultivated ferns, although it is variable in habit. The fronds are sometimes dwarf, but almost as broad as long; the margin is irregularly and deeply lobed and incised, the apex is often cut and crisped, if not as often branched, so that it becomes a dense tuft of bright green miniature fronds. Found in Devonshire and Ireland.

Besides the above, there are many other equally distinct varieties. The above are from specimens in our own herbarium. An excellent inducement to seek the hart's-tongue varieties is in the fact of their easy cultivation, they will grow well in a rockery, in any court or back-yard, without the aid of fern cases or greenhouse. An excellent plan is first to cultivate them for a time, thus many varieties turn out permanent forms of great value.

OUR MOUNTAINS, AND HOW WE CAME BY THEM.

By the Rev. J. Clifton-Ward, F.G.S., &c.

No. II.

In the last number we considered the various theories which might be suggested to account for the origin of our mountains, and came to the conclusion that they were neither due to the individual upheaval of the masses, so that any bedded rocks entering into their composition would be thrown into a rude dome; nor to their being separate cases of igneous intrusion through and above an original plain; but that the hills, as we now see them, owe their being to removal of surrounding matter, in other words the mountains exist because, and in spite of denudation. It will however shortly be seen that although the direct cause of the separate mountain masses may be the removal of matter by physical agencies, yet this could not have taken place without a general upheaval of the whole district, and a gradual bringing of the various rocky deposits within the reach of the denuding agencies.

Having made these preliminary remarks, mainly for the purpose of giving a more intelligent and lively interest in what immediately follows, we now proceed to examine into the character of the matter composing the mountains, endeavouring to discover under what conditions that matter was formed or laid down.

First, it must be remarked that the Mountain District and the Lake District are not co-extensive. Almost all the true mountains of the district lie to the north-west of a line drawn in a very straight course from the north-west side of the estuary of the Duddon, by the heads of Coniston Water and Windermere* to Shap Wells (see rough map, fig. 61). This line we shall see is formed by a definite geological horizon. On the south-east side of it there lie the three lakes of Coniston, Esthwaite, and Windermere, and the country though not mountainous, is still very hilly and much cut up by valleys, often narrow and deep, draining to the south. Upon the north-west side of this line the traveller cannot fail at once to notice the change in the character of the scenery, for bold mountains almost immediately confront him, and this is especially the case in the immediate neighbourhood of Coniston, where the true mountain region begins precipitately almost like a huge rampart or wall. Walking northwards from this point, many a bold mountain peak is seen, and many a scarped face, and it is not until the country on the west side of Derwentwater, and the Skiddaw range are reached that the rugged and cliffy forms give place to mountains of a softer outline and smoother slope. Among these we will begin our studies of mountain-matter.

As a general south-west and north-east line divides the truly mountainous district on the north, from the hilly country on the south, so a line having a very similar direction, about six miles north-west of the former, parts the mountains formed of Skiddaw slate from those formed of rocks of the Volcanic series (see map), or in other words, parts the softer outlined mountains from the more rugged. We only recognise, in passing, this dependence of mountain-form upon the geological structure and material, meaning to devote more time to this part of the subject when we are better prepared by a general survey of the history to grasp the true meaning of the facts which Lake District rambles present. The southern boundary of the Skiddaw slate mountain district is, however, a very zigzag line, running from a little east of Egremont, first generally eastwards, then northwards to Ennerdale, then eastward again to the head of the Buttermere Valley, north-eastwards to the head, and east side of Derwentwater, and eastwards once more to the conglomerate hill of Mell Fell. On the north the Skiddaw slate is overlapped by the carboniferous limestones, or by rocks belonging to the Volcanic series. There are three other small areas where the Skiddaw group of rocks is met with, these are, a tract skirting a considerable part of Ullswater, another to the west and north-west of Shap, and thirdly Black Comb north of the Duddon estuary.

The formation derives its name from Skiddaw, one of the finest and most conspicuous mountains composed of rocks of this age. On Skiddaw, indeed, the rock is slaty, and so in many of the other mountains, but the formation is by no means universally slaty, and

* In this case a little south of the absolute head.

in no parts of the so-called Skiddaw slate area are good workable slates met with. This slaty structure, it will be known to many of my readers, is one that has been produced in the rock by agencies called into play long after the first formation of the rock, and of these we shall speak in a future chapter; for the present suffice it to say that a rock is said to be cleaved, or subject to slaty cleavage, when it will split more or less readily into thin plates, irrespective of other divisional planes. In the mountains of Whiteside and Grasmoor, overlooking the Vale of Lorton and Crummock Water, the formation is represented by beds of sandstone and fine grit, whilst in various scattered localities the rock is a coarse grit. The matter of the mountains in this most northern area consists therefore of slate (or sometimes even black shale), sandstone, and grit. Besides these there are occasional small or large areas of rock in the direct formation of which heat, more or less intense, has played a part, and such we call (*a*) igneous (fiery), and (*b*) metamorphic (changed) rocks, and these have either (*a*) been thrust through the surrounding rocks, or (*b*) consist of the same rock as that around, very much altered by heat acting under pressure. But our slate, sandstone, and grit, how were they formed? Have they anything to do with heat? Not directly, though we have already hinted at the slaty structure having been produced by physical agencies, of which lateral pressure seems to have been the chief, and there can be no pressure exercised without heat to a certain degree being produced. But we must cease to look at the rock as a slate and seek for evidence of its original mode of formation. Such a search reveals the fact that we have here what was originally mud, for in some parts of the district the rock* is very soft and shaly, very much like the black shales of the coal measures, and so much so indeed as to have led in former times to the sinking of pits with the hope of reaching coal, a waste of money, which would have been at once checked by even a small amount of geological knowledge. In some parts also the rock is seen to be clearly traversed by fine parallel bands or lines, sometimes of slightly different colours, precisely similar to the banding we may observe in a mud-bank which has been cut into at the mouth of a river. Such an appearance leads us to suspect the aqueous (or watery) origin of the rock, and we are confirmed in our surmise by finding here and there the entombed remains (fossils) of various forms of life, just as we might find in our mud-bank buried shells and sea-weeds. Moreover, on comparing the forms of these fossils with those of existing life, we come to the conclusion that for the most part they represent ancient marine life, and that the mud rocks of the Skiddaw slate formation were laid down probably in a more or less shallow sea. Examination of the sandstone and the grit still further confirm this idea; they also occasionally contain marine fossils, and show conclusively by this bedding and current (or ripple) marked surfaces, that they were laid down beneath the shallow waters of the ancient Skiddaw slate sea, if we may so term it. Such deposits at the present day, however, are shore deposits, although occasionally the waters of a mighty river, such as the Amazon, may carry out fine mud in suspension, several hundred miles from land. Pebbles forming conglomerate and sand forming sandstone, are deposited nearer shore in shallower water.

This, then, is the origin of the group of rocks now called the Skiddaw slate—land washings, as we may term them from some tract of continental land, deposited over that part of the earth's surface, a portion of which is now occupied by our present Lake District. To the reader unaccustomed to geological thought it may be difficult to lose sight of the present surface and configuration of land, but this he must completely wipe out from his mind and conceive all as from the commencement of the geological history in this district. In which direction the land lay from which these sedimentary deposits were borne it is difficult to say with any certainty, but, inasmuch as on the whole the gritty beds increase westwards (being perhaps more developed in the Isle of Man than in West Cumberland), one may hazard a conjecture that the land lay to the westward.

One word with regard to the thickness of this series of deposit. It is impossible to measure the entire thickness of this formation, because one knows of no defined base to the series, and the difficulty is much increased by the wonderful manner in which the beds are contorted and curved; nevertheless by taking some of the more regularly bedded and little contorted parts, one is able, by measuring across the beds—as across those of Whiteside in the horizontal section given in the last number (fig. 54)—to make a guess at the probable total thickness, and this I am inclined, after examination of the whole Skiddaw slate area, to put down as not less than 10,000 feet. Let us think for a moment what this means. The deposits being mud, sand, and pebbles, are, in the main, shore deposits; moreover it is not the case that the coarser beds are confined to the top of the series and the finer to the base; for if it had been so we might have fancied that the first layers of fine mud were deposited in a deepish sea far from land, which gradually became more shallow, principally by the deposition of this great thickness of beds, so that at length the coarser material would come to be laid down in the shallowest sea. It would seem rather, that with the exception of a thin bed of conglomerate near the top of the series, the coarser deposits are in most force at the lower part of the series, so that it would seem, we must assume, that the deposits generally were laid down in a more or less shallow sea, the deposition being accompanied by a gradual sinking

* All matter entering into the composition of the earth in mass is called in geological language *rock*, whether hard or soft.

of the sea bed, so as to allow the accumulation in direct succession of some 10,000 feet of strata. To an ungeological ear this may sound astounding, but further acquaintance with the phenomena of even this small district will reveal matters which may appear still more startling.

Thus far I have only spoken of the character of the Skiddaw slate as a formation, and of the physical conditions under which that formation was deposited; later on I shall have occasion to describe how these marine deposits were uplifted, curved and contorted, changed, cleared, and hardened, and how at last the smooth slope of Skiddaw, the deeply ruined front of Blencathra, and the craggy face of Grasmoor, were carved and sculptured; in the mean time let it be remembered, that for us in the present stage of our historic knowledge, some 10,000 feet of mud and sand lie accumulated beneath a shallow sea at the close of the so-called Skiddaw slate period. And what followed?

Between the two south-west and north-east boundary lines that I have already described, and which are placed on the rough map (fig. 61) to help the eye, lies another great thickness of rocks of a volcanic character, which from their full development in Borrowdale, that most beautiful of all the dales in the district, I have called the Volcanic series of Borrowdale. The rocks of this series must now be described as to character, and their mode of formation entered into.

I have said that they are volcanic, most of my readers will therefore at once form some idea of their nature. Every one has seen the light pumice-stone and specimens of lava brought from some modern Volcanic mountain, and will remember that one conspicuous characteristic of such rocks is the fact that they are often more or less riddled with holes, or are vesicular, as it is called. All know too, that lava is emitted from volcanoes in a more or less fiery liquid state, and that in streams it flows down the sides of the volcanic cone. It quickly cools at both under and upper surfaces; in the one case from coming in contact with the cooler ground, and in the other from its exposure to the air. Not so the interior, however. This retains its red heat long after it is quite possible to walk upon the cool crust. From the surfaces of the lava the imprisoned gases readily escape, hence the many vesicles; but if the floor be of any thickness, the interior, cooling more slowly, assumes a solid and compact appearance with few vesicles. Such is the general outward aspect of lava-rock as you may see it on the flanks of Vesuvius, or on the sea-shore at the foot of that volcano. Oftentimes

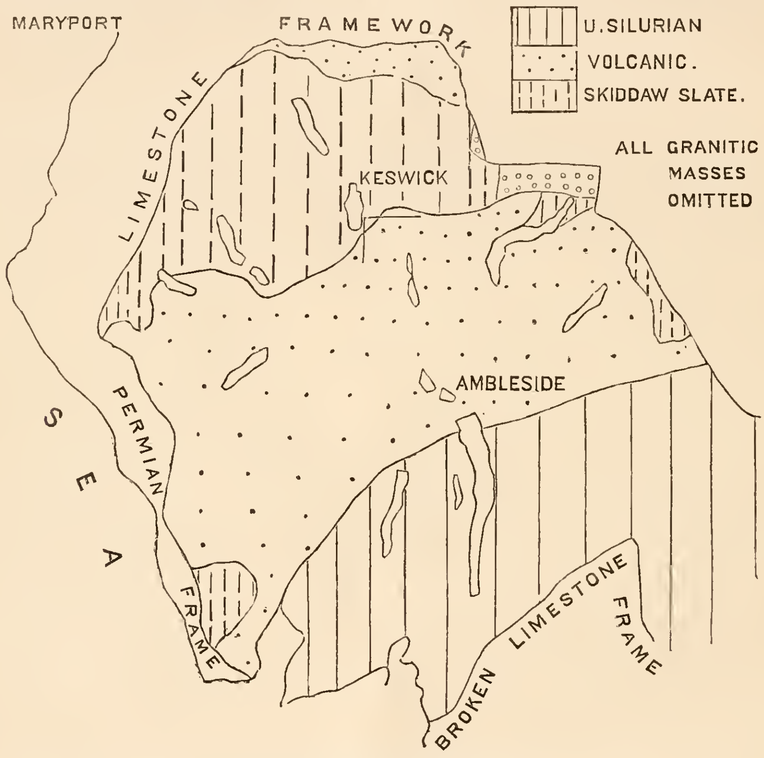


Fig. 61.—Sketch Map, showing the principal Geological Formations in the Lake District. The Lakes are the only physical Features indicated.

in cooling, also, the shrinkage produces jointing in the compact rock which frequently assumes a columnar form. The sea-worn ends of such columns you may walk over on the shore beneath Vesuvius. Sometimes instead of definite columns the rock is divided up into rude spheres.

Now we may return to our Lake District, and upon many of the mountains included in the area of the Volcanic series, may find rocks almost precisely similar. Could the reader climb with me up the Falcon Crag hillside, overlooking Derwentwater, we might see beds of lava cropping out, as it is termed, upon the hillside, very similar in appearance to lavas of a modern volcano; the same vesicular and irregular upper and lower surfaces, the same compact interior, and in one case (two-thirds of the way up the steep side) a thick compact lava with a curiously curved tubular and globular jointing.* The same likeness to the modern lava occurs again and again, though in many cases the vesicles formed by the ancient escape of the volcanic gases are filled with various mineral matters which have been deposited from water holding them in solution during the long ages since first these lavas flowed from the old volcanoes. Subsequent weathering on exposure to the atmosphere, has however frequently emptied the cavities once more and restored the ancient look. I might proceed further and show that not only in the lavas of the lake country are there representatives of several different classes of modern lavas as to mineral and chemical composition, but also that the internal microscopic structure and arrangement of those minerals are very much the same, and follow the same general laws in both cases. For the evidence of this however, the reader must be referred to the already published Memoirs and papers. So that taking the evidence all round, there cannot be a shadow of a doubt that we have among our Cumbrian hills, true lava-flows emitted from some old volcanic centre or centres.

If stronger proof were needed, the deposits of so-called volcanic ash supply that proof, for as around modern volcanoes there are scattered far and wide, accumulations and beds of fragmentary matters of all sizes thrown out from the vent, from the finest produce to blocks as big as small cottages, so in the Lake District do we find similar accumulations and beds of like fragmentary material, now, however, compacted together into a hard rock, in which, nevertheless, the fragments are generally discernible. In some cases, indeed, subsequent alterations (heating under pressure, &c.) of these old ash deposits may partially, or even entirely, conceal the original structure, though this may often be revealed on weathered surfaces of the rock when the interior shows no trace of that structure. The ash ejected from Vesuvius has often been showered down into the waters of the Bay of Naples, where it has been sifted and bedded so as doubtless to form regular layers at the bottom of that sea. The finest ash, such as that which enveloped Herculaneum and Pompeii, often presents also a distinct and very finely-bedded appearance, sometimes increased by the fall taking place along with deluges of rain. In our home district there is plenty of the same finely-bedded ash, much of which may have been actually deposited in water, while the rest may have fallen much as the ash just alluded to fell, when the towns of Herculaneum and Pompeii were overwhelmed by it.

Several traverses of the mountains formed of these volcanic rocks will give abundant examples of ash deposits of all degrees of fineness and coarseness, and there are some cases where tall crag-faces are seen to contain within them mighty fragments of several yards in length.

But some will say there is yet one thing wanted to make this proof complete, and that is, that the actual volcano, the actual centre, or vent, from which these deposits were emitted, be shown. There are two reasons, however, which make this peculiarly difficult in the present case: one is, that the age of these deposits is extreme, and the actual volcanic cone consequently very liable to be completely obliterated in the lapse of ages, and the other reason is, that a large portion of the volcanic area doubtless now lies buried beneath more recent deposits, and among these now hidden portions one or more of the old centres may be buried. There are, however, several bosses of igneous rock in the district, and I will especially call attention to one, namely, Castle Head, Keswick. This rock, in all likelihood, represents the plug, as it may be called, of an old volcano. Imagine the fires of Vesuvius to die out; the liquid lava now rolling up and down in the funnel to cool slowly into an exceedingly hard and compact rock, differing in some respects from the lava which had flowed out in sheets, on account of the different conditions under which they respectively cooled. Then further imagine that, during a long course of ages, the atmospheric powers, the rain and running water, and the action of the sea along the base of the cone, as perhaps it was slowly depressed beneath the waves, all so far obliterate the old volcanic mountain as to destroy its form, perhaps leaving partly upstanding the hardened plug and some of the original beds in cliffs here and there. Imagine this, and you have an idea of a little of what has taken place with the old Cumberland volcano or volcanoes, so that Castle Head may yet represent an old volcanic centre, of which but the hardened plug of the old volcano remains, while the lava and ash-beds of the Walla Crags, a little to the north, are some of the ancient volcanic material which was emitted from this vent. I do not say that this old centre, near which

* The various beds seen in this hillside, less than a mile and a half from Keswick, are described in detail in my Memoirs on the northern part of the English Lake District (H.M. Geolog. Survey), pp. 13–16.

the town of Keswick so prettily nestles, was the only, or even the chief, centre of the district; there may have been but one, or there may have been several. Certain it is that lava-flows prevail more among the exposures of volcanic rock, within six or seven miles of Keswick, than they do in any other part of the district; but this may be partly because the lower portions of the series which contain more lava than the upper, are here mostly represented. How, then, are we to carry on our history from the close of the Skiddaw slate period? Generally, where the lowest volcanic beds of the series are seen they are found to alternate with beds of the Skiddaw series, and in one or two cases some of the lowest ash-beds are decidedly conglomeratic, that is to say, the fragments have been rounded, by having been rolled under water. These two facts clearly indicate that the first showering down of ash, and flowing out of lava, took place beneath the waters of the shallow sea. How long this lasted it is difficult to say, but in all probability a volcanic cone soon showed itself above the waters, and its growth may have been accompanied—as is frequently the case with volcanic districts—by a gradual elevation of the whole area, so that after a while the greater part of the volcanic deposits were thrown down upon dry land. It may have been, however, that some of the very finely-bedded deposits were accumulated beneath water at some distance from the centre of eruption, or possibly in crater-lakes. No fossils are, however, found in any of these bedded volcanic rocks, while in submarine volcanic rocks of somewhat similar age in Wales they are not infrequent. On the whole, considering that we have here, as I have been led to estimate, probably 12,000 feet in thickness of these volcanic rocks, without any trace of ordinary mud, sand, or grit-beds amongst them (except quite at the base), and altogether devoid of fossils, I think it is easier to conclude that the mass represents in the main the products of a land volcano, no trace of the original form of which, as already stated, is now left.

We must infer from what we have learnt of the Skiddaw sedimentary series that the period of time represented by that formation must have been very great; how great, it is difficult with any accuracy to estimate; but when we come to consider the same question of time with regard to the volcanic series the difficulties are of a somewhat different kind. Modern experience of volcanic action seems to show that, while sometimes the energy manifests itself almost continuously, and sometimes with great violence, at other times the efforts are very spasmodic and only occasionally great. From the general apparent absence of great breaks (geologically called unconformities) in the series, the deposits do indeed appear as if they might have succeeded one another without any very long intervals of time, and if this were the case, this period may have been a shorter one than the preceding. Those who know something about the different classes of volcanic rock may be interested to know that many of the lavas in the lower part of the series (especially those of Eycott Hill) are like true modern basalts; whilst the majority of the flows occurring higher up in the series show intermediate characters between the basalts and the trachytes.

A word now about the close of this period. A time came at last when the volcanic energy died out beneath this particular tract. Observations of modern volcanic phenomena seem to indicate that when the volcanic fires have died out there frequently follows a sinking of the area over, or near, which the volcanic action has been displayed. Perhaps this may be partly due to the mass of matter previously thrown out from within, so that large hollows having been left, a downward sinking of the crust above succeeds, like the creep of the ground over a worked-out coal area.

But even apart from this, we know that movements in one direction or another, upward or downward, are constantly taking place over various parts of the earth's surface. A movement of depression certainly took place when the volcanic energy abated, a depression it would seem, extending to below the level of the sea, so that bit by bit the volcanic mountain or area must have been gnawed into along the sea margin, until, when the last of these deposits had sunk beneath what to us is a new sea, large portions must necessarily have been washed away (or denuded) by the encircling waves, the consequence being that the first ordinary sedimentary deposits of the next period were laid down upon very various parts of the old volcanic series.

The first of these deposits which we shall have to notice is a limestone bed, full of marine shells of no great thickness, called the Coniston limestone, and it is the outcrop of this particular bed which forms the long, straight south-west and north-east boundary line previously mentioned (see map) as dividing the boldly mountainous area from that less so, in which Coniston and Windermere lie. And I make special mention of it here before closing this chapter because in connection with it there occurs another faint attempt at volcanic action, for, interbedded with the limestone in some parts of its course, occurs, what would appear to have been a flow of lava of highly silicic character, perhaps answering to our modern quartz-trachytes. This was the consequence of but a slight submarine eruption, and is the last trace we meet with in Lake District history of volcanic energy displayed at the surface.

To look back over the road we have thus far travelled, or through the ages we have been passing, let us remember that geological history begins in the Lake District, with the conditions of a shallow sea into which are carried deposits of sand and mud, the bottom of that sea subsiding gradually as the beds were laid down in succession one over the other; secondly, that this state of things gave way to one of troubled volcanic action, the eruptions commencing beneath the waters, but a land volcano soon appearing; thirdly, the fires die out, old Vulcan retires from the scene, and the wearied volcanic land sinks shortly into the sea again; fourthly, upon the partly denuded surface of the volcanic series, a new set of marine deposits begin to be formed, a limestone first, and during its formation one little submarine volcanic outburst occurs.

We must next study this second great series of sedimentary deposits and then see what befell all three formations together.

[The above article was the last literary act of its gifted and genial author, who has died suddenly at the early age of thirty-seven, and only six weeks after his appointment to the Vicarage of Rydal, the most lovely spot in the lake district he loved so well! No man was ever more sincerely beloved by his fellow-workers—for his sterling honour and high sense of duty, and for his overflowing and kindly feeling! Science has lost in him one of her most promising disciples. He died in the midst of projected work, to carry out which he hoped the lovely quiet of Rydal would be so congenial. There is not a geologist in England who will not feelingly exclaim, when he hears of his sudden end, "Poor Ward!"]

COLLECTOR'S MONOGRAPH OF THE BRITISH DOG-ROSES.

FOR the past fifteen years we have closely observed and collected many hundreds of specimens of the difficult genus Rosa in the north of England, using as a text-book Mr. Baker's review, published in the "Naturalist." But in drawing up this short sketch we have not relied upon our own specimens for the specific or varietal characters, but upon those collected and labelled by Baker, Ward, and Bloxam, of which we possess a large and well-marked series in our herbarium. We expect the roses to be in bloom very early this year; a note of warning, however, may not be in vain; they should be collected when in flower, not later than 10 A.M., if gathered later in the day it is impossible to dry them with the petals. Each species or variety, according to the view taken by the collector, should be represented in the herbarium by not less than three sheets. The first sheet of specimens ought to represent the flowering branch, with the end of a barren shoot by its side to show the prickles, the latter show the leaves at their best. The second sheet should show the fruit, soon after the petals have fallen, because then the sepals clearly mark the group. The third sheet should represent the fruit when mature; we have found no difficulty in marking the bush, when gathering the early flowers in May, to secure the fruit from the same shrub at a later period.

We have taken as a guide Hooker's "Student's Flora," both for the names and divisions, to which we, with every confidence, refer our readers as the best work published on the British Flora. In every part of the country there are to be found numerous forms, and no collector can better employ his time than by working up his own neighbourhood for one season. We promise any one disposed to work ample enjoyment; doubtless there are many varieties still unknown to science, thus the student may also look for a fair reward.

ROSA CANINA, Linne. Group I.

Group I.—*Ecristatæ.*

Leaves large, approaching lanceolate, or sometimes cordate, but always glabrous (often shining) on upper surface. Stipules remarkably small on barren shoot. Peduncles (naked) smooth, long. Seps. reflexed after flowering. Fruit, large ovate. Bracts, very large ovate.

Div. 1. L. glabrous on both sides.

1. *Rosa lutetiana* (Lem.). A tall luxuriant shrub. L. bright green, smooth, 3–4 inches long, on barren shoot, sharply serrated. Flrs. 2 inches in diameter, pink, on long smooth ped. Abundant.

2. *R. surculosa* (Woods). Flrs. in large clusters, sometimes 15–20, the young shoots and leaves tinged with red. Frequent.

3. *R. sphærica* (Gren.). Frt. globose. Pets. slightly pubescent. Rare.

4. *R. senticosa* (Ach.). L. 1 inch long on barren shoot. St. very slender and twining in habit. Rare.

5. *R. dumalis* (Bech.). Pets. often glandular. Flrs. deep pink. Frequent.

6. *R. biserrata* (Merat). St. and stips. bright pink. L. deeply serrate. Common.

7. *R. vinacea* (Baker). L. green. Bracts long, lanceolate. Frt. oblong. Frequent.

Div. 2. L. smooth above (shining), hairy on nerves below.

8. *R. urbica* (Lem.). L. densely pilose beneath on veins. Leaflets grey. Frt. oblong. Common.

9. *R. frondosa* (Stev.). Frt. very small, globose. L. ovate, oblong. Frequent.

10. *R. arvatica* (Baker). Frt. ovoid. L. ovate-oblong. Pets. pubescent. Common.

Div. 3. L. hairy along margin (glaucous-green).

11. *R. dumetorum* (Thuill.). L. large, softly hairy beneath. Pets. densely grey, pubescent. Flrs. deep pink (fine). Common.

12. *R. pruinosa* (Baker). More glaucous than the last, hence called *R. cæsia* (Bar.); pets. glandular. Frequent.

13. *R. incana* (Wood). L. densely pubescent below, doubly serrate. Frt. large, oblong. Flrs. fine, white. Rare.

14. *R. tomentella* (Sem.). Branches green. Tender peds. very short, often hidden by the large lanceolate bracts. Flrs. very small, white. Prickles strongly hooked; a common rose, and one easily recognised.

Div. 4. Peduncles glandular, i.e. with gland-tipped hairs.

15. *R. andevagensis* (Bast.) L. large, bright green, 3-4 inches long. Peds. aciculate. Flrs. large,

Fig. 62.—Group I. *(Ecristatæ)* of British Dog-roses.

tinged with pink. A fine shrub with long arching stems. Frequent.

16. *R. verticillacantha* (Merat). L. slightly gland-ciliated, doubly serrated, shining or bright green on upper side, glabrous on both sides. Pets. prickly. Stips. gland-ciliated. Peds. aciculate. Styles hairy. This is also a fine shrub, with flrs. in large terminal clusters, pure white. Not unfrequent.

17. *R. collina* (Jacq.). The flrs. are small compared with the last, but in clusters of 12-20; the tips of the shoots and short peds. are pink, closely resembling arvensis. L. quite flat, smooth, rounded at the base. Frequent.

18. *R. cæsia* (Sm.). L. grey-green lanceolate, with strong serratures. Stip. and bracts pubescent. Flrs. often in pairs, small and white. Frt. purplish directly after pets. have fallen. Common.

19. *R. concinna* (Baker). L. flat, very small. Styles hairy. Pets. pubescent. Frt. small, broadly ovate. Rare.

20. *R. decipiens* (Dum.). Seps. rather spreading than reflexed in this species; densely glandular on back of seps.

Group II.—*Subcristatæ.*

Leaves small, glaucous-green, ovate, often almost circular in outline, pilose (covered with soft hairs) soft to the feel. Stips. large, glandular. Ped. naked or with a few glandular hairs, very short. Frt. globose. Seps. erect after flowering. Disk small, almost closed by the sepals.

Fig. 63.—Group II. *(Subcristatæ)* of British Dog-roses.

21. *R. Reuteri* (Godet). Bracts, stips. and young stems of a prickly tinge. Bracts often so large as to cover the short peduncle clasping the stem. Prickles small. Flrs. in clusters of 4-6, very large, pink. L. small, glaucous-green. Not uncommon.

22. *R. subcristata* (Baker). Flrs. deep red. L. glabrous, but glaucous-green above. Petioles very prickly. Peds. quite naked. Seps. gland-ciliated. Frt. globose. Frequent.

23. *R. Hailstoni* (Baker). St. with numerous small prickles, hooked. L. glabrous on both sides, but brighter green than the last; a small shrub with but few pink flowers and villose styles. Rare.

24. *R. implexa* (Gren.). A large bushy rose. L.

larger than subcristate, it resembles urbica in habit and appearance, only the L. are glaucous and small. Rare.

25. *R. coriifolia* (Fries). A tall, branching shrub, with large white flrs. in dense clusters. L. greyish-green, very hairy beneath, small ovate-oblong, and rounded at base. Bracts large, lanceolate, hiding the short ped. Fruit large, globular, ripens in October. In hilly districts frequent.

26. *R. Watsoni* (Baker). Very like the last, except that the bracts are minute, and flrs. in small clusters. Rare.

27. *R. celerata* (Baker). Habit of tomentella. L. grey-green. Frt. globular, on long peds., but seps. as in this section. Rare.

Group III.—*Subrubiginosæ.*

L. very large, on barren shoots, densely glandular on midrib; petiole aciculate and prickly. Seps.

Fig. 64.—Group III. *(Subrubiginosæ)* of Dog-roses.

very large, also glandular, especially on margin. Ped. short, aciculate, also glandular. Bracts minute. Seps. spreading, i.e. not reflexed as in Group I. Frt. small, globose.

28. *R. Borreri* (Woods). Prickles robust, and curved at tip. L. flat (like Group I.) thin in texture and shining. Peds. briskly weak. Flrs. in dense clusters. Styles, hairy seps. in many fine divisions.

29. *R. Bakeri* (Descg.). Prickles slender. L. shining green, on upper side. Flrs. in small clusters (3–4). Peds. very short, seps. before the fruit is ripe become ascending, but do not fall until the tips are ripe, which are oblong and small. We have not seen a living specimen of this species. It is said to be confined to Yorkshire.

30. *R. marginata* (Wall.). Branches glaucous. L. large glaucous, and hairy beneath, oblong. Frt. ripens in September. Prickles strong hooked. Flrs. in small clusters, pale pink. A fine arching shrub, known by purple and glaucous stems, and veins densely glandular beneath. Not unfrequent in hilly situations.

How to gather and study the Roses.

It is a good plan to carry a strong jack-knife, which may be obtained from any ironmonger. Armed with this useful tool, and with a good large basket with a cover, for it is useless to take the ordinary vasculum in collecting either roses or brambles, then you are equipped for a day's stroll.

On the same shrub may generally be obtained both flowers and green fruit; tie all the specimens in a bundle from each bush to avoid confusion. In laying out these in the press, mark them at the same time with locality, so as to remember the finishing work in the autumn, for if you secure mature fruit the species may be decided with ease. Dry with the barren shoot several leaves with stem not less than four inches long, or, as "a nod is as good as a wink to a blind horse," never allow a poor or imperfect specimen to enter your herbarium; you will not regret the trouble afterwards. Let the barren shoot be so laid out on the sheet when in the press as to show the upper and under surface of each leaf, upon this rest many of the specific characters; the old stem with prickles should be pared on the under side to lie flat on herbarium shelves. Lay out the flowers with great care; allow one at least to lie fully open to exhibit the styles; we use a bit of thin cardboard when laying it out to keep it flat; then dry it quickly. To retain the delicate pinky tinge, use for this purpose chalk paper (buff colours are the best); never gather any specimens for drying in damp weather. We have heard many complaints about not being able to dry, or preserve the ripe fruit: nothing is easier, if no pressure be employed. The cover of the press is sufficient, without any extraneous weight: we admit its impossibility if the full weight be used. A perfect collection of British roses, with each of Baker's species represented by some half-dozen examples of excellently and neatly preserved specimens would be invaluable, but it is a caricature to call the small mutilated bits of leaves and flowers specimens. The first point to attend to, and this ought to be remembered in the field, is the sepals. If they are reflexed, after the fall of the petals, as in the above cut, they belong to the first group; then from the size and appearance of the leaves and bracts and glandular petioles with small prickles intermingled, the name of any variety may be at once ascertained.

Damp Stains in Paper.—I should be obliged if any one can tell me of any plan for removing the brown spots, resembling iron moulds, which so frequently appear in, and disfigure the plate paper, used more especially for steel engravings.—*Joseph Anderson, jun.*

SOME NOTES FROM AN INDIAN JUNGLE.

THINKING, perhaps, some notes on the natural history of the jungles of Southern India would be read with interest by stay-at-home English naturalists, I take my pen to put down such random recollections as occur to me of a couple of years' experience in the wildest parts of the "impenetrable jungle" of Travancore and Cochin. Unfortunately, before I left the country, I had the misfortune to lose all my collections of skins and insects, and all my notes and diaries, by the accidental burning down of my hut, or bungalow as Anglo-Indians call a house of any sort; so I have to trust to memory, and can only make my remarks very general and unscientific.

The jungles of the far South of India are not half explored yet. The only English who penetrate them are hard-working coffee-planters and equally hard-working government surveyors. Both shoot and hunt when they get the opportunity with all the ardour of their race, but I never came across a specimen of either class who knew or cared anything about natural history by itself. Consequently there is a great field open for the first enterprising naturalist who goes into the jungles to devote his time to the pursuit of specimens and skins.

My own work left me as little time as most other Englishmen, and all I could do was to carry my gun with me whenever the opportunity offered, and snatch any spare moments I could get for a ramble with the net and collecting-boxes.

The gun used to bring me in some beautiful and strange birds. In the early morning, when the white mist lay thick and still in the hollows and ravines, I used to sally forth into the deep shadow of the gloomy jungle, where the sun rarely penetrates to the ground, the branches overhead are matted so close, and for a time nothing could be heard but the dripping of the dew from the leaves overhead. The woodpeckers were usually the first birds to move in the morning, their shrill laughter echoing through the silent woods in a wild, unearthly way. Of these there were four or five species, ranging in size from a diminutive little black and white bird the size of a sparrow, to a splendid great species the size of a crow, with a body of crow-like blackness and a flaming crimson crest. Then when the sun got higher other birds appeared: little green and yellow finches, generally in families of thirteen or fifteen, always of odd numbers, like most other flocks of birds, and a handsome black bird of the thrush tribe, all in black, with two sky-blue spots on either shoulder. I never saw this bird except in the deepest jungle, but there its low, mournful whistle on being disturbed was common enough.

Another handsome bird, a later riser, was the Indian ground thrush. His plumage was very striking, green and grey above, and white, fading into warm pink, below, with a brown head and a black band running down either side of his neck. He only appeared in the monsoon, or wet season, and was perpetually engaged in searching for snails, especially a handsome red snail with a black shell, which, as Mr. Weller says, was his "particular wanity."

At mid-day, the tree tops would be full of pigeons of several varieties, most noticeable amongst which were the beautiful little green and claret-coloured fruit-doves as we called them, the native name being, I think, "Sona Kabooter." Sometimes I have been standing under a spreading fig-tree out of the mid-day heat, when a flock of these birds have flown up and after a turn or two round the neighbourhood settled in the branches overhead, but although I have watched them carefully, so well did their colours harmonize with the pale green fig-leaves, that I was quite unable to make out a single bird until a few minutes' patience was rewarded by hearing the figs come pattering down to the ground, and seeing the birds plucking at the ripe bunches.

All the hottest hours of the day the nullahs, or watercourses, were tenanted by brilliant little blue kingfishers, who flashed about like living gems, or sat in couples on the slender green bamboos bending over some still pool, perhaps never before visited by any human being until I broke in upon its solitude. In the shallow, small grey herons stood sleepily upon one leg, watching the small fish and frogs below, and a few species of stints and snipe ran along the margins in their usual nervous manner.

And then the sun went down behind the forest-covered mountains in the west, the pigeons went away to roost, and the other birds hid themselves away in the deepest thickets, and the day's work for the collector was over.

LESTER ARNOLD.

LIST OF ASSISTING NATURALISTS.

[*Continued from p.* 52.]

KENT.

Tunbridge Wells. Thomas Walker, 2 Beulah Road. *Phanerogamic and Cryptogamic Botany.*

MIDDLESEX.

Tottenham. John Walker, 5 Talbot Road. *Botany.*

NOTTINGHAMSHIRE.

Nottingham. C. T. Musson, 68 Goldsmith Street. *British land and fresh-water Mollusca, Geology.*

Nottingham. B. S. Dodd, 33 Elm Avenue, Sherwood Rise. *British Mollusca, both land, fresh-water, marine, and British marine algæ.*

SURREY.

Croydon. A. Bennett, 107 High Street. Flowering plants, particularly *Orobanches* and *Potamogetons*. Also the genera *Chara* and *Nitella*.

WARWICKSHIRE.

Birmingham District.

Birmingham. Montagu Browne, F.Z.S., Broad Street, Reservoir Road. *General Zoology*, especially *Ornithology* (European and exotic).

Perry Barr. W. B. Grove, B.A., Cheadle Cottage. *Botany*.

Aston. H. W. Jones, F.R.M.S., 183 Park Road, *Chemistry of Zoology*.

Aston. J. Levick, Lime Tree Villa, Albert Road. *General Microscopy*, especially "Pond-life."

(*To be continued.*)

CENSUS OF EUROPEAN FLORAS.

IN glancing over a few of our standard Floras, I find the proportion of families or orders is about as follows. This is a very interesting study for a winter's evening, and, better than anything, gives a fair knowledge of the respective districts, thus:—

Grasses, to Phanerogamic orders, is about :

1 in $10\frac{1}{3}$ in Flora Lapponica.
1 ,, 11 ,, Flora Edinensis.
1 ,, $10\frac{1}{2}$,, Devonshire Flora.
1 ,, $11\frac{3}{4}$,, Berwick-on-Tweed Flora.
1 ,, 12 ,, Flora Scotica.
1 ,, $12\frac{1}{2}$,, British Flora (entire).
1 ,, $10\frac{2}{3}$,, London Flora.

The *Cruciferæ*, to Phanerogamic orders :

1 in $22\frac{6}{11}$,, Flora Lapponica.
1 ,, $25\frac{1}{3}$,, Flora Edinensis.
1 ,, $17\frac{6}{11}$,, Devonshire Flora.
1 ,, $21\frac{1}{4}$,, Berwick-on-Tweed Flora.
1 ,, $20\frac{1}{4}$,, Flora Scotica.
1 ,, $20\frac{1}{8}$,, British Flora.
1 ,, 21 ,, London Flora.
1 ,, $12\frac{2}{7}$,, Flora Gallica.

Cyperaceæ, to other Phanerogamic orders :

1 in 9 in Flora Lapponica.
1 ,, $15\frac{1}{3}$,, Flora Edinensis.
1 ,, 16 ,, Devonshire Flora.
1 ,, $16\frac{4}{7}$,, Berwick-on-Tweed Flora.
1 ,, $14\frac{1}{2}$,, Flora Scotica.
1 ,, $17\frac{3}{4}$,, British Flora.
1 ,, $17\frac{1}{4}$,, London Flora.

Thus as we proceed toward the south, many orders which are purely northern, in their general distribution become more rare, as well as fewer species.—R.

DEVELOPMENT OF THE FRESHWATER SPONGE.

By JAMES FULLAGAR.

IN the January number of this year there is a short account of the growth of a small sponge in one of my glasses, from which I obtained some fresh ovaries, and from these ovaries several small sponges have been produced, and have been very interesting objects to me in watching their further growth. From August up to the end of November they had continued to increase in size, and the skeleton spicules had become very numerous. The incurrent through the pores, and the excurrent by the oscula, continued to flow, and these were very plainly seen when a small quantity of carmine was placed in the water. From December up to February the sponge has not made much progress, though it has constantly been supplied with fresh river water. The excurrent from the oscula is now quite suspended, and I rather doubt whether the sponge will perfect itself and again produce the ovaries, the production of which I had hoped to witness, but I must now wait until next August before I shall be able to procure a fresh supply of ovaries. On the ovaries being left out of water they become cup-shaped (fig. 65) by the contraction of the upper half inwards, in the process of drying, and in this condition the foramen appears at the bottom of the cup (fig. 65, *a*); placing them in water for a short time restores them again to their spherical form. The production of the flinty spicules in the sponge is truly wonderful, when we consider their rapid growth and delicate forms, transparent as glass, composed of pure silica. As we are informed that water holds in solution so small a quantity of silica as from one to two grains only in a gallon, the process of extracting it by sponge appears marvellous. Some of the spicules at first are inflated in the centre (fig. 66), some of them have two or three of these enlargements, which probably diminish in bulk as the spines extend, and are lengthened out to the shape at fig. 67, this being their normal shape. Bowerbank does not mention this form of spicula as occurring in *S. fluviatilis*. Could we have overlooked them? I do not think this possible; but, be it as it may, I have now by me in the young sponges many of the inflated form, and some of them with as many as six protuberances, occupying nearly the whole length of the matured spicule; on the other hand I have a mounted slide of the common shape spicula, containing some hundreds of them, but not one inflated form among them, so that they appear not to be a constant form. The spicula peculiar to the ovaria I have endeavoured to sketch in fig. 68, having boiled them in nitric acid, by which the coriaceous skin covering them was destroyed, and the spicules were liberated. When mounted in dammar they form very pretty objects for the microscope. In fig. 68 are sketched some of them pressed down, showing the stellate or rotulate form of the ends of the spicula; and in fig. 69 the position they occupy in the support of the spherical form of the ovarium, the outer rotula at *b* supporting the external membrane, and the inner one at *c* performing the same office for the internal one. Some few of the ovarian spicules have a short spine protruding from

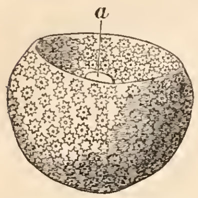


Fig. 65.—Ovary of Fresh-water Sponge.

Fig. 66.—Inflated Spicules of Fresh-water Sponge.

Fig. 67.—Elongated Spicules of Fresh-water Sponge.

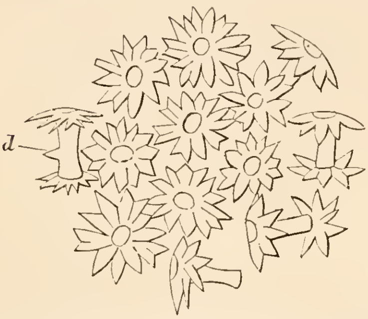


Fig. 68.—Rotulate Spiculæ of Ovarium of Sponge (highly magnified).

Fig. 69.—Position occupied by Rotulate Spiculæ in Ovarium.

the middle of their shaft (fig. 68, *d*), but these are rare instances in *S. fluviatilis*. The shaft of the rotulate spicules appear to be hollow tubes, for when looking direct down the shaft it appears more light and transparent than does the rest of the star-shaped top, which would not be the case if the shaft was solid.

Drying Flowers without losing their Colour.—Let R. B. L. try the following plan: Gather the flowers *perfectly dry*, and with a small brush paint them over with a strong solution of alum, then place in a book to dry, changing them often.—*B. B. S.*

MICROSCOPY.

A New Zoophyte Trough.—I beg to send you a zoophyte trough, the form of which is new, I think, and possesses the following advantages. It is very light, owing to the sides being made of wood, easily cleaned, and as the wooden frame is cut so as to leave the bottom semicircular there are no corners, and the trough is easily brought under any objective. The rabbet enables the central glass to keep objects in their places.—*Fred. Row.*

Marine Infusoria.—A capital paper, recently read before the Birmingham Natural History and Microscopical Society by Mr. W. Saville Kent, F.L.S., entitled "Notes on certain Marine Infusoria, obtained during the summer excursion (1879) to Falmouth," appears in the April number of the "Midland Naturalist." The paper is embellished with a page illustrating nineteen of the objects.

Microscopical Society of Liverpool.—The fourth meeting of the twelfth session of this society was held on April 2, 1880; Dr. Hicks, president, in the chair. Mr. I. C. Thompson (hon. sec.) exhibited a simple but effective form of aquatic trough, adapted for Infusoria and other minute living objects, the ends being of any desired depth, made of thin pieces of glass and cemented upon an ordinary 3 + 1 slip, the cover resting upon these ends, and kept in position by capillary attraction. He also called the attention of microscopists to a new and excellently illustrated work entitled, "The Biological Atlas," edited by Messrs. McAlpine, of Edinburgh, which comprised a course of biological study from the very lowest to the higher forms of animal and vegetable organisms. Mr. Butterworth, of Oldham, read a paper, entitled "A Short History of the Discovery of the Fossil Plants of the Lancashire and Yorkshire Coalfields," illustrated by sections and photographs by the aid of the limelight. Mr. Butterworth stated that he had studied the richest localities in the Oldham and Halifax districts for upwards of twenty years, and exhibited numbers of coal sections prepared from specimens there obtained. In some of them the stomata and other parts of plant structure were clearly visible under the higher powers of the microscope. A discussion followed, in which the Rev. H. H. Higgins, Mr. Morton, Dr. Symes, &c., took part.

Microscopical Society for Highgate.—At a meeting held at the Highgate Literary and Scientific Institution, on Tuesday, March 23, at which Dr. M. C. Cooke, M.A., LL.D., &c., presided, it was resolved to establish a Microscopical and Natural History Society for Highgate and neighbourhood. The first meeting of the Society was held at the Institution on Friday, April 16. Any one wishing to take part in the Society will kindly write to the

Hon. Sec. *pro tem.*, Mr. J. G. Tasker, 18 Junction Road, Upper Holloway; or Mr. J. H. Toydd, Hon. Sec. Highgate Literary and Scientific Institution, Highgate, N.

ZOOLOGY.

The Late Professor Bell.—At the ripe old age of eighty-seven, and retaining his intellectual faculties vigorous to the last, as his recent edition of White's "Selborne" abundantly proves, Thomas Bell, the author of "British Reptiles," "British Quadrupeds," &c., has just passed away. He lived for the last eighteen years in Gilbert White's old house at Selborne, where he edited his last work.

A New Order of Holothuridiæ.—In a recent number of "Nature" appeared an account, by Professor Sir Wyville Thomson of the "Challenger" expedition, of a new order of Holothuridiæ. Dr. Théel, to whom the specimens were submitted for description, has proposed Elasmopoda, as the name for the order whose chief features are: body distinctly bilateral; ambulacra well defined, the lateral ambulacra of the trivium bearing large, slightly retractile pedicels; trivium provided with very long, not retractile processes; no respiratory trees; integument naked, spiculous, or plated.

Polymorphic Butterflies.—At a recent meeting of the Linnean Society, a paper by Professor J. O. Westwood, on a supposed polymorphic butterfly, was read. The conclusions arrived at were: (1) of *Papilio Castor* being males of a species whose females have not yet been discovered; (2) that the typical *P. Pollux* are females of which the male with rounded hind wings, having a diffused row of markings, has yet to be discovered; and (3) that the coloured figures given by the author represented the two sexes of a dimorphic form of the species.

Exploration of the Island of Socotra.—We are glad to announce that Dr. B. Balfour has arrived safely at Socotra. In a communication to Sir Joseph Hooker, he says that "the island is well worth examination; that already one hundred and fifty species of plants, besides some birds, lizards, and insects, had been collected. The geology of the island is curious, granite, diorite, and limestone being all mixed up in a most perplexing way. The Sultan is giving great help by ordering the sheiks to provide camels, men, and everything that is wanted."

The Popular Science Review for April contains the following interesting articles:—"Chamæleons," by Professor J. R. Greene; "The New Chemistry: a Development of the Old," by M. M. Pattison Muir; "The Classification of the Tertiary Deposits," by Professor J. W. Judd, F.R.S.; "Artificial Diamonds," by Professor F. W. Rudler; and "The Threshold of Evolution," by Dr. Wallich.

Epping Forest Natural History Field Club.—The first ordinary meeting of this club was held at the headquarters, 3 St. John's Terrace, Buckhurst Hill, Essex, on February 28; the president, Mr. Raphael Meldola, F.R.A.S., F.C.S., &c., presiding. The president delivered an inaugural address on the objects and work of the club, in which he mentioned that the idea of establishing such a club had long been present in the minds of many habitués of the forest and surrounding country, but no definite scheme had been broached till Mr. Cole took the subject up, and by his zeal and energy gave it a sound footing. He thought there was no doubt a field club would promote observation, and supply a public want. Although not quite two months old, the club numbered more than 160 original members. He especially recommended young naturalists to begin by making a collection. In attempting to arrange objects by referring to some standard work, the great principle of biological classification would dawn upon them, and surrounding objects would become imbued with a new interest. A paper by Mr. A. M. Christy was then read, on "The occurrence of the great bustard (*Otis tarda*, L.), and the rough-legged buzzard (*Buteo lagopus*), near Chelmsford, during the winter of 1879." The specimen of the great bustard was shot on December 5, 1879, at Hull Bridge. It was a young male, and had not therefore the imposing size and conspicuous beard of the old bird, and instead of weighing over 25 lbs. it only weighed 10 lbs. Its total length was about 3 feet 9 inches, and the expanse of wing exceeded 7 feet. The rough-legged buzzard was shot at Patching Hall, near Chelmsford, on December 19, 1879. It was a female, in very good condition.

To preserve Birds' Eggs.—There must be a reason for the mould on E. P.'s eggs, and it should be easily detected. Damp is most probably the cause, either in the cabinet or in the substance upon which they are displayed. It ought not to occur in such a situation as he describes, if the eggs are placed on cotton wool. With regard to the suggestions of T. J. Lane, washing the interior of an egg-shell with clean water should be amply sufficient, and the wash of solution of corrosive sublimate ought only to be used where the lining membrane is decayed, and then there can be no necessity to place the egg near the fire, which is very likely to injure the colour, as the spirit of wine will evaporate in a very short time without heat. I have never used the solution of corrosive sublimate and have never found the need of it. The colouring matter on the surface of many eggs is soluble in water, therefore they should never be washed, and any description of varnish absolutely destroys the character of the egg and renders it perfectly valueless. If eggs are protected from damp and light, there is no reason why they should not remain unchanged for an indefinite period.—*T. Southwell.*

BOTANY.

Alternate Dehiscence of Anthers.—In reference to a paper on "Alternate Dehiscence of Anthers," in March number of Science-Gossip, I wish to say that I believe the flowers of *Geranium pratense* to afford an example of the phenomenon described. It is some years since I observed the plant, but I remember noticing that all the anthers did not ripen at once, and that as they ripened they changed their position.—*M. E. Pope.*

Pitcher-plants and Creeping Insects.—At a recent meeting of the Linnean Society, Dr. Maxwell Masters brought forward a specimen example of a pitcher-plant (*Nepenthes bicalcarata*) from Borneo, and he read a note thereon from Mr. Burbidge. It seems these pitchers are perfect traps to creeping insects, by reason of the incurved ridges round the throat of the pitcher. To get safely at the prisoners, a species of black ant ingeniously perforates the stalk, and tunnelling upwards, thus provides an inroad and exit to the sumptuous fare of dead and decaying insects contained in the reservoir. The remarkable Lemuroid (*Tarsius spectrum*) likewise visits the pitcher-plants for the sake of the entrapped insects. These it can easily obtain from the *N. Rafflesiana*, but not so from *N. bicalcarata*, where the sharp spurs severely prick if the animal dares to trifle with the urn lid.

The Rose of Jericho.—The figures of the "True Rose of Jericho," engraved at p. 57 of Science-Gossip for last month, are those of *Mesembryanthemum tripolium.* This species, which is undoubtedly that referred to by T. E. Amyot, is a native of the Cape, and the dried fruits are not unfrequently to be seen exposed for sale in shops in London, especially at the East End, being no doubt brought by sailors as curiosities on account of their hygrometric properties. *Mesembryanthemum nodiflorum* has similar properties. T. E. Amyot will find a reference to this habit of the fruits in Lindley and Moore's "Treasury of Botany," article "Mesembryanthemum" p. 738, also in Smith's "History of Bible Plants," p. 73.—*John R. Jackson.*

"Respiration of Plants."—Sachs, in speaking of an atmosphere devoid of oxygen, certainly means free oxygen. The proportion of carbonic anhydride is about one part in two thousand five hundred parts of atmospheric air, therefore, practically, this compound might be considered as absent from any enclosed quantity of air that might be experimented upon, or at least the quantity would be so small as not to allow of the plant giving off any appreciable quantity of oxygen after having taken in the carbonic anhydride. The process of respiration continues during the life of the plant, and is as little dependent on light or darkness as it is in the animal kingdom. An experiment proving the process of respiration during darkness is as follows:—place a growing plant in a bell jar, the atmosphere of which contains a known amount of oxygen and no carbonic anhydride; after remaining, say, twelve hours in darkness, it will be found that a certain amount of oxygen has disappeared, and the presence of carbonic anhydride can be easily demonstrated. Plants only absorb their atmospheric food when the conditions are favourable for its immediate assimilation or digestion, and this can only be effected under the influence of light, and as this absorption of carbonic anhydride and the consequent giving off of oxygen under the conditions mentioned is so much in excess of the act of respiration, it becomes a matter of difficulty, except by very accurate experiments, to demonstrate the latter phenomena during daylight. The carbonic anhydride given off by germinating seeds is not the result of either assimilation or respiration, but is due to metastasis, or the changes of composition of certain compounds before they can be used by the embryo as its first food. It does at first sight appear anomalous that plants breathe out their own food, but a moment's reflection shows that it is an act common to all organisms; the members of the vegetable kingdom are so constituted as to be able to utilise the refuse of their own substance at first hand. The high specialisation of most animals has rendered them powerless to derive their full amount of nourishment from gaseous food, but when their breath has been solidified by plants then it becomes directly or indirectly their food. I trust the above may throw light on some of the points mentioned by Colonel Dickens.—*G. E. Massee.*

Ranunculus ophioglossifolius (Vill.).—This plant has not, I may inform your correspondent, been detected in Jersey since 1865 or 1866, and is, I fear, with *Isnardia palustris*, irrevocably lost to the Channel Islands. Mr. Piquet, of St. Helier's, kindly presented me with one of the last genuine specimens, gathered by him in June 1866, and though St. Peter's Marsh still abounds in boggy and treacherous ground, still the whole character of the place is changed from what it was formerly, and I am quite assured that the most careful search will prove fruitless for any except the common marsh plants. *Ranunculus flammula* and *R. hirsutus* grow there plentifully—the former often with small flower-heads, which might deceive the uninitiated. I am afraid that before long *Ranunculus chærophyllos* will also be a thing of the past. Last June I observed only ten or twelve roots, and I would exhort botanists not to take a single root, as it spreads rapidly by means of its tubers—the seed not ripening in this country. The late Dr. M. M. Bull showed me a large patch of it in his garden at St. Saviour's Road, St. Helier's, which had extended from two or three roots originally introduced. In the place of these, I have lately made known the discovery last year of the true *Silene Gallica* (L.) at Gallows Hill, St. Helier's, where I found it growing with *S. quinquevulnera*, which is only probably a variety of it. This is new to our British lists. And I have also put on record the fact that the large quaking grass (*Briza maxima*, L.) is becoming rapidly naturalized all over Jersey, but especially near La Haule, St. Aubin's—not far from the *Ranunculus chærophyllos* station. We must expect, as the march of building extends along St. Aubin's Bay, very soon to lose *Allium sphærocephalum*, and other varieties of that kind: and we hope, therefore, as some compensation, that further varieties may be detected in these islands.—*J. Cosmo Melvill.*

How to preserve the Colours of Flowers.—If K. B. L. would after fastening a wire to each stem, dip the flowers separately in a clear weak solution of *Gummi Arabicum*, and well dry suspended on a line, he would find them covered with a glazing interfering very slightly with their beauty, at the same time preventing the air from destroying the colour.

GEOLOGY.

Correlation of the Irish, British, and Continental Devonian Rocks.—At a recent meeting of the Geological Society, the following communication was read:—"On the Geological Relations of the Rocks of the South of Ireland to those of North Devon and other British and Continental Districts." By Professor Edward Hull, M.A., LL.D., F.R.S., F.G.S., Director of the Geological Survey of Ireland. In this paper the author, after referring to his previous paper on the geological age of the Glengariff beds ("Quarterly Journal Geological Society," vol. xxxv. p. 699), in which he showed that between them and the succeeding Old Red Sandstone in the south of Ireland there existed a very great hiatus, proceeded to compare the sections of the rocks of the south of Ireland with those of North Devon, and to show that the hiatus in question is represented in the latter locality by the whole of the Middle and Lower Devonian rocks. He then discussed the relations of the Devonshire rocks to those occurring north of the Severn, in Scotland, and in Belgium; and from this review of the whole question he arrived at the following conclusions:—First, that there is only one Old Red Sandstone properly so called—represented in Devonshire by the Pickwell-Down Sandstones; in Ireland by the so-called Upper Old Red Sandstone, including the Kiltorcan beds; in Scotland by the so-called Upper Old Red Sandstone; and in Belgium by the "Psammites du Condroz." Secondly, that the so-called Old Red Sandstone of Herefordshire is the estuarine representative of the Middle and Lower Devonians of Devonshire; and that the so-called Lower Old Red Sandstone of Scotland, with its fish-remains, is the lacustrine representative of the Upper Silurian rocks. In conclusion the author discussed the physical conditions under which these various formations were deposited.

East Kent Natural History Society.—At the last meeting of this society, the president, Colonel Cox, read a paper on certain siliceous fossils of the chalk, illustrated by a magnificent collection of fossil sponges, and their allies from the south coast, principally collected and polished by himself.

NOTES AND QUERIES.

Errors of Calculation.—In objecting to my figures, why did Mr. Woolley stop at the "insects" which would be eaten by birds, which form the food of sparrow-hawks? Why not go deeper into the subject and take the various organisms which form the food of the insects above mentioned, and even further still, taking the lower organisms which constitute their nourishment? Then—in order to be within the pale, we will assume, as did Mr. Woolley, six times their own weight as food sufficient for a year—he would have a grand total of 19,956,372+36 lbs., or 718,429,392 lbs. of food destroyed annually by organisms, which are eaten by other organisms forming the food of insects which constitute the main support of the redoubtable sparrow-hawk. This immense total at 1*d.* per lb. (as assumed by Mr. Woolley) would be worth, in round numbers, nearly three millions of money sterling. Why stop here? Why not go further and further? The vague notice which Mr. Woolley publishes on my "statistics" are so full of errors, that I scarce know where to begin to rectify. He says, "Mr. Dealy presumes for me that all the food of the sparrow-hawk consists of sparrows." Nothing of the sort was ever either uttered or written by me! In November's issue of Science-Gossip, p. 246, are the words, "birds constitute its exclusive food," birds not sparrows alone; again, on the same page is written, "Suppose each to consume three birds, sparrows we will say," mind the word "birds" is distinctly said again, meaning not sparrows exclusively, but birds. The very instances I quote (p. 246) bear me out in what I say, for of the four birds dissected only one sparrow was discovered. Again, because but one sparrow was discovered among the four dissected birds, is there conclusive evidence that one-fourth of the sparrow-hawk's food consists of sparrows? This is what Mr. Woolley seems to think. Again, sparrows are not the only birds which eat or otherwise destroy grain. According to Mr. Woolley, the food of these insects, of which so much has been said (p. 20, Jan., 19,956,372 lbs. of insects' food at 1*d.* per lb. = over £83,000) is of value to man, or in other words, these wanton insects destroy or consume nothing of a detrimental character, but merely live on the fat of the land to the extent of £83,000 yearly. Mr. Woolley does not take into account the many putrid and refuse matters which are as banquets to numerous classes of insects, and which if left to the action of the atmosphere would become prolific centres of disease. Many, if not most of the insects included under the 3,326,062 lbs. (Mr. Woolley's letter, p. 20, Jan.) act as the scavengers of the earth and air.—*Tom W. Dealy.*

Poisonous Properties of the Yew-tree.—I beg to supplement a few facts relative to the poisonous properties of the yew-tree. Your correspondent Dipton Burn has already given overwhelming testimony to S. A. B., both as to the fact of it having been regarded by ancients as poisonous, and further by a modern professor, when likely not to be poisonous, also to the fact of the two bullocks having died through eating the yew, facts which I think are pointed. Now I would just supplement Dipton Burn with one or two more facts. The "Annual Register" for May 1766 contains an account of a parcel of sheep belonging to a farmer at Edmonton having eaten a quantity of the bark of a yew-tree. Five of them died soon after, the others, by proper care, were restored. Another case is mentioned in the "Gentleman's Magazine" for January 1781, of a Mr. Oakover, near Derby, losing a valuable hunter through browsing on the leaves; one more case is mentioned in the same journal. A gentleman having a horse disordered by worms, was advised to give him some savines. "An ignorant fellow," he says, "being employed to get the savines, brought yew in its stead, which proved fatal to the creature." He also says, that very little of the blighted sort was found in either of the horses, so that if the green succulent had not been poisonous, neither of them probably would have died; from hence, it is evident that the more copious the sap, the more poisonous the leaves. The question is whether the tree that S. A. B. has been noting is blighted or of poor growth through sterility of the soil, or whether we must take the statement of Dipton Burn, which seems most plausible, that is, the horses, sheep, and cattle nibble it when they are full. However this may be, S. A. B. may rest assured, from the facts adduced, that the yew is a poisonous plant, and though it is possible for horses or cattle to survive it under certain circumstances, farmers would do well to avoid it.—*T. H., Blackburn.*

Early Flowers.—On February 5, I found in a field near my residence, the red dead-nettle and hairy bittercress in full flower. The former had even lost the corolla in many cases, and must have been flowering on the first day of the month, though I did not happen to see it. This was near the shores of Lough Erne, in County Fermanagh. And on the 10th I found the lesser celandine, and on the same day (on a bank on the roadside), I found, and have now before me, a plant of the wild strawberry, with not only some flowers fully developed, but in one with the petals already fallen off and the fruit well formed. Is this not very peculiar? Last year I made notes of the first appearance of the common wild flowers, and none of these were in flower before the middle of April. The temperature of the county is not exceptionally high, rather the reverse; and as a general rule, vegetation is counted to be about three weeks later than in England. This makes the above appearance all the more surprising. I am aware that occasionally in paragraphs headed "Mildness of the Season," may be read accounts of primroses in flower at Christmas, and more of the same kind; these might be reckoned, however, just as well to the past as the coming year, and were owing to the fact that there had been in truth no winter. The present cases are quite different Ten days earlier the lake was frozen over, and every one was skating. Suddenly the frost broke up, and a soft south wind blowing constantly, these flowers came out in little more than a week. They were in the strictest sense "spring flowers."—*B.*

Mortality of Shrewmice.—Shrews are common in my neighbourhood, and numbers are found lying dead by the side of hedgerows, &c. It is generally known that cats kill them, but do not eat them, but as they are found in parts where cats would be unlikely to frequent, other causes must be attributed to explain such numbers dying. I believe among their enemies are stoats. I have an agricultural friend that has watched a stoat kill a shrew and leave it; weasels may do the same. Jenyns says that "owls reject the shrew," so probably they destroy them. I think this may be a better solution of the mystery than that there is an annual epidemic amongst them, or of their dying from the cold. This latter cause is not likely to apply to Cornwall, where bats may be seen occasionally every month in the year; and a tortoise in my garden has not considered it necessary to entirely disappear in the earth for many winters until this past one.—*Hamilton James.*

Mortality of Shrewmice.—In reply to Mr. A. Malan's question in reference to the periodical mortality of so-called shrewmice (*Sorex araneus*, Bell), it appears to me, from the fact of the mortality being so general at certain times, hardly probable that they are killed by cats or birds of prey, but seems rather to point to some other cause, such as an unusually wet season, or possibly an untimely frost. I am not able to speak definitely as to the cause, but from the evidence which has come under my notice, I am inclined to believe that shrews may be, and often are, killed by damp or rainy weather. I have frequently observed cats bring shrews home to their kittens, although, in no instance, have I seen them attempt to eat the dead bodies, but I question whether even "well-bred cats" (to quote C. J. W. in Science-Gossip, No. 183) would refuse to eat them merely because they had not had the honour of killing them. I was under the impression that the flesh of shrews was rendered unpalatable—to cats, at least—by the peculiar humour which exudes from the sides of their bodies. Perhaps it was owing to this fact that our ignorant forefathers regarded this inoffensive little creature with such superstitious prejudice. Rev. Gilbert White, in his "Selborne," gives some very interesting particulars of a "shrew-ash" which once existed "at the south corner of the Plestor," at Selborne.—*George Clinch.*

The Deal-fish.—Your correspondent was in error as to the occurrence of the Vaagmœr near Whitby. In the "Field" of February 21, he will find it correctly described as a Banks' Oar-fish (*Regalecus Banksii*). There is no doubt as to the correctness of the determination.—*T. Southwell.*

Query about Eggs.—With reference to J. G. R. D.'s (Suffolk) query in April number of Science-Gossip, as to identification of two eggs, it would be hard to positively determine the species without seeing the eggs. But from description I should say the first is a robin's rather faded, if found near bottom of a hedge; the second a whinchat, or perhaps a stonechat. If J. G. R. D. found the eggs himself, and would compare notes with Hewitson or Morris, he would find by description whether I am right or not.—*John M. Vereker.*

Lily of the Valley (*Convallaria majalis*).—I found several plants of the above, about seven years ago, in Epping Forest, about half a mile south-east of the King's Oak, High Beech, in a very secluded part. Can any one tell me if it is still to be found, or is it extinct, as I have hunted for it in vain since? The plants I found were placed in my garden, and the flowers have increased greatly in size.—*Saponaria* *officinalis.* A double variety of this I found in a hedgerow in a field some years ago. The new branch line of the Great Eastern Railway to Alexandra Palace now runs over the spot, so it exists, unfortunately, no longer. This was the only place in Tottenham and Edmonton, &c., districts, where it has, I believe, been found.—*J. W., Tottenham.*

Hawks, Owls, and the Game Laws.—The following letter, which we commend to the notice of our readers, has recently appeared in the "Suffolk Chronicle," signed "A Farmer." "A few years ago a pair of common barn owls built their nest and hatched four young ones on the false ceiling of my house, a thatched one. Becoming troublesome on account of the noise they made in the night, I had them removed to my stable loft, when, noticing one evening the many times the old birds went to and fro and always with something in their claws, I had the curiosity to go and see the next morning, when judge of my surprise on finding nine rats and mice of various sizes, one of them a full grown water rat, and three small birds of the hedge-sparrow kind, left over from their last night's feast. Of course after this I went many times to see what their food was: it was always the same, but not so many as I saw the first time. Not a sign of any description did I see, during the time the young ones were fed by the old birds, of any kind of game. Now, sir, I must leave you and your readers to judge of the vast quantity of vermin those birds cleared off during the rearing of their young, and yet those birds are shot by all game preservers because they are supposed to kill game. It would be far wiser to fine a man for shooting an owl than killing a rabbit. As regards game, after twenty years' experience in farming, I believe the common barn rat to be more destructive to young partridges and pheasants than all the birds of prey and weasel kind of animal put together. I have lost a great many ducks and chickens just after hatching, and always traced them to rats. The last time we had eleven young ducks taken in two nights from coops. I trapped three large rats and lost no more ducks that summer. Another instance. We had a hen and chickens a month old in a meadow close by the house. I saw a great commotion amongst them, and on going to the spot found one chicken killed and a large rat going to the hedge which I killed. Now this, I have no doubt, is many farmers' experience. The inference I draw is this, that if they kill young fowls they will kill young game. When in the summer they go into the fields and breed there is nothing but green corn for them to feed on, then is the time they prey on young birds. I have many times noticed the old birds losing nearly all their young ones, but I was a long time finding the cause. I should like in conclusion to say a word for the common mousehunt and weasel. I have had them about my stackyard and premises and seen them amongst my fowls many times, but never saw them or had reason to believe that they ever killed any. Yet those useful little animals are destroyed wherever met with by gamekeepers and others. I often wonder how long an intelligent people will submit to those selfish Game Laws, which give men the power to destroy every animal or bird useful to the farmer, besides showing great ignorance of natural history."

Comparative Anatomy of the Eye.—I shall be glad if any readers of Science-Gossip will kindly inform me of publications wherein I may find information respecting the comparative anatomy of the eye. I will return postage for any communication.—*Richard Bangay, M.D.*

Botanist's Portable Collecting Press.—Any botanist who has tried the above press, might confer a favour on other botanists, now the botanical season is approaching, by stating whether it supplies a need which has long been felt, especially in holiday rambles, of some simple contrivance for the preservation of specimens on the spot.—*J. R. M.*

Metropolitan Societies, &c., their Meetings.—As the secretary of a suburban microscopical society, I have often met with considerable difficulty in arranging for meetings, especially soirées, so as to avoid clashing with the meetings of other societies, the dates of which are frequently unknown beyond their own circle of members. To this want of information amongst neighbouring institutions respecting each other's arrangements, I presume, is due the fact that in the course of the winter months, we are sometimes invited to exhibit at three or four soirées in about as many weeks, and then hear of no more throughout the season. This and other considerations point to the conclusion, that there should be some means of making each society acquainted with the others' movements, and of promoting some unity of action in regard to common interests. As a step in this direction, I venture to suggest that some of your space should be devoted, say in the January number of each year, to the publication of a concise account of the announcements and arrangements of the London Microscopical and Natural History Societies. I am convinced that such information supplied in the magazine which has so extensive a circulation amongst microscopists, would in a large measure remedy the evil described, and be found generally useful in other respects.—*George Dannatt, Hon. Sec. Greenwich Microscopical Society.*

I have had one of Crouch's Educational Microscopes since Christmas, 1877, and within the last two months have noticed that the field produced by the ¼ inch objective has become duller than usual. I have taken it to pieces and rubbed it with chamois leather, but with no avail. Could any of your readers inform me as to the cause and remedy? I had a suspicion that the evaporation produced by water objects was the prime cause, but, if this is so, how could the evaporation produce a permanent effect?—*Walter G. Woollcombe, Trinity College, Oxford.*

Watercresses.—Lovell, in his "Panbotanologia" (printed at Oxford in 1665) says of watercress that its "temperature is hot and dry. Virtue: dissolved in wine or milk, it healeth the scurvy, &c." An eminent medical man told me some years ago that the well-known antiscorbutic properties of this plant are furnished by the large quantity of iodine it contains. The leaflets have often a bronzed appearance. Does this arise from the presence of iodine?—*R. A., Wellington, Shropshire.*

A Bicipital Anemone.—About two years ago a dianthus in one of my tanks developed the above peculiarity, and the second head is now hardly to be distinguished from the original in size. If the animal be fed by both, the food is seized by each separately, and can be seen to enter the stomachic cavity; if fed by one its course can be similarly followed; but whether fed by one or both, there is during digestion the usual enlargement and display of tentacles by each head. If one disk be touched, the other contracts synchronously; if, again, the base or pillar, both heads instantly close. These few observations may interest some of your readers who keep marine tanks.—*Y. L. B., Denmark Hill.*

Noise made by Water Snails.—I have often noticed the peculiar noise from my aquarium mentioned in Science-Gossip (page 23) by C. J. P., Weymouth, it seemed to proceed from the *L. stagnalis* (perhaps the same kind of snail mentioned by C. J. P., as it was formerly named *H. stagnalis*). I had several other kinds of mollusca in the aquarium, but that seemed to be the only kind floating on the surface at the time. The noise seemed like a very sharp "drip," and after a minute or so drip again.—*Mrs. S., Brentford, Middlesex.*

The Fagus of Cæsar.—The point originally discussed in Science-Gossip was what was this tree? The quotations from "Virgil," by Mr. Moggridge, show conclusively that it could scarcely have been the evergreen oak, since this is neither a "lofty" nor a "spreading" tree. These terms, however, seem well to apply to the chestnut, of which Gerarde remarks, that "The chestnut is a very great and high tree, and casteth forth many boughes," and as Longfellow reminds us when he says:

> "Under a spreading chestnut tree,
> The village smithy stands."

The terms "alta" and "patula" suit equally well the beech and the chestnut.—*F. H. A.*

Woodcocks or Goat-suckers.—In your February number of Science-Gossip, under the head of "Notes and Queries," I perceive a short article headed "Woodcocks or Goat-suckers." I have been an ardent sportsman for many years, and having had numerous opportunities of watching and noting the habits of the woodcock, I beg to say I have, on different occasions, seen them disporting themselves as described by Charles Kingsley, not only over plantation, but in the open at dusk before their retiring to the marshes, and in search of food. Their playful flight was not unlike that of the goat-sucker, but no person of any experience in ornithology could possibly mistake the different intonation of voice. Whilst watching for rabbits a few years since, at a place in the county of Wexford, "Askinfarney," in the beginning of March, after five o'clock in the evening, I saw two woodcocks disporting themselves, as I mentioned above. Happening to fly near where I was at the wood fence, so close were they together in their gambols that I killed both with one shot.—*W. C.*

Wren's Nest at Christmas.—In answer to the question of J. Steel, Greenock, as to "whether the nest was a forsaken one of last season," I may say that it had the appearance of a newly-made one; it was quite free from dead leaves, &c., which are generally found in old nests, and moreover, the eggs on being broken were found to be quite fresh.—*F. F. R., Northampton.*

Viper swallowing its Young.—In last month's Science-Gossip a correspondent (J. J.) reopens this vexed question which has been repeatedly discussed in your columns. I must confess that independent of all the statements of the viper swallowing its young, which have come under my notice, I still remain sceptical on that point. Your correspondent does not state whether the breach from which the young ones escaped, opened into the stomach, or into the oviduct, a point of great importance. If the opening led from the oviduct, as I think it would, there is nothing strange in the lively appearance of the young, as it is well known that the viper being ovo-viviparous, the young are no sooner brought to light than they assume all the liveliness of their parents. The viper is usually a very timid creature, and it is only when in a gravid condition that the female runs the risk of an encounter with man through her unwillingness to move from the spot where she may have been basking in the sun. If the young had been located in the stomach, I am afraid their condition would not have been so active. Mr. Thos. Q. Couch, F.S.A., in Science-Gossip for 1873, page 160, however, mentions having found "six young adders lying at length in the stomach" of a viper he had dissected, but is he sure the reptile in this case might not have been a cannibal? If any one who had an opportunity of witnessing this act would submit the subjects to some well known erpetologist who would be familiar with the anatomy of the viper, it would effectually settle the question. I have for some years been on the watch, and although I have during the past two or three summers had many opportunities of observing vipers in places where they are numerous, I have still been unsuccessful in witnessing this curious act.—*J. M. Campbell.*

Bees and Honey.—In May last, some friends living in the neighbourhood of Tenby found one of their beehives to be full of honey, but not a single bee alive or dead could we find anywhere. They have kept bees a great many years, and they could not in any way account for it.—*A. A.*

Notes from Oxford.—On February 20 I found a *V. urticæ* in quad of Corpus College, and on March 2 another in the country; hibernated specimens. On March 20 a nest of the common thrush (*Turdus musicus*) contained four eggs. On March 8 primroses (*Primula vulgaris*) and Celandine (*Ranunculus Ficaria*) in abundance. *Mercurialis perennis* beginning to flower on same day; fully out on the 11th.—*W. G. Woollcombe, Trinity College, Oxford.*

Probable origin of the Menai Straits suggested.—Since reading the Rev. W. Fox's account of the severance of the Isle of Wight, as cited by Mr. John Evans ("Ancient Flint Implements of Great Britain," p. 605), I have been strongly possessed by the idea that the severance of Anglesea was effected in a very similar manner. In looking on any geological map it appears evident that the mountain limestone of the Great Ormes Head and Llandudno was once connected with that of the south-east of Anglesea, Prestholme Island being remains of the ancient chain. The river Conway, flowing as now in nearly a northern direction, met this barrier much where now is its mouth, and being debarred egress to the sea (supposing the chain to have been unbroken), ran in a south-easterly direction past Bangor, down the Menai Straits, which unlike those which had been formed by encroachments of the sea, on two opposite sides of a narrow neck of land, are of nearly equal width throughout their entire length, and have very much the character of the bank of a large river. Now I am fully aware that this suggestion (for such it really is) is of little value in itself, but I have penned it hoping it may incite some geologist who is personally acquainted with the district to examine that part of the Conway Valley which lies near its present mouth, for ancient and high-lying quaternary beds. If such occur, I think we might look for a continuation of them along both shores of the Menai Straits, seeing that these do not appear to have been much widened since they ceased to be a river. Of course such detrital beds might possibly be a repository of mammalian or molluscous remains or even of implements of palæolithic workmanship. In conclusion I hope this note may catch the eye of some local worker who will give any facts he may collect in the future pages of SCIENCE-GOSSIP. Since the above was penned, I have met with an abstract of a paper by Professor A. C. Ramsay, entitled "How Anglesea became an Island." (Geological Society, January 19, 1876.) But as his views do not seem wholly to exclude the possibility of river action as well as glacial, I submit the above to your readers with all deference to other opinions.—*H. W. Kidd.*

LARVA OF CAJA.—Is it not unusual for the larva of *Chelonia caja* (garden tiger) to pupate without hybernating?—*W. G. Rolfe.*

QUERY AS TO FALCON.—Will any ornithologist or other naturalist kindly elucidate the following passage in Wordsworth?—

> "A pair of falcons wheeling on the wing
> In clamorous agitation, round the crest
> Of a tall rock, their airy citadel."

What species of falcon is here alluded to; and does it still frequent the precipices of the Little Langdale Valley in Westmoreland? Wordsworth, in several passages alludes to the habits and character of the stock-dove. I have been always under the impression that this bird was confined exclusively to the south of England. How then does it come to pass that this poet, who lived almost entirely in the northern districts, should muse so frequently on a creature so far removed from his usual haunts and associations?—*P. Q. Keegan.*

MOONLIGHT AND STAINED GLASS.—Can any of the readers of SCIENCE-GOSSIP inform me why rays of light from the moon passing through stained glass are not influenced by the colour of the glass, but preserve their original whiteness? I have often witnessed this, and shall be greatly obliged for any information on the subject.—*Jno. Langdon, Plumstead Parva.*

OAK-APPLES AND INSECTS.—Have any of the readers of SCIENCE-GOSSIP noticed the fact that the common oak-apple sometimes contains a number of small insects not more than a third of the ordinary size of the *Cynips Kollari*, but apparently resembling it in all other respects; also the occasional presence in the same galls of a minute hymenopterous insect of a bright metallic green, and with a pointed abdomen?—*G. C. Goody.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

R. B. L. will find in SCIENCE-GOSSIP for 1878, page 136, in a paper by Mr. J. W. Buck, how flowers can be dried without losing their colour.—A. Paterson.

E. LOVETT.—Accept our thanks for the capital slide of ova of *Pagurus Bernhardi.* Please send us your method of mounting.

ROBERT AITKEN.—From your description we have no doubt that the globular, jelly-like mass, found on seaweed, was the eggs of some mollusc, but what species we could not say without examination.

THOMAS B. BRACKEN.—Bentham's "Handbook of the British Flora" has only woodcut illustrations, not coloured plates. Anne Pratt's book would, we think, answer your purpose.

F. L. T.—A flame is a gas or vapour raised to a high temperature by combustion.

J. W. CUNDALL.—The specific name of *Testacella Maugei* was given to this animal by De Férussac in honour of a French naturalist.

A. B. P.—Rye's "British Beetles" is the best of its kind for indigenous beetles.

G. G.—See a capital article on "A Simple Method of Preparing Skeleton Leaves," on p. 30 of SCIENCE-GOSSIP for 1872.

G. S. WILLS.—We do not know anything of the advertisement of the treatise on "The Microscope" beyond its publication in our last number. You had better address a note to him under cover to D. Bogue, 3 St. Martin's Place, Trafalgar Square, W.C.

J. A. C.—No object on "enclosed weed" reached us.

WILLIAM KIRKBY.—The "red lentil" is merely a well-marked variety of *Ervum lens*, and is commonly known as the Egyptian lentil.

T. MCGANN.—Write A. J. R. Sclater, Teignmouth, Devon, who will, we have no doubt, give you full instructions and help in stocking your pond with gold fish.

A. D. H.—Your specimen is the water-moss *(Fontinalis antipyretica).*

JOHN SHAW, jun.—The structures in the very capitally mounted slide of section of Hydrocharis are raphides, or crystals of calcium oxalate.

J. T. A. (London)—Dana's "Mineralogy" is the best manual of its kind. Others and cheaper are the shilling manual on the subject published by the Society for Promoting Christian Knowledge, written by Mr. H. Windham; and the "Elements of Mineralogy," by F. Rutley, F.G.S., published at 2*s.* by Thos. Murby, 32 Bouverie Street, Fleet Street.

W. JOHNSON.—The last edition of the "Micrographic Dictionary" was the third, published by Van Voorst. You had best apply to Dr. Cooke, editor of "Grevillea," for information respecting the present state of our knowledge of freshwater Algæ.

Q. M. S.—A really good ¼ inch objective is all that is necessary for an ordinary student. To carry an original research and investigation, an ⅛th is necessary; but we think that at present you would find the latter of more trouble than use. The German eighths have not so high a repute as the English.

DR. W. T. KING.—The neighbourhood of Ipswich is one of the best in England for microscopical material of all kinds.

PHILIP MCK.—The object you sent us is the limy, nodular masses usually found at the base of *Corallina officinalis*, a well-known lime-secreting seaweed; and the soft (now dried up) and bristly part is a young sponge.

H. W. D.—*Lappa major* belongs to the Natural Order of Compositæ, and *Erianthis* to the Natural Order of Ranunculaceæ.

J. P. THOMPSON, (Portland, Me., U. S. A.)—Only 2 parts of Dr. Donkin's work on the Diatomaceæ have appeared as yet. The publisher is John Van Voorst, 1 Paternoster Row, London. Neither Saville Kent's "Infusoria" nor Dr. Braithwaite's "Sphagnaceæ" have yet been published, but we understand they are well in hand.

J. T. BROWN.—The letters F.R.S. and others, denote Fellows of various incorporated and chartered scientific societies, and they are obtained by scientific men who are elected by ballot on account of their researches, discoveries, or ability in the various sciences.

EXCHANGES.

A SMALL collection of butterflies (45 species) for Coleoptera.—C. H. Goodman, Lesness Heath, Kent.

FOR exchange, one Herbarium, 700 specimens, many rare, Alpine, &c. Offers wanted. Catalogue will be sent. Address A. Macindoe, Maryhill, N.B.

OFFERED, Withering's "Botany" in four volumes, for Hooker's "Flora."—H. P. Russell, Manor House, Plumstead.

FOR exchange, about 50 species (90 specimens) of North American Coleoptera, including the Colorado potato beetle *(Doryphora decemlineata)* for works on Natural History, and microscopic slides.—Joseph Anderson, jun., Alve Villa, Chichester, Sussex.

BRITISH shells. A collector will be obliged by the etymology of Maugei (*Testacella Maugei*).

FIRST-CLASS sporting rifle, long Snider, long stocked, London made, offered in exchange for good telescope, or magic lantern, or microscope.—E. Edwards, 8 St. John's Cottages, Penge.

WANTED, pure gathering of Diatomaceæ, exchange books.—E. Edwards, 8 St. John's Cottage, Penge.

OFFERED, first twenty parts of "European Butterflies and Moths," by W. Kirby, unbound, quite new for half price, cash.—H. C. Wilkie, 4 Pemberton Terrace, Holloway.

PEREGRINE falcon, kite, honey buzzard, tawny owl, Tengmalm's owl, snow bunting, raven, crane, woodcock, &c. Desiderata—Rare sea birds' eggs, also sandpipers' and plovers' eggs. Send for full list.—D. Cooper, 17 John Street, Clayton-le-Moors, near Accrington.

WANTED, a good polariscope in exchange for gold dice, suitable for watch-guard, and cash. Address, "Microscopist," care of J. Uttley, Esq., 21 Adelaide Road, Haverstock Hill, London, N.W.

FOR exchange, &c., Browning's 22*s.* spectroscope, "How to work with the Spectroscope," "How to Choose a Microscope," Cassell's "Countries of the World," parts 1 to 33, Cassell's "Science for All," parts 1 to 25, a number of "Popular Science Review," Tennyson's Cabinet Edition, 10 vols., Henry and Scott's "Commentary," 6 vols., half calf. Address, G. Freeman, 6 Macduff Terrace, Danby Street, Peckham, S.E.

IN exchange for scientific works or apparatus, Elisée Reclus' "La France" and "L'Europe Méridionale," 2 vols., half calf, cost nearly £4. Nearly 2000 pages of matter, 15 coloured maps, 142 engravings, 408 maps in text; equal to new.—F. Timbrell, Stafford Villa, Selwyn Road, Plaistow, E.

BRITISH shells. A collector will be glad to exchange duplicates. Wanted, Ianthina, Mangelia, Odostomia, &c.—J. W. Cundall, Carrville, Alexandra Park, Redland, Bristol.

OVA of Hermit Crab (*Pagurus Bernhardus*), mounted in fluid for paraboloid, in exchange for other ova similarly mounted, or zoœa forms of Crustacea.—Edward Lovett, Holly Mount, Croydon.

WANTED, a pocket Babington's "Flora" last edition, for an ordinary one 7th ed., 1874, as good as new; would pay the difference in price, or what offers for it?—Address, A. E. Lomax, 41 Church Road, Tranmere, Birkenhead.

Helix obvoluta and *Pupa ringens* offered for *Helix revelata*, or the two Testacellas—and duplicates of the following good British land and freshwater shells are offered in exchange for other desiderata, *Lim. Burnetti*, *Succinea oblonga*, *Vertigo pusilla*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. moulinsiana*, *V. angustior*. Desiderata, good foreign land shells, and named British birds' eggs.—W. Sutton, Upper Claremont, Newcastle-on-Tyne.

A GREAT variety of material, &c., for the microscope and otherwise, useful to the marine zoologist, for Johnston's "History of the British Zoophytes," popular edition.—E. Matthews, 40 Ponsonby Place, Vauxhall Bridge, London, S.W.

WANTED, cabinet for 1000 micro-slides, also some limestone rock-section cuttings, in exchange for good fossils, minerals, and rock specimens; also wanted, classified Foraminifera, recent or fossil, for fossil ditto.—E. Wilson, 18 Low Pavement, Nottingham.

RICH scrapings from Hilbre Islands, Cheshire, full of Foraminifera, also small specimens of Australian zoophytes for microscope, in exchange for good slides of diatoms, &c. &c.—B. B. Scott, 24 Seldon Street, Kensington, Liverpool.

WELL-mounted slides of Podura scales (test) Lepisma, Bramble brand, and others in exchange for slides of interest.—T. Forty, Well Street, Buckingham.

WILL exchange *P. Cratægi*, *P. Brassicæ*, *P. Sabellicæ*, *G. Rhamni*, *Hipparchia Pamphilus*, *H. Janira*, *H. Ægeria*, *H. Tithonus*, *V. Urticæ*, *V. Atalanta*, for small living reptiles (except the newt, toad, and frog).—H. C. Brooke, 45 Union Grove, Wandsworth Road, S.

As I intend during the coming summer to make micro-fungi my especial study, I should be glad to correspond with some mycologist with the view of exchanging specimens (mounted or unmounted), and for mutual improvement.—George T. Harris, Long Street, Atherstone, Warwickshire.

L. C., Nos. 66, 104, 109, 133, 146, 176, 527, 556, 611, 682, 704, 767, 769, 820, 831, 838, 975, 988, 998, 999, 1001, 1130, 1483, 1485, 1519, and others, in exchange for other rare species. Send lists to T. Tempere, 249 Moss Lane, Manchester.

LIVING specimens of *Cypris vidua*, plant hairs, scales, brilliant Indian beetle (*Mimela Horsfieldii*), and other unmounted material, in exchange for microscopic slides. Foreign Lepidoptera also wanted.—M. Medhurst, 1 Gladstone Road, Liverpool.

FOR slide of ceramium with diatoms (*Grammatophora marina*) in situ. Send good slide to R. Smith, 30 Great Russell Street, Bedford Square, W.

WANTED, any British Orobanches (Broomrapes) except minor, especially in a fresh state. Will give rare living, or dried British plants for above.—A. B., 107 High Street, Croydon, Surrey.

WANTED, recent volumes of the "British (or any other good) Journal of Photography" in exchange for foreign insects or other micro material.—H. M., Anglesea Lodge, Godalming, Surrey.

FOR six slides of fossil sponge spicules all new to science, send six slides of recent or fossil spicules to J. Smith, 94 Dundas Street, Glasgow.

SLIDES of *Phthirius pubis*, &c., in exchange for selected diatoms, forams or anatomical slides. Send lists to A. Stokes, Vestry Hall, Paddington, W.

FORAMINIFERA from the west coast of Ireland (several species) clean and beautifully mounted in balsam, for interesting mounted objects.—John Butterworth, Goat's Shaw, Oldham.

WANTED, *Pilularia globulifera*, *Lycopodium annotinum*, *Lycopodium inundatum*, and *C. Selaginella selaginoides*, all with fruit; also fronds (fertile) of *Polypodium alpestre*, *Cystopteris angustata* and *montana*. Foreign fern roots or fronds in exchange.—Miss Ridley, Hollington, Newbury.

PARASITES of the horse, mounted, for any other interesting well-mounted slide or slides.—Alfred Tozer, Jackson's Row, Manchester.

WANTED, British birds' eggs, will exchange fossils, minerals, or deposit of large foraminifera.—A. D. H., 53 Sheriff Street, Rochdale.

A PIECE of the fresh skin of a hedgehog, with many spines on it, and two fleas from same. Send any micro material and stamped addressed envelope to R. E. H., 130 Sowerby Street, Moss Side, Manchester.

DUPLICATES — Flavicornis, Oxycanthus, Pilosaria, Chi, Lemophearia, Rupicaprarea, &c. Desiderata—Dentina, Oo, Nigrocincta, Sylvinus, *T. Cratægi*, Falcula, &c. Or offers in Coleoptera (British).—List on application.—H. B. Pim, Kingswood Road, Upper Norwood, S.E.

WANTED, Hincks' "Hydroid Zoophytes," Busk's "Catalogue of Polyzoa," parts 1 and 2, SCIENCE-GOSSIP, vols. 1873, 74, 75, 76, 77, Dana's "Mineralogy." Exchange in standard geological and chemical books and cash.—James C. Christie, Hamilton, N.B.

FOR exchange, the following lepidoptera: Machaon, Lathonia, (European), Stellatarum, Convolvuli, *Filipendulæ, *Populi, *Ligustri, *Dictæa, Prunaria, *Chrysorrhœa, Chi, *V. aureum* (*pulchrina*) Tiliaria, *Derivata (marked * bred) for "The World of Wonders," (new and revised edition), Cassell & Co.—Joseph Anderson, jun., Chichester, Sussex.

CLEAN gatherings of Diatoms, Foraminifera, from estuarine clays, and mounted slides, for exchange.—William Gray, Mountcharles, Belfast.

BOOKS, ETC., RECEIVED.

"Fossil Men and their Modern Representatives." By J. W. Dawson, LL.D., F.R.S. London: Hodder & Stoughton.

"Science Primers: Introductory." By Professor Huxley. London: Macmillan.

"Report of the Commissioners of Agriculture for 1877," Washington, U.S.A.

"Illustrations of the Cretaceous and Tertiary Plants of the Western Territories." Washington, U.S.A., 1878.

"Popular Science Review." April.

"Midland Naturalist." April.

"Land and Water." April.

"Journal of Applied Science." April.

"Catalogue of the Publications of the United States Geological Survey of the Territories." 3rd edition.

"The Antiquary." April.

"Le Monde de la Science," &c. March.

"British Dogs," parts 8 and 9. London: "Bazaar" Office.

"Canadian Entomologist," No. 2.

"Scottish Naturalist." April.

"Feuille des Jeunes Naturalistes." April.

"Annual Report of North Staffordshire Naturalists' Field Club," 1879.

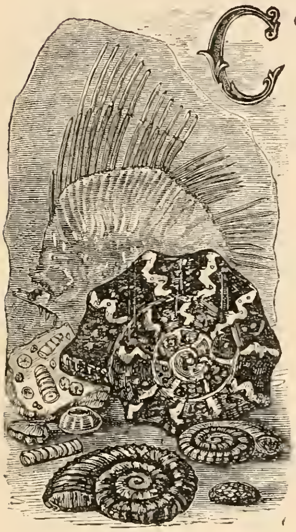
"Notes of Observations on Injurious Insects." London: W. S. Sonnenschein & Allen.

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 9TH ULT. FROM:—J. F.—P. K.—R. A.—R. A. W.—E. E.—L. A.—M. E. P.—M. P.—A. J.—W. G. C.—W. G.—R. O. K.—J. P. T.—J. T. A.—C. H. G.—A. M.—H. P. R.—J. A.—W. H. N.—A. B.—G. T. H.—W. H. M.—J. C. T.—H. C. B.—T. B. B.—A. P.—R. S.—T. F.—M. M.—B. B. S.—R. A.—J. T.—E. W.—J. W. C.—W. G.—E. M.—F. T.—J. M. V.—A. B.—W. D. S.—E. L. B.—G. F.—J. G. T.—C. L. W.—G. C.—J. F. U.—H. G. B.—D. C.—E. L.—J. C. M.—T. S.—G. M.—J. L.—J. M. C.—C. H. S.—F. K. R.—E. W.—G. S. W.—A. S.—W. K.—G. G.—R.—H. W. D.—J. S.—H. B. P.—M. H. R.—A. D. H.—J. C. C.—S. C. G.—A. T.—P. Q. R.—&c.

IN WILD CONNEMARA.

By G. C. DRUCE, F.L.S.



COMMENCING at Westport our hundred miles walk through Connemara, by visiting the demesne of the Marquis of Sligo, we gathered on our way, *Œnanthe crocata* and *Lachenalii*, *Circæa lutetiana*, and *Chrysosplenium oppositifolium*—the latter not altogether above suspicion of being one of the carnivora, for its hairs held captive several insects. A bridge over the river was a lovely sight, from the profusion of *Scolopendrium*, *Trichomanes*, and *Ruta-muraria* with which it was covered. The shores of Clew Bay yielded *Silene maritima*, *Armeria*, and *Senebiera didyma*. The view of the bay was at first disappointing, but as we ascended the heights above the bay, its hundred islands, which looked like the mainland before, now assumed their true character, and from their number and variety of shape and size produced a very striking effect.

Westport appears to be a rapidly diminishing town, and its ambitious-looking quays and harbour are but now of slight use. It has a very good hotel, and a little brook (planted on either side by trees) runs before its door, gives it a picturesque appearance, but generally speaking the houses are very bad indeed, possessing no garden or chimney. The roofs, however, support a great number of plants, such as the oat, mustard, herb robert, and even, in some places, potatoes. But leaving Westport, on our course to Leenane, we began to pass through country of a more truly Hibernian character; peat-walls bounding the road, by whose side deep dykes of water furnished habitat for plants which cultivation has rendered scarce in our own island.

Beyond the dyke and turf wall lay the bog, covered (and this is true of almost any bog through Connemara) with the beautiful *Anagallis tenella* in the utmost abundance—a beautiful sight, with its delicate, waxen-like corolla. Amid the water, showing its beautiful blossoms, was *Hypericum Elodes*. Then *Pinguicula lusitanica*, a most eager insect-eater, its small leaves being curled up over a mass of débris, and the bright spikes of star-like flowers of *Narthecium ossifragum* were also common, while *Drosera rotundifolia*, *intermedia*, and *anglica* were covering the turf. *Anglica* appeared to be the great carnivorist, the quantity of viscid secretion poured out from its glands being most extraordinary. The heaths *Tetralix* and *cinerea* were, of course, plentiful; and, thickly growing over the whole of the boggy land, the bright-looking *Rhynchospora alba*, with the sombre *Molinia cærulea*, formed by no means an unpleasant contrast, while the strange *Schœnus nigricans* made up in variety what it lacked in beauty. But surpassing these were the great waving plumes of *Eriophorum angustifolium* and *vaginatum*, which were also very common. Add to these the eye-purging Euphrasy *E. officinalis*, *Juncus squarrosus*, *compressus*, and *acutiflorus*, *Ranunculus flammula*, *Epilobium palustre*, *Stachys palustris*, *Senecio aquaticus*, *Lythrum salicaria*, and *Filix-fœmina*, and some idea may be formed of the rich profusion of uliginal and paludal plants which were continually in view. We were too late for the *Carices*, but some specimens of *binervis*, *pulicaris*, *stellulata*, *ovalis*, and *flava* were still to be found. About four miles from Westport a more than usually deep dyke attracted notice, and soon we saw the lovely bells of *Dabeocia polifolia*, the delicious colour of its flower with the cottony under-surface of its leaves, glossy green above, was viewed for the first time with great delight. The peduncles were thickly strewn with viscid glands, on which several insects were usually fastened. In this same dyke, too, we saw our first *Osmunda*, and a magnificent specimen it was—some four or five feet high. On an old wall were some tall *Cotyledon umbilicus*, afterwards scarce in Connemara, and beyond, in a wet meadow, *Carduus pratensis* was growing among masses of *Stachys palustris*, *Senecio Jacobæa*, and *Lythrum Salicaria*, the latter three being the cornfield weeds in western Ireland. *Hydrocotyle*, *Viola palustris*, and *Lycopodium selaginoides* were then found, and shortly after *Myriophyllum spicatum* growing in the dykes. On the margin of some nameless lough we found the pretty *Alisma ranunculoides* rather plentifully, and great masses of white and yellow lilies were growing in the centre, while the borders were fringed by tall growths of *Arundo Phragmites*. Continuing our course we at length reached the Erriff valley, very finely bounded on one side by hills rising in graceful outlines, on whose slopes were some fine effects of light and shade. On our right, glowing in rich colour in the bright sunlight, stretched great tracts of moorland to the conical top of Croagh Patrick far in the distance. But few trees, save "wet shot" alder, had been seen, so the little shady wood of Erriff was a welcome sight, and the scenery became very pretty as we rounded the head of Killery Bay, surrounded as it is by some fine outlined hills. As soon as we caught the sea-breeze, appeared *Sedum anglicum* and *Saxifraga umbrosa*, *Lysimachia nemorum*, and, nearer the beach, *Triglochin maritimum*, *Atriplex littoralis*, *Glaux Armeria*, and other maritime plants. Leenane seemed very far off, and the miles unusually long as the road wound round bays and headlands to an almost interminable length for weary pedestrians, but Leenane's quiet hotel was at length reached after our twenty-four Irish miles walk.

A morning's ramble resulted in the find of *Ceterach officinarum* on Leenane Bridge; *Plantago maritima* and *Coronopus*, *Silene maritima* on the beach. On the hill behind the hotel, from which a lovely view may be had of Killery Bay, we found *Hypericum pulchrum*, *humifusum*, and *Androsæmum*, *Polygala vulgaris* and *Lotus major*. In a ravine some naturalized *Tanacetum vulgare* was growing. The walk after breakfast by the side of Killery Bay was very delightful, Mweelrea looking admirable across the bay, the road from Leenane to Kylemore lying over hilly moorland with loughs at frequent intervals and glorious prospects of sea and mountain scenery. Among the plants we gathered in this walk were *Scirpus Savii*, *Saxifraga umbrosa*, *Silene acaulis* (at low elevations), *Scirpus pauciflorus*, *palustris* and *cæspitosus*, *Utricularia minor*, whose insect traps were objects of much curiosity, *Menyanthes trifoliata*, *Comarum palustre*, *Carduus pratensis*, all the *Droseræ*, and a double-flowered specimen of *Cardamine pratensis*. The long rooting stems of *Juncus uliginosus*, floating in the peat-holes, appeared most strange.

On entering Kylemore Pass we were certain it would not equal the Scotch passes, but as we proceeded the charms of Kylemore so increased that eventually we said it equalled, and at last exceeded even the Trossachs, which it much resembles in general character, Ben Venue's place in Kylemore being occupied by the Diamond Mountain (so called from crystals of carbonate of lime of very clear colour being found nearly at the top), while Kylemore Lough offers attractions as great as Loch Achray, though we are bound to say in Kylemore there is no Katrine. In botanical treasures Kylemore is most interesting, among the more showy being *Dabeocia polifolia*, *Hypericum Androsæmum*, *Ulex Gallii*, *Lythrum Salicaria*, *Orchis maculata*, *Asperula odorata*, *Lysimachia nemorum*, *Lonicera Periclymenum*, *Trifolium medium*, *Lycopodium Selago*, magnificent *Filix-fœmina*, *Solidago cambrica*, *Blechnum*, *Rhinanthus Crista-galli*, *Melampyrum pratense*, *Hypericum humifusum*, *Habenaria chlorantha*, *Jasione montana*, and by the lake, *Nymphæa alba*, *Lobelia dortmanna*, and *Peplis Portula*. From Kylemore to Letterfrack, where we had diamonds from the mountain offered us, and from thence to Clifden, yielded but few fresh plants, *Scirpus setaceus*, *fluitans*, and *Myosotis cæspitosa* being seen, but the walk was through country of a very picturesque character, with its streamlets bordered as thickly with *Osmunda* as our English ones are with *Epilobium*, the *Dabeocia* being as plentiful as our *Taraxacum*, so it could not prove uninteresting. On entering Clifden a variety of *Geranium robertianum*, closely allied if not identical with purpurea, was noticed.

Clifden was the termination of our second day's walk, it being about nineteen Irish miles from Leenane. Clifden, like so many Irish towns, showed too plainly the effects of emigration; but little wonder was excited at that emigration, considering the miserable state of the population. The cabins we had passed excelled in wretchedness anything we had deemed possible, a chair being frequently the only furniture, and that more usually occupied by hens than the proper inhabitants, who seemed to prefer the mud floor as a resting-place, and solaced themselves (we refer to the aged female portion of the community) by smoking a short clay pipe. The window was often but of one pane, and in several cases that was stopped by rags, no chimney, the smoke choosing the door rather than the hole in the roof for an outlet, and the interior filled even in summer with peat-smoke to such an extent as to make a stranger's eyes water; perhaps, in some way, accounting for the frequency of purulent ophthalmia, with which many of the children were afflicted. The dress of the people was certainly not unventilated, nor did it consist of more than was absolutely necessary for the sake of decency, yet, notwithstanding, they seemed as cheerful as could be expected, considering "their contiguity to the melancholy ocean." Nor, the eyes excepted, did they seem to suffer much in health from the neglect of the simplest sanitary laws, resulting from the presence of porcine residents or too frequent visits of anserine guests. At Clifden, however, the people were more fully clothed, and the houses better and cleaner, whitewash being frequently indulged in, and this we were glad to see, for in Connemara whitewash and prosperity are said to go together.

THE EFFECT OF SCIENTIFIC SOCIETIES UPON OUR NATIONAL CHARACTER.

By F. W. Morriss.

THIS subject is one of great importance, and well worthy of the attention of all connected with scientific societies. In considering the subject it is needful to form a clear idea of the noblest character a nation can possess.

The word "righteousness" seems to me to convey the best idea, as being the result of the right use of reason, the primary cause being the proper education of the mind.

The national character is neither derived from the rich, nor from the poor alone. All grades of society, from the royal household to the ploughman's cottage, perform their part, and are engaged in the construction of that vast edifice, the beauty and safety of which will be according to style of workmanship and quality of material employed. Every individual has, more or less, his or her share in the work. The working-man is generally dependent upon himself for the amount of true happiness that falls to his lot, that is to say, the business which provides for himself and family their necessary daily wants, is bound to be performed on honest grounds; for on the one hand, he finds the laws of his country demand it, and on the other, his friends would desert him if he were dishonest, and poverty would be his reward. So the working-man has a certain amount of restriction to endure in his business hours which forces him to adorn his character in a becoming manner, to suit his employers or customers. Now, in his recreative hours there is not *materially* the same amount of restriction upon him as in his working hours. It is for him to use his spare time as to him seems best. It is, then, in his recreation we find all the influences of vice and folly offering themselves in disguise to his mind.

On tracing the history of humanity from the time when Rome was mistress of the world, to the present day, we may notice how greatly the national character depends upon what man does in his recreative hours. The Roman youth, who were given more to the study of their bodily improvement, produced a nation for a time to be feared by all the known world; but this was only for a very, very short time. The present and more enlightened generation have found there must be something far more substantial than a rod of iron.

It is not for me to name the many noxious habits man is so liable to fall in love with in his spare time, but our great authorities are ever telling us of many things which, in their sight, they consider liable to diminish our good character. Lovers of microscopy often find that this science utterly drives away cares, which a short time before were attempting to sadden their days. The mind is made to receive knowledge, and the weakest will endeavour to gain a certain share of it. To examine and unravel the mysteries of the infinitely small and the infinitely large; to become acquainted with the varied flowers that strew the fields, and the tiny insects that fill the air with their vibrations; to search the rocks and there find engraved the past history of the world, are fountains of knowledge for the mind—the pursuit of these studies also performs an influential part in securing healthy exercise for the body.

In comparing the exercise of our reasoning faculties with the gymnastic exercises of the body one very great difference is discernible—while the mind is being subservient to the process, it is at the same time unconsciously receiving food, while the body can only perform one feat at a time. Happily the study of natural science has the property of giving needful exercise in conjunction with mental nourishment. It is in youth, when all the faculties of the mind are vigorously expanding, that we find the foundation of a man's future character. It is to youth we have to look for the future national character. We may ask if our various scientific societies are receiving the attention they deserve? Are our men of science doing all that lies in their power to encourage those, in a lower social position than themselves, to give their minds to scientific pursuits?

Scientific knowledge taught at school is learned with various success. Still, many a youth who has spent weary hours over his Latin, Greek, and Euclid, has only by the study of natural science been made a man of high mental powers. I do not agree with a recent communication to the "English Mechanic," in which a correspondent expresses a decided objection to the idea of our scientific societies being made scientific schools.

The effect of a scientific society upon its individual members depends greatly, in the first place, upon those who occupy the most prominent position.

There must be experienced in its workings that vital energy of its officers and original members which makes itself felt by all connected. The young man of business who has his attention particularly drawn to the microscope or any other of the sciences is so greatly impressed with the new field of thought so brightly dawning upon him, that he invariably desires to gain more knowledge upon the matter—to see further into those secrets, and the more he sees the greater becomes his curiosity. At a certain stage in his study, however, he is no longer able to get on without company, and should he be so successful as to live in the neighbourhood of a society he has there his wants supplied.

The first thought of sharing with others his own knowledge and not keeping it stored up in his own mind was a good lesson, but, the greatest lesson of all is when his study forcibly urges him to reason in the matters of life, and so demonstrates to him the only sure basis whereon he may found a higher character.

There are many good social habits always tending to result from these societies. At the usual meetings there is a unity of purpose, of general amity; party is a word unknown—sect is out of the question—rich and poor know no distinction.

The members are brought together through the society established for the advancement of a certain science, and all work with sincerity, for no other purpose than the benefit of the society.

By the foregoing remarks I have endeavoured to point out the effect of our scientific societies on individuals: of course the national effect will be in proportion to the individual members.

Projects are being deduced with the good intent of adding to the welfare of our artisans. Our societies are hardly acknowledged by the politician, and the end aimed at by them is known to few.

It is of the greatest consequence that our youth should be acquainted with the nature of our recreative occupations. I hold that while it is not at present in the power of our public schools to do this, it is a duty devolving more or less upon the members of our scientific societies.

Those who are year after year giving their assistance in the formation of scientific societies, are clearing the road to many neglected branches of knowledge, and are using powerful means for the attainment of a higher national character.

THE RUSTIC BOTANIST.

HOW delightful is the season of spring, when all nature seems awakening from its long winter's sleep! We purpose, however, now to treat of our common flowers, especially those noted for their "virtues." Though little esteemed in our time, they were once much used and valued by the ancient housewife. Let us commence with them as follows:

1. The so-called aromatic plants used as spices or perfumes. 2. Plants used in the rustic medicine. 3. Culinary or edible plants. We trust a short history of their various characters may be a kind of gossip such as you will not despise.

1. The aromatic plants used as spices or perfumes. Of the former we have but a meagre list, and cannot rival those of the East; but with respect to the latter, we think we may satisfy the most delicate olfactory organ. For instance, the lily of the valley, the sweet dame's violet, the wallflower, the rose, and the sweet-scented violet, with many others of Flora's gifts.

In the order Gramineæ, we have the sweet anthoxanth, vernal grass (*Anthoxanthum odoratum*). This grass forms a large proportion of many meadows and pastures. In drying, the plant exhales the odour of woodruff, and is the chief cause of the fragrance of new hay, hence its English name; it is included in a different class from most other grasses. Sir James Smith, in his "English Flora," mentions that Mr.

Fig. 70.—Holy Grass (*Hierochloe borealis*).

Brown traced a great affinity between this grass and *Hierochloe borealis*. The holy-grass is said to be used on high festivals, for strewing the churches of Russia, as *Acorus Calamus* has time out of mind been employed in the cathedral and streets of Norwich, on the mayor's day. The sweet flag (*Acorus Calamus*) grows by the banks of rivers, also in ponds and other wet places in England. All parts of the plant, but especially the rhizomes, have a strong aromatic and slightly acrid taste ; hence it has been used as a stimulant and mild tonic ; by confectioners as a candy, and by perfumers in the preparation of aromatic vinegar, and other perfumed articles. The flowers are rare. Withering speaks of the *Acorus Calamus* as the "myrtle flag, sweet-smelling flag, or *Calamus*, sweet myrtle grass." He also remarks, "The roots powdered might supply the place of our foreign spices." It is our only native truly aromatic plant, according to Linnæus. The Turks candy the roots, and think they are a preservative against contagion. Neither horses, cows, goats, sheep, nor swine will eat it.

Fig. 71.—*Angelica sylvestris.*

Fig. 72.—Elecampane *(Inula Helenium).*

In the Sedge family, we have the English galingale (*Cyperus longus*). This plant is not found out of England ; the root is very aromatic and astringent. As it is rare, we will say no more about it.

Sweet gale, or bog-myrtle (*Myrica Gale*) is the favourite of the Gaelic maidens, who like to wear it as a button-hole bouquet for its sweet smell. The berries of this plant are very small, covered with resinous dots, exhaling a delightful fragrance when rubbed between the fingers : the leaves are fragrant from the same cause.

Linnæus tells us that "The northern nations used this plant instead of hops." The catkins boiled in water throw up a waxy scum, which gathered in sufficient quantities would make tolerable candles, like those of *Myrica cerifera*, or candle-berry myrtle. Gathered in autumn it dyes wool yellow ; it is used both in England and Wales for that purpose.

There are plants often found on the sites of ancient homesteads and such places, no doubt cultivated by our rude forefathers for their real or supposed virtues, or various other good qualities. Among these we meet with many of the Umbelliferæ. Sweet cicely (*Myrrhis odorata*) is one of the earliest flowering, sweetest, and handsomest of the umbelliferous tribes. It is found near houses, in orchards and waste places : it is called by the local names of sweet cicely, great sweet chervil, and sweet fern. The whole of the plant has a strong aromatic scent. The seeds are of an agreeable taste, having the flavour of anise. Mr. Woodward states, that "the seeds are used in the North of England, for polishing, and perfuming oak floors, and furniture." The root is fleshy, sweet, and aromatic.

We would next mention the great Master-wort (*Peucedanum Ostruthium*). This fine rare plant often occurs with the Myrrhis on moorland sites. It is also a genus of the Umbelliferæ family. The root is fleshy, tuberous, somewhat creeping, of an aromatic, and acrid quality; long supposed a sovereign counter-poison, and celebrated as a powerful external, as well as internal remedy in various disorders.

Angelica (*Angelica archangelica*) received its name as a record of the angelic virtues possessed by some of the species, for not only was it a singular remedy against poison, &c., but was considered to be invaluable against witchcraft and enchantments. Its tender twigs make a fine canopy, and a friend has known the plant brought to market, to be sold to the confectioners for that purpose. Elecampane (*Inula Helenium*) is the *Marchalan* of the Welsh. It is a

Fig. 73.—Common Comfrey *(Symphytum officinale).*

genus of the composite plants. The root has an aromatic camphor-like taste, due to the presence of a dry crystalline substance called helenin, allied in chemical constitutions to creosote. It also contains a quantity of starchy material called inulin. Elecampane was formerly much used as an aromatic tonic. The root is esteemed a good pectoral, and like the Angelica root is candied, as also are the eryngo and comfrey root; the latter is also used as a fomentation.

Symphytum officinale, the common comfrey, is a well-known plant, having much the taste and properties of borage, for which it has not unfrequently been substituted in the old English cool tankard, and amongst herbalists it was highly extolled as a cooler of the blood. In Shakespear, allusion is thus made to the sea-holly (*Eryngium maritimum*) by Falstaff. "Let the sky rain potatoes; let it thunder to the tune of *Green Sleeves;* hail kissing-comfits, and snow eringoes." (*Merry Wives of Windsor*, v. 5). Gerarde tells us that eryngoes are the calcined root of the holly, and he gives the recipe for candying them.

Fig. 74.—Tree-Mallow *(Lavatera arborea).*

The broad-leaved groundsel (*Senecio saracenicus*) is another of the composite family; this plant is sometimes found in similar situations to the above; what are its exact virtues we do not know.

The sea tree-mallow, (*Lavatera aborea*) growing in a wild state upon maritime rocks, a rare plant, though often cultivated in sea coast cottage gardens, contains (like the best of the mallows) an abundance of mucilaginous matter.

Sweet leaf (*Pyrethrum balsamita*) and Alecost

(*Balsamita vulgaris*) are not British plants, but in some districts, as the Isle of Man, abound near old cottages—the former cultivated probably for its colour, the latter as a substitute for hops.

We shall hope to resume this subject in a future paper. We would observe, in conclusion, that not only are the bright flowers with their fragrant perfume grateful and pleasing to man, but also to the insect world, and most useful to the plants themselves. For further information on this part of our history we would refer the reader to Dr. J. E. Taylor's book, "Flowers: their Origin, Shapes, Perfumes, and Colours."

ELIZABETH EDWARDS.

NOTES ON THE COMBS OF BEES.

THE sight of bees' combs always excites admiration, but few or none have described exactly how the hexagonal cells are formed. I paid some attention to this subject lately, the results of which accord with what I said respecting it some years back in the "Gardener's Chronicle." This was noticed by some of our leading apiarians, and among them was the late Mr. Taylor. He objected to what I said respecting bees collecting wax from plants, and also that some of them ejected wax from their mouths when comb-building. I replied that I took the hint of bees frequenting plants (especially common laurels) after wax, from the first edition of his own "Book on Bees," and as to the other, that I was as sure of the insects ejecting wax from their mouths as I was of their secreting it through the segments under their abdomens in form of small scales. These may be seen on the bottoms of the hives, even by a casual observer; and they led Hunter to consider that beeswax was a secretion of oil from them, and not of vegetable origin. But be that as it may, wax is the chief material of which the combs are made. But when bees are forming the cells, they are covered or hidden by the dense mass of clustering ones which keep up the heat required to keep the wax flexible, and obscure the light. Therefore, it is only when bees are working upwards in bell glasses, especially on a warm day, without clustering, that one can get a glimpse of the cell builders. I have had several good opportunities of this, and mention without scruple that the insects eject wax through their mouths in a frothy state, and it oozes out between their mandibles, while with these forming the cells. The bases of these are patches of wax, perhaps mixed with propolis, daubed on where the combs are fixed, and on which the cells are begun. Their first rudiments are triangles, formed by a peculiar appendage in the bees' mouths, having joints at the angles, which open and close as they proceed with the cells. When not in use this appendage is of a triangular shape, is serrated, and may be mistaken for the insect's fore-legs. I had the first glimpse of this curious thing, which, to suit my purpose, I call a pair of compasses, while watching a queen hornet making her nest. The rudiment of the first cell was a triangle, and soon five more were added to it. When the lonely insect was at work with her forceps or mandibles, I observed she kept moving a curious appendage in her mouth, shaped exactly like that noticed of the bee. I mention both in particular because I consider that upon both hangs nearly the whole mystery of bees', hornets', and wasps' construction of their hexagonal cells. I need hardly observe that by such form there is no space or room lost in the combs.

If asked how the drone's cells are made larger, at present I can only say the insects open their compasses a little wider while at work; and when so on queen cells, they use their mandibles only, as doth the humble bee, whose cells are found, like those of the queen of the hive, except the mouths. These are downwards, and are made of tougher materials than the hexagonal cells. There seems to be a portion of propolis in them; they are built on the edges of the combs, they vary in number from six to twelve, and are never occupied except by the larvæ of the females, which attain the insect state during the swarming season, in order to lead the swarms off and thus establish fresh colonies. I may mention that propolis is a resinous substance which bees collect from trees, and carry home on their hinder legs as they do pollen. It may be called bees' cement, because they use it to close up the little crevices and to seal down the bottoms of their hives.

J. WIGHTON.

NOTES ON THE NESTS OF EUROPEAN TRAP-DOOR SPIDERS.

By G. H. BRYAN.

[*Continued from page* 61.]

THE third type of wafer nests I have to mention is constructed by *N. Eleanora*. It constructs what is termed the double door unbranched nest, the tube of which is not branched, but contains an inner door (fig. 75). This latter is somewhat circular in form, but straight at the hinge (fig. 75*b*). I observed that the tube is slightly swollen just below this, so that when the door is opened, it falls into this enlargement, leaving the passage of the tube unobstructed (fig. 75, 6*a*). This curious peculiarity I have not seen mentioned elsewhere.

The *N. congener*, found at Hyères, builds a remarkable nest. As all trapdoor spiders build on a sloping bank so that the outer door should shut by its own weight, I need not say that this one does so, but in this case, the spider makes its tube horizontally for about two inches, when it suddenly turns vertically downwards, while a branch turns upwards at the same point (fig. 76, 7). This point of junction is closed by a very wedge-shaped door, the narrowest point of which is at the hinge (fig. 7*b*), which door being fixed at the uppermost point of junction can be used for shutting off the entrance passage or the upper branch (fig. 7*a*).

Our next example, *N. Manderstjernæ*, constructs a still more complicated nest (fig. 77, 8). It may be said to consist of two tubes, one of which descends from the door and forms a cavity, the other coming from near the surface of the ground meets this close to its base and then continues for some inches further into the ground (fig. 77). At the point of junction of the two tubes is the inner door, which is very long, and may either divide the two tubes, or cut off the upper part of the long tube which forms the branch (fig. 8*a*). This door is easily mistaken for part of the tube, as it is much grooved on its upper surface (fig. 8*b*). Strange to say, the bottom part of the external short tube (called the cavity) is often filled up in the nests of old spiders, as if they have no further use for it.

The only protection the cork spiders have against their enemies, is the manner in which their tight-fitting door is concealed, as well as the firm grip with which they hold it when danger is suspected. But suppose an enemy detects one of the nests last described, and succeeds in entering, the spider rapidly closes the inner door, and the enemy—say a centipede—probably walks to the bottom of the cavity, supposes the next untenanted, and returns by the way it came; the spider remaining meanwhile comfortably ensconced in the inner part of its dwelling. Next, suppose the inner door to be detected, the spider would hold it to, with all its force and if its strength were then overpowered, pull the door back, and retire within the upper branch. In this case the enemy would either think it had explored the whole tube at last, or another struggle would ensue.

It must be borne in mind, that the females only inhabit these nests, the males of some of the species being as yet unknown. The young spider after quitting the nest of its mother, and while still quite small, builds an exact copy of hers in miniature.

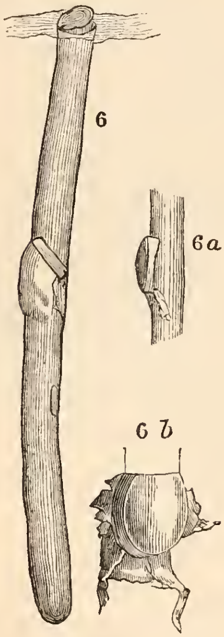


Fig. 75.

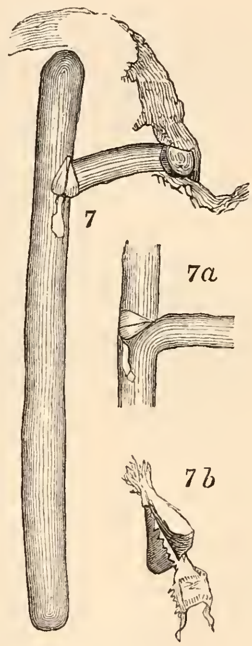


Fig. 76.

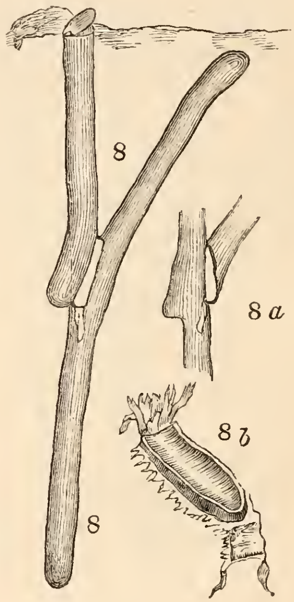


Fig. 77.

I have often cut off the top part of a nest with the door; and on returning to the same spot after a few days, always found the tube closed by a new door.

All these spiders are nocturnal in their habits, and search for food at night. As far as yet known, the European ones do not leave their nests, but only snatch in their prey when it comes within reach; but I have been told by an eminent entomologist, who spent much time in California, that a Californian species (probably *C. californica*) which builds a cork nest, leaves its nest at night, fixing its door open by spinning a silken thread from it to the bank; were it not to do so, these doors fit so tightly that it could with difficulty open it on its return.

THE SALMON DISEASE AND ITS CAUSE.

By M. H. Robson, Hon. Sec. of the North of England Microscopical Society.

SOME analogy appears to exist between the spread of fungoid disease, at present so destructive to salmon life, and the seemingly erratic dissemination of ordinary zymotic disorders, which in their origin may probably be all referable to violations of natural laws.

Unlike, however, the still more subtile characters of many epidemics affecting the human family, or even rinderpest amongst cattle, the vegetable parasite *Saprolegnia ferox*, at present developing itself with such unprecedented rapidity and mischievous results upon fish in English rivers, is of sufficient magnitude to be dealt with by the ordinary powers of the microscope—and its progress may be observed from the germination of the infusorial spore (fig. 78), throughout with a $\frac{1}{4}$th or $\frac{1}{6}$th objective.

The causes ascribed to account for this hitherto unknown outbreak amongst salmon are various, but mostly pointing to river pollution. They, however, so far as I am aware, do not indicate any considerable change of condition or circumstance to which the fish have been subject of late years.

The proximate cause of this disease, and why its ravages should extend so rapidly at this time, is a question of sufficient interest and importance to arrest the attention of all interested in the preservation of our noblest fish and one of the most important sources of food supply. Not that the fungus restricts its attacks to salmon, for many freshwater fish are destroyed by it, and even newts, tadpoles, and freshwater Mollusca are sometimes attacked; this is well known to those who have aquaria, as, despite all ordinary care, it sometimes happens that the finny favourites become fluffy and mouldy; the fungoid pest irritates and destroys the skin, until, seizing upon the gills, the tortured animal can resist the attack no longer—and is soon found floating dead—the fungus developing rapidly over it in woolly tufts.

Amongst salmon in rivers this pest first appeared so recently as the spring of 1878, in the Carlisle Eden, the Annan, the Mitt and the Lancaster Lune, where large numbers of spawned fish (kelts) and also some salmon smelts and trout were found in pools, and floating down the stream dead or dying. Nearly twenty years ago those engaged in developing the ova of trout, salmon and char, found these attacked by a vegetable parasite which effectually destroyed their vitality; this was also to a considerable extent cultivating and disseminating the fungus itself. Mr. F. Buckland thus describes the appearance of salmon killed by this disease: "they are all more or less covered with patches of fungus generally circular in form. The tail is nearly always affected, and often to such an extent that the soft parts are eaten away and the bony rays left quite uncovered. A bunch of fungus is found generally sitting on the head and nose, and hence the diseased fish in the Eden are called 'salmon with white nightcaps.'"

Many years ago the Rev. M. J. Berkeley instanced the genera Achlya, Saprolegnia, Pythia, and Aphanomyces as "notoriously antagonistic to animals, especially those of aquatic habits in a low stage of

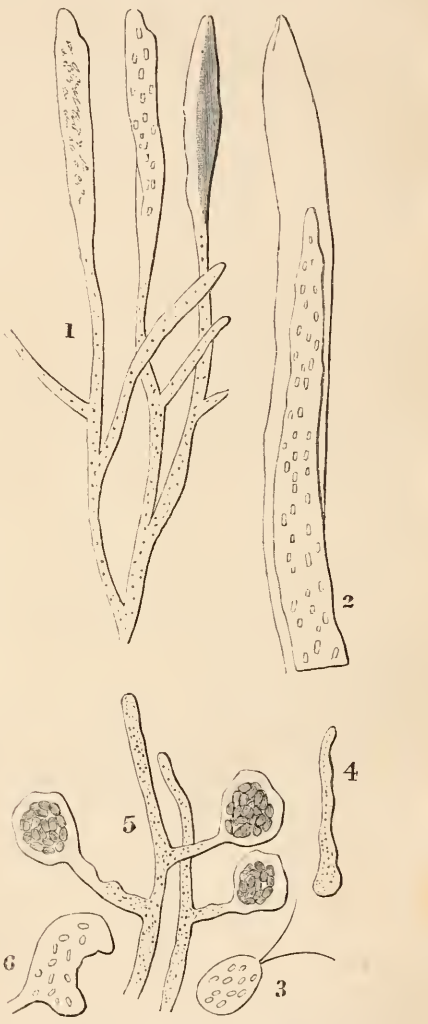


Fig. 78.—Salmon-Disease Fungus *(Saprolegnia ferox)*.

References to Sketches: 1, Group of threads with Sporangia in different stages of growth; 2, Formation of Second Sporangium; 3, Infusorial Spores; 4, Same in germination; 5, Oögonia in various stages; 6, Portion of wall to show the apertures. From drawings by the Rev. M. J. Berkeley, after Pringsheim.

vitality;" of these the genus Saprolegnia appears to be most inimical to salmon life. On account of their aquatic habits, and also from the fact that they emit active flagellated spores from the clavate tips of their threads, which swim freely like Infusoria, they were at one time associated with the Algæ. Mr. Berkeley, however, says "in these lower plants there is a duality or plurality of modes of fructification. Indeed, though the active spores, moving about with one or more lash-like appendages, resemble exactly the reproductive bodies which are so common amongst Algæ, there is now evidence amongst moulds, as in the genera Peronospera (the potato destroyer) and Cysoptus, and still more amongst the Myxogastres, that there are active spores amongst true fungi;" further, quoting Pringsheim's definition of the genus Saprolegnia, he says: "Infusorioid spores formed in the interior of the sporangia and, immediately after their formation, isolated and active without any previous membrane. New sporangia formed by the repeated protrusion of the basal membrane into the old sporangium. Oögonia, containing numerous resting spores (fig. 78)."

To make the history more intelligible Mr. Berkeley describes one or more species of each genus, and says of *Saprolegnia monoica* and *ferox*: "The first appearance is that of delicate white or greyish, nearly equal simple or slightly-branched threads, without any joints, radiating in every direction, and containing a grumous granulated mass. The tips of these threads gradually swell, and after a time a septum is formed at the base, after which the contents are collected into little pellets, each of which, at length, is separated from the rest, and becomes an ovate spore, which escapes by a little aperture at the tip, and is furnished by one or two delicate thread-like appendages, by means of which it is able to move about like an infusorial animal with great rapidity. After a short time motion ceases, and the spore germinates and produces a new plant.

"After the sporangium is exhausted the septum at the base becomes convex, pushes forward (fig. 78, 2) into the vacant cavity, which it more or less completely fills, and produces another crop of spores, sometimes projecting through the aperture of that which was first formed. This process is repeated a third or even a fourth time till the powers of vegetation are exhausted. Now, however, a second form of fruit appears—a form which has been called an Oögonium, because it produces spores which are quiescent and dormant for a time like eggs, and not furnished with motile appendages. Lateral branches are given off for their production which terminate in large globose sacs, which, like the sporangia, are not at first separated by any septum. One, however, is at length formed, and the membrane becomes pierced with numerous apertures."—"Intellectual Observer," vol. v.

The above authorities abundantly show that this fungus is possessed of a plurality of methods of fructification, and that it also produces resting spores which may retain their vitality for an indefinite time; further, it is not strictly aquatic in its habits, but can exist and propagate itself out of water, in fact, is amphibious. It is extremely common amongst flies in autumn, when the insect appears to be gummed to places and covered with a white powdery efflorescence. This is the vegetable parasite in question, known when it attacks the house-fly as *Empusa Muscæ*, but certainly analogous to, if not identical with, *S. ferox*. Mr. Berkeley regards it positively as the latter individual.

The fly by the destruction of its viscera, &c., becomes weakened and unable to move about, but the viscid fluid exuding from the tubular hairs surrounding its pulvilli continues to flow, and the insect becomes glued to the point of attachment by the very secretion which enables it ordinarily to walk on all surfaces and in all positions.

People who make a practice of feeding gold-fish, &c., with flies, may thus introduce into their aquariums a supply of germinative spores sufficient to destroy successive colonies of finny favourites. Some idea of utilising this parasite, so antagonistic to certain forms of animal life, appears to have been mooted in America. The following paragraph bearing upon our subject appears in the February Number of Hardwicke's SCIENCE-GOSSIP, current year:

"PARASITIC FUNGI ON INSECTS.—Professor Hagen, of Harvard, describes some experiments that had been made by Mr. J. H. Burns and others, and comes to the following conclusions: 1. That the common house-fly is often killed by a fungus, and that in epizootics, a large number of insects which live in the same locality are killed by the same fungus. 2. That the fungus of the house-fly works as well as yeast for baking and brewing purposes. 3. That the application of yeast on insects produces in them a fungus which becomes fatal to the insects. 4. That in the experiment made by Mr. J. H. Burns, all potato-beetles sprinkled with diluted yeast died from the eighth to the twelfth day, and that the fungus was found in the vessels of the wings."

Now that the life history of *Saprolegnia ferox* has been to some extent examined, we may revert to the causes assigned for its destructive outbreak and extension beyond all previous limits. Mr. A. B. Stirling, curator of the Anatomical Museum, Edinburgh, writes as follows: "I also wish to say that the fungus appears to me to be of a very irritating nature, causing the fish such torture that they destroy themselves in their efforts to get rid of their tormentor. The sores upon the fish are not caused by the fungus, but by the fish themselves, by rubbing the parts of their bodies affected upon stones or rocks, and any projections they find to suit the parts affected. I am quite unable to say what the cause of the fungus may be, but, as I found foreign matter of various kinds entangled in the mycelium of the fungi, I have pretty good grounds for thinking that it may have arisen from pollution. The foreign matter found in the mycelium of, or fronds of, the plant, were Torulæ, or yeast plant, triple phosphates, fecula, human hairs, and hairs of cat and mouse, also desmids and diatoms, shreds of dry wool and cotton, with other fragments of matter unknown to me."

With all due deference to Mr. Stirling I feel bound to remark that although the fish in its efforts to get rid of the parasite does lacerate itself, still the skin is already completely disorganised by the operation of the fungus. Soft-bodied animals, as tadpoles, when attacked are penetrated throughout by the mycelium of *S. ferox*, and the whole substance of the creature is interwoven with its threads. In addition to the débris detected by Mr. Stirling other impurities are indicated, as the following extract from a newspaper communication well shows:

"Certain kinds of chemical impurities are known to be favourable to the growth of fungoid life, and the practice of sheep-washing, which is largely carried on in the rivers of the south of Scotland, the use of artificial manures, washed by the heavy rains and melting snows of the past winter, and the existence in the streams of various polluting matters from factories and towns, are very likely to have combined to produce the condition favourable to the present outbreak."

Again, salmon in rivers are subject to artificial conditions, and cannot carry out their natural instincts. In evidence of this assertion Mr. F. Buckland writes: "A large number of fish which have done spawning are moved by their instinct to get down as quickly as possible to the sea, but they cannot do so on account of their journey being delayed by the weirs and 'caulds' on the Tweed and her tributaries. The instinct of the invalid salmon teaches them to go to the sea because it is certain the fungus cannot exist in the sea; and secondly because they wish to pick up condition and fatten upon their natural food, which consists of sand eels, sprats, herrings, smelts, and the fry of other sea-fish. When the fish are delayed above the weirs, the crowding tends to disseminate the disease, for I am sure the fungus is catching."

Whatever therefore may be the cause of the disease, the fact stares us in the face, that crowding above the weirs most certainly tends to foster and spread its ravages, just as when pilgrims at Mecca become too crowded the plague is started and spreads. Mr. Buckland here asserts positively "that it is certain the fungus cannot exist in the sea," its development may be checked, but it is questionable if the vitality of the resting spores would be impaired by continual immersion in sea water. The salmon recovery may also be due to improved feeding, and hence tone and increased vitality, which enables the fish to resist the encroachment and ultimately rid itself of the parasite. I once tried a little experiment with sticklebacks; of these I had a dozen or so, all more or less affected with the fungoid growth. I transferred them from a freshwater aquarium to sea water (sticklebacks live well in sea water after getting accustomed to the difference of density), but although their existence might be somewhat prolonged, the fungus ultimately reached their gills and killed them all.

The excessive protection afforded to many species of game, and unmitigated destruction of so-called vermin which naturally clear off the sickly and weak, appears to induce many hitherto unknown maladies among them. Such diseases do not confine their ravages to the point of origin; usually contagious, they extend their limits and include both strong and weak in a common destruction.

So with salmon, it may be that in artificial fish hatching and rearing a large percentage of weakly fish reach maturity which in an ordinary way would have succumbed to their natural enemies. Such would be the first seized by the fungoid parasite in question and of necessity convey the contagion to others. An outbreak so excessive can only be ascribed to some general cause, as it is scarcely reasonable to suppose that the contaminated rivers became polluted all at once. Where the disease appears, each infected fish becomes an agent of destruction to its kind, and an assiduous emissary in disseminating myriads of motile and resting spores, all seeking or waiting for the condition essential to development.

The question of chief interest to microscopists appears to be:- How does the parasite establish itself upon the animal, and in what manner is the skin impregnated by its spores? No doubt a scratched or abraded surface would readily meet the requirements of the fungus, but in the absence of such preparation, it is highly probable that the motile spores are introduced by absorption. Something analogous exists in the human family, and the terrible malady known as the fungous foot of India, prevalent amongst the shoeless portion of the population, affords an example. This fungus, resembling a Mucor, but scientifically classed as *Chionyphe Carteri*, perforates and honeycombs the bones of the foot, the cavities becoming filled with the mycelium of the plant, when, if speedy amputation is not effected, death soon ensues from exhaustion. Mr. H. J. Carter, F.R.S., is of opinion that this disease is occasioned by the entrance through the sudorific ducts of minute spores in an amœboid state and which attain a monstrous growth as the black fungus in the human body.

It is certainly within the microscopist's province to ascertain and accurately describe the character and habits of these destructive pests. When the conditions under which they flourish are once known, such may be removed and the foe ousted from its source.

But to deal empirically with an enemy like this, or when known to adopt merely vacillating measures, is to trifle with a destructive and insidious antagonist with the probable result of rendering the mischief chronic. Although epidemics amongst preserved animals seem usually to run their course and vanish for a time, as with the civilised portion of humanity, yet a primary cause must exist to account for each outbreak, probably resolving itself in its origin into an interference with the ordinary processes of nature, inducing a sudden and abnormal development of some putrefactive vegetable ferment which breaks out in a predominant form of disease.

Hospital gangrene was supposed by Berkeley to be of this nature. This much is certain, that the salmon by its environments is subject to conditions of so artificial a character as to render it improbable that any indigenous wild animal can submit to, without impoverishment, or adapt itself to the rapidly altering circumstances; hence, unless there is a general reversion to natural conditions, only those will remain, which can survive amidst the increasing pollution consequent upon trade extension and the development of mineral resources.

It therefore follows that all available means should be adopted in order to conform to natural requirements and that the fish should be permitted to follow their habits without the interposition of barriers, which interfere with tendencies and instincts that are actually bound up with the creature's existence, and which may be justly regarded as so many inflexible laws laid down by nature for the preservation of a species.

NOTES ON THE LUCERNARIADÆ.

THIS family of the order *Anthozoa helianthoida* is of great interest, yet probably less known than most of the huge class of marine zoophytes. From my experience in the Isle of Wight, the Lucernariæ are easily met with, being generally distributed about low-water mark, visible to the naked eye, and easily transferred alive from the Algæ to which they attach themselves to the aquarium; they are hardy, and will live for a long time if the aquarium is maintained in a healthy condition. Johnston gives the following description of the Lucernaria:—"Body campanulate, fixed, when at rest, by a narrow disk or stalk: mouth quadrangular, in the expansion: tentacula disposed in tufts at regular distances on the margin, oviparous, having internal ovaries."

1. *Lucernaria fascicularis*. This is the common form, found generally attached to Algæ at extreme low-water. It has the power of attaching itself to any object either by the base or the tentacles. If the hand is placed on a specimen in the clear pool it will immediately adhere to the finger, leaving the weed. Fascicularis is from a quarter to one inch in length, of an orange or brown colour. In full-grown specimens the stem is wrinkled, the bell of about equal length with the stem; the tufts or tentacles are eight in number, occasionally nine; they are said to have about a hundred tentacles in each pair of tufts. Many specimens have quantities of ova within the cup. The animal has the power of assuming very different shapes, but when fully expanded is exactly like the figure. Like most zoophytes the Lucernariadæ are extremely phosphorescent. The larger specimens are well suited to an aquarium; some attach themselves immediately, others remain free. The figure is given of natural size, and under one inch power.

Fig. 79.—*Lucernaria fascicularis* (magnified).

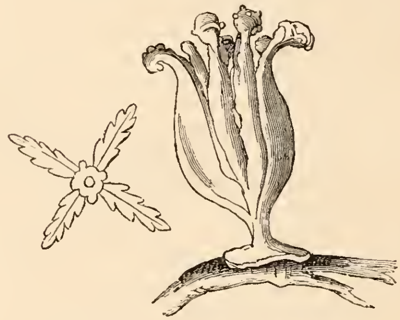


Fig. 80.—*Lucernaria campanulata*.

2. *L. auricula*. This is far from a common species, easily recognised by a globular tuft growing on the rim of the cup between the tentacles. The stalk is much shorter than in the preceding species. The ova are distinctly visible, giving the animal a mottled appearance through the semi-transparent substance. I believe the vesicles between the tentacles to be always present. The mouth is quadrangular, as in the other species. The colour is of various shades of brown, but it has been found pure white. Found at Ventnor at extreme low-water mark, adhering to algæ.

L. campanulata. This species has hardly any stem, and is liver-coloured, about an inch high. Pedicle quite flat; the tentacles are brighter coloured than the rest of the body, each tipped with a peculiar gland; the interior is singular, a formation like fine oak leaves coming from the mouth in the shape of a Maltese cross. When taken from the water all the

Lucernariadæ are shapeless, like a mass of thick brown jelly, which sticks firmly to the hand. Campanulata is found at Ventnor. The Lucernaria is very lively, swaying its tentacles to and fro in search of food. They swim with some rapidity by alternately expanding and contracting the body, the adhering power is doubtless of service to the animal in capturing food, as well as for fastening itself to Algæ.

Another species, *L. cyathiformis*, has been described, having the tentacles in a fringe all round the cup; I have not met with this form. I think it likely several new species may be detected in this family.

Fig. 81.—*Lucernaria auricula* (natural size).

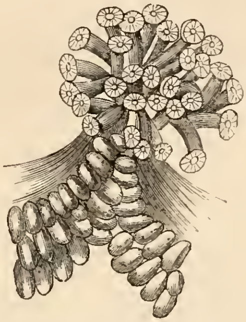


Fig. 82.—*Lucernaria auricula* (magnified), showing ova.

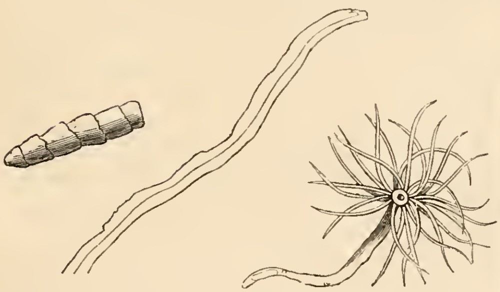


Fig. 83.—*Iluanthus* (natural size, Isle of Wight specimen).

Iluanthus.—Although not in the same family with Lucernaria, the Iluanthus is somewhat similar, and is found in the same situation as the former. It belongs to the Actiniadæ, but is different from any other genus. E. Forbes has described it thus: body cylindrical, tapering to a point at its posterior extremity, free. Tentacula simple, retractile, surrounding the mouth.

Only one species has been named, but I think in the Isle of Wight we have two: *I. scoticus*, a most restless creature, extremely irritant. Body circular and worm-like; tentacles very long and too numerous to count. Under the inch power a most beautiful object. It is named from its partiality to muddy situations—occasionally it lies on the mud, shapeless as if dead; on being touched it wriggles away angrily and is difficult to catch. I believe they are of rare occurrence. Body about an inch long, pure white or sometimes having the body streaked with red. In three specimens I have caught the body is longer and very much slighter than the one figured by Johnston; the others answer exactly to his descriptions. It is possible they represent different stages of growth. Johnston only names two localities for this curious free-swimming Actinia; one in Scotland, the other

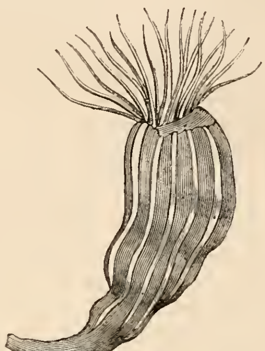


Fig. 84.—*Iluanthus scoticus* (after Johnson).

in Ireland. I should like to know if any of your correspondents are acquainted with Iluanthus in other parts of England besides the Isle of Wight? Fig. 83 shows the difference between two specimens; the body and a tentacle slightly enlarged on the left hand.

C. Parkinson.

THE EARLY HISTORY OF THE DIATOMACEÆ.

By F. Kitton, Hon. F.R.M.S.

[*Continued from page* 79.]

BORY opposed Gaillon in the article Némazoaires ("Dict. Class. d'Hist. nat."). But Meyen again contended with Leo and Girod Chantrans that Bacillaria were produced by Oscillatoria. Agardh agrees (1828) with Leiblein in placing Closterium in the family Diatomeæ, in which he was also disposed to place *Spongilla lacustris*. In the year 1858 Meyen constructed the genera Pediastrum (Micrasterias) and Scenosdesmus (Arthrodesmus), Staurastrum and Sphærastrum (these are now placed in the family Desmideæ,—F.K.) and which he looked upon as sports of the plastic power of nature ("Spiele der bildenden Natur") and described them as plants. Reichenbach placed the Bacillaria in the family Confervacea. Turpin, in the same year, constructed his genus Surirella * (Navicula), and which he considered as hovering between plants and animals. Agardh (1830), in his first academical thesis on the Diatomeæ, changes the name Frustulia to Cymbella; and, in the same year, Blainville asserts the Bacillaria to be plants. I, at this time, removed the Bacillaria

* Ehrenberg adopts this genus in his "Mikrogeologie."

to the group of Polygastric animalcula distinguished by a hard, glassy, bivalve shell, and increased the number of genera in this family by the addition of Cocconema and Syncyclia, and also endeavoured to explain the physiology of the genus Echinella. Moren, in the same year, formed his genus Crucigenia (Bacillaria?). In 1831, Agardh published the continuation of his "Conspectus Diatomacearum," and Gray constructed his genus Biddulphia out of *Conferva biddulphiana* and *C. obliquata* (Isthmia) ("Arrangement of Brit. Pl.").

In 1831 I succeeded, through new observations, in establishing the place of the Bacillaria in the animal kingdom, and added the new genus Euastrum. In 1832 Agardh added the new genera Isthmia, Odontella, Striatella, and Grammonema (Fragilaria). In the same year I published a more detailed communication, and increased our knowledge of this family, and also added the genus Xanthidium. In the year 1835 Kützing elaborated a "Synopsis Diatomacearum," and added the new genera Sigmatella (Navicula), Encyonema (Monema), Psygmatella (Exilaria), Trochiscia (Tessararthia and Aristella), Epipyxis. He also found by chemical analysis that the hard glassy shells of many of these forms were siliceous, and considered them upon the whole to be plants.

I made similar researches with the aid of Professor H. Rose, and confirmed these chemical observations. Wallroth was desirous of changing the less happy Latin names of Frustulia and Fragilaria to the equivalent Greek names *Rhabdium* and *Temachium*, and formed them into a group of plants under the name of Hygrophytozoa. Gaillon in 1834 gave a new synopsis of the Némazoaires, with many new and very unpleasant generic names for already named forms, and which are now fallen into oblivion. Corda, 1835, also gave many new generic names, which, if more appropriate, are not sufficiently critical, and too trivial in comparison with those already known, to be allowed to remain; as Pharyngoglossa (Navicula), Cosmarium (Euastrum), Colpopelta (Euastrum), Staurastidium (Micrasterias), Sphærozosma (Odontella), Syrinx (Fragilaria), Paradesmus (Fragilaria), Pleurosicyos (Closterium), and Scalptrum (Navicula). The same observer speaks of the existence of oral openings as sexual organs, a thread-like alimentary canal, and even of a tongue in several of the forms, but without stating these supposed facts with any scientific accuracy. He also states he had observed the opening and closing of the shells, but which, however, cannot by any possibility take place.

Upon the whole he considered these forms to be animals, and not plants, and joins them to the Oscillatoria. In the same year I called attention to the characteristic distinctions obtained from the arrangement and number of the striæ. Henle believed that he had observed similar kinds of forms in the internal organs of larger animals.

Jürgens gives a list of these forms in his "Flora of Nordeney" (1835). Meyen again asserted that the Closteria and Pediastreæ were plant cells.

In further developing the earlier views of the Infusoria, I became captivated by this family. I added (1835) the following genera: *Pentasterias*, *Cocconeis*, *Pyxidicula*, *Podosphenia*, *Tessella*, and *Syncyclia*, and in the same year ten plates of this work were engraved, all of which are devoted to the Bacillaria.

The organisation in this family is, on account of the refraction and hardness of the shells (Panzer), difficult to discern; but I have by degrees made it out with greater certainty. The characteristic investment (Panzer) is of a varied nature. The group is separated into hard forms, with shells strongly impregnated with silica, and membranous forms without silica. (These forms are Desmids and animalcula—F. K.) It is worthy of notice that no calcareous forms have hitherto been detected.

The external shell is considered by some to be a silicate of iron. Many species have surrounding the siliceous shell a delicate, jelly-like, variously-shaped investment (Frustulia, Schizonema, Micromega, &c.). The structure of the Bacillaria is box-like, with a simple opening, or two or more shelled with many openings. Among the siliceous forms, a round, a prismatic, or four-sided, and among the non-siliceous a flat, three to five sided shape prevails.

Organs of locomotion, as tactile organs, are very clearly seen in the *Acineta*, but they differ very widely from the character of those in the great group Bacillaria.

I have recently described in the "Transactions of the Berlin Academy, 1837," and added two other genera—Actinocylus and Eunotia. These organisms can only be regarded as the type of a single group, therefore they can only be considered as a partial member of it; moreover, it is only in the Navicula species that a snail-like foot as a locomotive organ has been observed, and this is rarely projected far beyond the shell.

It is doubtful whether the mobile granules observed in some Naviculas (as also in the Closteria) belong to this part. The alimentary organ, even by the means of coloured food, has as yet not been detected in any species, but in many of them indications of it may be seen. There are also seen in many of these organisms comparatively large, transparent, variable, colourless globules in the coloured egg mass, which are analogous to those in the stomachs of other Polygastrica, and these are what Girod Chantrans imagined (in Naviculas) to be eggs. As the received reproductive organs are in almost all species coloured, on some forms colourless eggs, like granules, are visible. The very fine granular matter is sometimes yellow, brown, or green; the internal mass is clearly divided into 2–4 plates, or tubes, which are united in the central body, as seen in Navicula, Cocconema, Naunema, &c. Sometimes it is piled up in many minute lumps, or distributed in little bags (Beutelchen) which, later on, as in Achnanthes, sometimes form into a four-armed cross, or, as in Desmidium, into one with 3–6 divisions, or sometimes massed into little balls, and apparently empty, and which also invest the stomach cells and also the other organs, as seen in Xanthidium, Euastrum, Micrasterias. Many of these forms probably die after once depositing their ova. Many develop the ova first, and then appear to have completed their cycle. Afterwards the egg mass shows many faint divisions, the original forms are reproduced, and the same cycle of change occurs. Even a male organ is said to have been found. A single or double ball-shaped organ, analogous to the prostate gland, may be seen in Micrasterias, Arthrodesmus, Tessararthia, Xanthidium, and the cognate Acineta. Contractile seminal vesicles have not as yet been observed with certainty. With the phenomena of reproduction (Fortpflanzungsverhältnissen) is connected self-division, and which apparently is always lengthwise, so that the conferva-like forms are not thread-like, long, and narrow, like plants, but broad and short. Imperfect division sometimes happens from back to ventral part, thus forming ribands, the sides remaining attached to each other (Navicula, Fragilaria), and sometimes from side to side, whereby other (crescent-like) forms are produced, as in Cocconema Eunotia. The double envelope, or internal shell, usually separates; the external envelope grows and developes, like the envelope of the Volvocina (Kugelthiere), through other laws. These forms often resemble confervid and Fucus-like plants, which the botanist, not without some appearance of justice, therefore claims as belonging to the vegetable kingdom. No nervous or circulating system has, up to the present time, been detected.

Catalogue of all the Genera of Diatomaceæ in the Infusionsthierchen. The synonymy is printed in italics.

1. Achnanthes, Ag. 1822: Fahnenthierchen; *Conferva* in part, Müller, 1779; *Ceramium* in part, Roth, 1806; *Diatoma* in part, Decandolle, 1805; *Fragilaria* in part, Kützing, 1833.

2. Actinocyclus, Ehrenberg, 1833: Strahlendose.*

3. Bacillaria, Gmelin, 1788: Zickzackthierchen; *Oscillaria* in part, Schrank; *Pinddyr*, Nye; *Vibrio* in part, Müller, 1786; *Conferva* in part, Dillwyn, 1809; *Diatoma* in part, Decandolle, 1815.

4. Cocconema, Ehrenberg, 1830: Stelzkorn; *Vibrio* in part, Schrank, 1796; *Kolpoda* in part, Schrank, 1796; *Bacillaria* in part, Nitzsch, 1817; *Cymbella* in part, Agardh, 1830; *Gomphonema* in part, Leiblein, 1830; *Frustulia* in part, Kützing, 1833; *Navicula* in part, Corda, 1835.

5. Cocconeis, Ehrenberg, 1835: Schildschiffchen.

6. Echinella, Lyngbye, 1819: Palmenthierchen; *Meridion* in part, Agardh, 1824; *Exilaria*, Greville, 1827; *Licmophora* in part, Agardh, 1827; *Gomphonema* in part, Chauvin 1828? *Diatoma* in part, Jürgens; *Styllaria* in part, Bory de St. Vincent, 1822.

7. Eunotia, Ehrenberg, 1833: Prachtschiffchen; *Echinella* in part, Jürgens; *Navicula* in part, Ehrenberg, 1830; *Frustulia* in part, Kützing, 1833.

8. Fragilaria, Lyngbye, 1819: Bruchstäbchen; *Bacillaria* in part, Bory? 1824; *Vibrio* in part, Müller, 1786; *Frustulia* in part, Agardh, 1824; *Diatoma* in part, Corda, 1835; *Conferva* in part, Müller; *Nematoplata* in part, Bory, 1822; *Syrinx* in part, Corda, 1835; *Paradesmus* in part, 1835; *Gallionella* in part, Lyngbye, 1819; *Tessella* in part, 1819; *Grammonema* in part, Agardh, 1832.

9. Frustulia, Agardh, 1824: Gallertschiffchen; *Cymbella* in part, Agardh, 1830.

10. Gallionella, Bory de St. Vincent, 1825: Dosenkette; *Conferva* in part, Dillwyn, 1809; *Frägilaria* in part, Lyngbye, 1819; *Lysigonium* in part, Link, 1820; *Meloseira* in part, Agardh, 1824; *Oscillatoria* in part, Lyngbye? *Lyngbya* in part, Leiblein, 1827.

11. Gloenema, Agardh, 1812: Röhrenkorn; *Encyonema*, Kützing, 1833.

12. Gomphonema, Agardh, 1824: Keilbäumchen; *Vorticella* in part, Müller, 1773; *Echinella* in part, Lyngbye, 1819; *Styllaria* in part, Bory, 1822; *Dendrella* in part, 1824; *Crystallia* in part, Sommerfeld, 1831; *Ulva* in part, Hornemann, 1810; *Meridion* in part, Agardh, 1824; *Frustulia* in part, Kützing, 1833; *Epistylis* in part.

13. Isthmia, Agardh, 1832: Isthmenthierchen; *Conferva* in part, Smith, 1808; *Diatoma* in part, Agardh, 1824; *Biddulphia* in part, Gray, 1831.

14. Meridion, Agardh, 1831: Fächerstäbchen; *Echinella* in part, Greville, 1822; *Frustulia* in part, Duby, 1828; *Exilaria* in part, Ehrenberg, 1830.

15. Micromega, Agardh, 1827: Röhrenbäumchen.

16. Navicula, Bory de St. Vincent, 1824: Schiffchen; *Enchelys*, Hermann, 1784; *Bacillaria* in part, Nitzsch, 1816; *Cymbella* in part, Agardh; *Vibrio* in part, Müller, 1786; *Frustulia* in part, Kützing, 1833; *Oat-animal*, Arderon and Baker, 1754; *Chaos*, Schrank, 1776; *Scalprum*, Corda, 1835; *Pharyngoglossa*, Corda; *Sigmatella* in part, Kützing, 1833; *Surirella* in part, Turpin, 1827.

17. Naunema, Ehrenberg, 1838: Röhrenschiffchen, *Schizonema* in part, Agardh, 1824; *Conferva* in part, Trentepohl, 1806; *Naunema* in part, Greville, 1827; *Bangia* in part, Lyngbye, 1829; *Girodella* in part, Gaillon, 1825.

18. Podosphenia, Ehrenberg, 1835: Keilschüppchen; *Conferva* in part, Vahl, 1792; *Echinella* in part, Bory, 1824; *Licmophora* in part, Agardh, 1832; *Gomphonema* in part, Kützing, 1834; *Styllaria* in part, Bory, 1822; *Synedra* in part, Ehrenberg, 1833.

19. Pyxidicula, Ehrenberg, 1835: Kugeldose; *Frustulia* in part, Agardh, 1827; *Cymbella* in part, Agardh, 1830; *Gallionella* in part, Ehrenberg, 1835.

* This genus is that now known as Actinoptychus.

20. Schizonema, Agardh, 1824: Strahlenschiffchen.

21. Striatella, Ehrenberg, 1835: Zickzackfähnchen. *Diatoma* in part, Decandolle, 1815; *Fragilaria* in part, Lyngbye, 1819; *Achnanthes* in part, Carmichael, 1827.

22. Syncyclia, Ehrenberg, 1835: Ringschiffchen.

23. Synedra, Ehrenberg, 1836: Ellenthierchen; *Vibrio* in part, Müller, 1786; *Diatoma* in part, Graveloup, 1806; *Bacillaria* in part, Nitzsch, 1817; *Echinella* in part, Lyngbye, 1819; *Frustulia* in part, Agardh, 1824; *Exilaria* in part, Kützing, 1833; *Rhabdium* in part, Wallroth, 1833; *Conferva* in part, Vahl, 1792; *Lunulina* in part, Bory? 1824.

24. Tessella, Ehrenberg, 1835: Plattenkette; *Diatoma* in part, Hornemann, 1812; *Striatella* in part, Agardh, 1832; *Achnanthes* in part, Kützing, 1833.

Number of species, 144.

Doubtful genus, Microtheca.

In the above genera are comprised all those previously observed, of which Ehrenberg abolishes 35, two of which have been re-established by other Diatomists.

In 1844 Kützing and others increased the number of genera to 69, and the species to 784.

The number of genera now probably exceeds the number of Ehrenberg's species in 1838, and the species may be reckoned by thousands.

MICROSCOPY.

Estuarine Foraminifera.—In the estuary of Lough Foyle, County Londonderry, I have discovered a deposit of estuarine clay, extremely rich in foraminifera. One grain of the floatings has been found to contain as many as 10,000 individuals. My friend Mr. Joseph Wright has examined the floatings, and he has already detected about 90 species, including nearly all the British *Lagenas*, and many other species, that are by no means common elsewhere. I shall be glad to distribute some floatings among any correspondents who may desire it.—*William Gray*.

Preserving Fluid.—In the recipe given on page 87 one of the ingredients is "Methylic alcohol." This is, I believe the chemical name of wood naphtha. I should be glad to learn whether this or ordinary methylated spirit of wine is the article to be used, and also whether or not the fluid has been tried by any of the readers of Science-Gossip.—*W. G. Tux*.

Preservation of Living Objects and their Examination under the Microscope.—We are glad to see that Mr. Thomas Bolton, F.R.M.S., has republished the articles on the above subject from the "English Mechanic," in the form of a small pamphlet which may be obtained from the author, 17 Ann Street, Birmingham, price threepence. It contains short articles on the following subjects: "Examination of Objects attached to weeds and root fibres, such as Polyzoa, Hydra," &c. "Examination of free-swimming Rotifers, Infusoria," &c. "A short Summary of the most useful Apparatus," &c.

A New Collecting Bottle.—Hoping to aid those who may at this season be seeking for pond life, I send a sketch of a collecting-bottle that I have just devised and find very excellent. You will at once

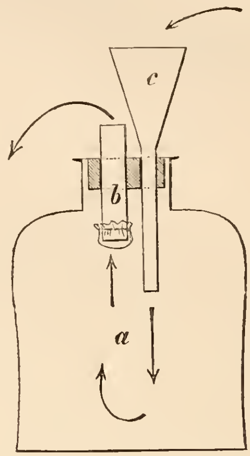


Fig. 85.—New Collecting Bottle.

a, Wide mouth bottle; *b*, Glass tube with muslin tied over the bottom; *c*, Glass funnel both fitting tight in a good cork; the action will at once be seen.

see that its success is due to filtration by ascension. The weeds may be swept with any convenient vessel (I use a flat photographic dipping bath, as it presents more surface) and emptied into the bottle so long as may be desired.—*Fred. Row*.

Dull Objectives.—I think Mr. Walter G. Woollcombe has over-cleaned his ¼ inch objective, and this may be the reason of its increasing dulness. He says he has rubbed it with chamois leather. This is enough to spoil any good objective; let him shake his chamois leather and see the dust which will come from it. The glass of a really good objective is very soft and most easily scratched. If an objective wants cleaning, use nothing but a very old and well-worn silk handkerchief, which must be very clean. Many good lenses are ruined by injudicious cleaning.—*W. C. Penny*.

Pond Life in the Parks.—Microscopists seeking for Rotatoria, would do well, before going further afield, to examine a little water from some of the lakes in London parks. I have lately (April) found several good things in the Serpentine, amongst which were *Triarthra longiseta* and *Polyarthra platyptera*, two of the leaping rotifers. I have also met with the male of *Brachionus urceolaris* in abundance from the same source. *Floscularia* and *Limnias* are common on the weeds. Doubtless many of the lakes in the other parks would also be found prolific, especially in the warm days of summer.—*J. M. Offord.*

Preparation of Crystals for the Polariscope.—The following way has lately been discovered by which crystals may be mounted in their own mother liquor. Paint on a slide a thin ring of gold size, whose entire diameter shall equal that of the cover glass, and smooth the edges. As soon as the ring is finished, heat it over the flame of a lamp until it becomes brown. Then make a solution of some substance adapted for polariscope examination, such as salicine, tartaric acid, &c., of such strength that crystals will form only when quite cold. Coat the ring, already hardened, with a little fresh size, and likewise the edge of the cover-glass. Put the slide and cover-glass thus prepared on the hot-plate for a few minutes, and then pour a few drops of the solution into the cell, and apply the cover-glass; immediately pressing it down gently with a dry cloth, which will absorb the superfluous liquid. Touch the edge of the cover-glass with gold size, and then transfer to the turn-table and finish. The crystals may be seen forming with the polariscope. After standing some time, the crystals lose their sharpness. They, however, can be restored by a fresh application of heat sufficient to cause them to dissolve and recrystallise. The quantity and strength of the solution will modify the results obtained.

American Exchanges.—Enclosed please find one of the postal cards which I am circulating over our country, and which meet with very good reception by all. Cannot some arrangement be made with English microscopists by which the benefits we derive at home, may be reaped abroad? Some one at London could act as general collector for the United Kingdom, and transmit to me slides intended for exchange with Americans, and I would return the package with some of our slides. That such a course would be satisfactory to your fellow countrymen, I feel assured by the number of names in the exchange list of Science-Gossip. If deemed desirable or advisable please notice in your next issue, and also write me what you think will be the feeling of the English microscopists. I am corresponding with the micro-men of other countries, and hope that the project will be as well received abroad as at home. If you need any London reference, I can refer to B. F. Stevens, Esq., 4 Trafalgar Square.—*Herman Poole, Microscopic Exchange Bureau, 23 West Swan Street, Buffalo, N.Y.*

The Journal of the Royal Microscopical Society, for April last, contains the full address of the president, Dr. Beale, F.R.S., delivered in February last, in which we have the nature and changes in living matter and dead matter, the properties of protoplasm, *Bathybius*, hidden molecular structures, the "cell soul," &c., severally passed in review. A capitally illustrated and fully written paper is that by Mr. A. D. Michael, F.L.S., entitled "A further Contribution to the Knowledge of British Oribatidæ," in which the author was assisted by Mr. C. F. George, M.R.C.S. Mr. J. W. Groves has a short paper "On a means of obviating the Reflection from the inside of the Body-tubes of Microscopes; with suggestions for standard gauges for the same and for sub-stage fittings," &c. There is likewise a short paper by Mr. A. Nachet, "On a Petrographical Microscope." Perhaps the most important part of the "Journal" is the full and ably condensed record of current researches relating to Invertebrata, Cryptogamia, Microscopy, &c. This part is very abundantly illustrated, and by its means the student is kept well posted in all that relates to microscopical research all over the world.

On the Use of Carbolic Acid in mounting Objects for the Microscope.—Some years ago I mentioned in Science-Gossip the use of carbolic acid in mounting microscopic objects, and I am led to believe that the subject is comparatively unknown in England, though in use here more than ten years, and to such an extent that turpentine is seldom used in many studios. The first specimen I saw it tried upon was the head and jaws of a spider mounted by Mr. Ralph, the president of the Microscopic Society of Victoria, which led me to try it in various ways to render objects transparent, and now I seldom use anything else. When I mention carbolic acid, I mean the best crystallised, which can be bought at any chemist's, who will, on being asked, add just sufficient water to keep it fluid. I do not recommend Calvert's so much as many other makers, as it always seems so much more liable to change colour, turn dark, and will then stain many specimens. Whether it is animal or vegetable tissue the effect will be the same, the acid will in a very short time render the object transparent, and the Canada balsam will, when applied, run into the article as readily after it as after turpentine. For experiment let the reader take a mollusc and remove the palate. Wash it well in water, then remove it to a bottle of the acid to stay a few hours, if he is not in a hurry to mount it. But suppose we desire to mount it at once, place it after washing on a glass slip in proper position for mounting and drop one or two drops of the acid on it. At first it will look thick and cloudy; warm the slide over the spirit-lamp, let it cool, and drain off the acid; if not perfectly clear when cold, apply some fresh acid and warm again; place on a cover if not previously done, and apply the balsam, by means of a little heat it will run under and the operator will have a slide which will repay him for his trouble. With polyzoa, I find the easiest plan is to place them in a little hot water which softens them, then lay them out on a glass slip; place another on it which is of quite sufficient weight to keep them in position while they dry, then drop them into a bottle of carbolic acid and soak for a time: twenty-four hours will render any polyzoa transparent, without rendering them brittle. I have many times mounted specimens perfectly clear and transparent in ten minutes from the time they were amusing me alive in the zoophyte trough, treating them as I have recommended for palates. For gizzards and parts of insects, nothing comes near carbolic acid. One great advantage it has over turpentine, it never renders specimens brittle. You can pull them about as readily as when fresh, any object to be desired, particularly with polyzoa. Should there ever be any clouding, it arises from the moisture of the object, not from the carbolic acid, but from want of it. A friend has used carbolic acid to remove the covers of bought slides of diatoms with a view to remount them with great success. I feel I cannot speak too much in praise of carbolic acid, as it is comparatively inexpensive, far less unpleasant in smell, and not so sticky and dirty in use as turpentine. Again, with the use of carbolic acid, it is not necessary to let your object dry, which invariably alters the shape more or less; still, should it be dry it is not any time becoming transparent compared with the old process of soaking in turpentine. We all know how difficult it is to render foraminifera transparent and free from air ready for mounting in balsam. One trial of carbolic acid will convince the most sceptical of the advantages it has over turpentine, benzine, &c. The only drawback to its use that I know is that it renders some vegetable tissues too transparent, but this is not very often the case.—*F. Barnard, Kew, Victoria.*

ZOOLOGY.

Preserving Crustacea.—As a collector of crustacea I have read with much interest Mr. Lovett's article on the preservation of this most interesting form of marine life. Not knowing anyone able to give me any help in the matter, I have been obliged, by experiment, to discover the best means of preserving my captures. Though my own experience has led me to adopt pretty much the same method which Mr. Lovett recommends, perhaps a few further hints on the subject will be acceptable. With regard to the larger specimens, I have sometimes met with considerable difficulty in removing the flesh from the claws and legs. I find this process greatly facilitated by leaving the specimen in water for two or three days, when the flesh becomes softened. Care must be taken not to leave it in water too long, or the colour will fade. By this method there is no necessity for disarticulating the limbs or their separate segments. After the flesh has been softened, as above described, the whole contents of the claws and legs can be extracted through a slit in the under side of the joints by a wire hook. By so doing the tiresome operation of joining on legs and segments of legs is avoided, and the specimen may be straightway set up in position and left to dry. If, however, an artificial joint is necessary, I would advise cement as being much stronger than gum tragacanth. With regard to setting out specimens I would remind beginners that some kinds, as Galathea, Lithodes, and Porcellana, have a pair of rudimentary legs which they usually stow away under the carapace. These should be carefully drawn out before the specimen is left to dry. Some collectors set out their specimens on cotton wool, which has the disadvantage of adhering most pertinaciously to the pubescence common to many species. I have found cementing the specimens down on a glass slab to be the neatest method for a cabinet collection. In conclusion, I would urge that the locality, and if possible, the depth of water of all captures be recorded on their label.—*Lionel E. Adams, Victoria Park, Manchester.*

Protective Mimicry in Larva of Emperor-Moth.—The larva of the emperor-moth (*Saturnia carpini*) affords a very interesting case of protective mimicry. Not only does its green colour resemble that of the heather upon which it feeds, but the small pinkish-purple dots with which it is studded closely imitate the flower buds of this plant, and its habit of twining itself around the stem when alarmed, makes it almost impossible at a little distance to distinguish it from the heather.—*G. C. Goody.*

The Weather of 1879.—We have received a copy of an interesting pamphlet bearing on the "Weather of 1879" as observed in the neighbourhood of London, and compared in all respects with that of an average year, and with the tables of daily observations and a diagram, by Edward Mawly, F.M.S. It is published by Bemrose & Sons, 10 Paternoster Buildings, and Irongate, Derby.

The Cotton Worm.—Bulletin No. 3 of the United States Entomological Commission is devoted to the above subject, giving a valuable summary of the natural history of the cotton worm (*Aletia argillacea*), with an account of its enemies, and the best means of controlling it, by Professor Charles V. Riley. This pamphlet of 144 pages may be regarded as a thorough monography of the subject. It is beautifully illustrated by a coloured plate of the cotton plant and the various stages in the development of the moth, and in addition there is an abundance of woodcuts diffused through the text.

Goldfish Breeding.—To breed goldfish in a pond, the pond should not be less than eight or nine feet wide, and two and a half feet deep, with a smaller tank a foot or more deep in the centre, for the fish to go in when the pond is cleaned out. The following plants should be placed in the pond: three of *Vallisneria spiralis*, two or three of the watersoldier (Stratiotes), two or three water-lilies, and three plants of the Anacharis, which is the best plant I have discovered for a pond that will cause goldfish to breed in it. The fish will always find food where the Anacharis grows, and will eat it, hide in it, and spawn on it, if not disturbed in their breeding season. The plants should be placed in flowerpots some distance apart, and rock work around the pots to keep them steady; some of the plants when grown too large, can be taken out, and a few of the young buds placed in instead, particularly the Anacharis, as it grows so fast in the summer months; it should be changed twice a year. Any small spray will grow planted, and will grow as well if left floating on the water. I would not recommend it for a large pond or a large sheet of water, as it will soon choke it up, unless swans are kept there; those birds feed on it and thrive well. I think our aquarium tanks are too small for the spawn of goldfish to come to anything. I have kept tanks for years and never got any young gold-fish from their spawn, after trying all sorts of ways. To keep goldfish healthy in the aquarium you must only give them a small fly or a red worm; if you can get enough plants of Vallisneria do not place in any others. Above all things do not give the fish biscuit, bread, or meat, as it will cause a disease in the fish. The fish like fine gravel at the bottom. They take it in their mouth occasionally; it does them good, and cleans the mouth. Small roach may be kept with goldfish, as they thrive very well together.—*A. J. R. Sclater*, *Teignmouth.*

BOTANY.

Respiration of Plants.—If Colonel Dickens will expose a piece of a plant to the light of the sun under an inverted glass vessel full of some water in which has been dissolved some carbon dioxide, he will soon see bubbles of gas collect on the leaves of the plant. If this gas is examined, it will be found to be oxygen gas. If on the other hand, the water be examined, it will be found to have lost some of its carbon dioxide. This I think proves that plants take in carbon dioxide, and give out oxygen; but that they do not take in oxygen and give out carbon dioxide.—*C. B.*

Abnormal Development of Fir-stem.—In Merevale Park, Atherstone, Warwickshire, there is growing a fir which has its stem bifurcate from about half-way up. The bifurcation is remarkably equal, and both stems continue beautifully straight. I have never before noticed this dichotomous branching of the fir; have any of your readers? It probably resulted from injury to the terminal bud when young.—*George T. Harris.*

Plants and the Late Winter.—It may interest your readers to know what plants were injured by the repeated changes of the weather during the last winter in the Flower Garden, Kensington, and at Battersea Park. The Flower Walk, 13 April, 1880.—*Quercus virens*, *Quercus cerres*, *Quercus suber*, *Quercus agrifolia*, *Quercus* (*broad-leaved*), *Quercus ilex*, *Mahonia agrifolia*, *Ligustrum lucidum*, *Jasminum fruticans*, *Arbutus procera*, *Laurus nobilis*, *Laurus nobilis* var. *salicifolia*, *Cerasus lusitanica*, *Cedrus deodara* (unhealthy), *Biota tatarica*, *Cratægus pyracantha*, *Nitriscus syriacus*, *Eucalyptus globulus*. Battersea Park, 13 April, 1880. Generally little difference, somewhat better, except *Viburnum tinus*, many of which much hurt, and the leading shoots of many hollies dead, in which case Battersea Park is worse off than Flower Walk. The damage may perhaps be attributed to frequent rain by day, followed by frost at night, thus coating the leaves with ice.—*M. M.*

Heteromorphic Fertilisation of Primula Vulgaris.—I was botanising in a wood, one of the days this spring, and on stooping down to select some specimens of *Primula vulgaris*, I noticed something dark moving among the stamens of a thrum-eyed flower; carefully shaking out the insect, I found it was a small beetle covered with pollen; I then searched for a root bearing pin-eyed flowers, and was successful in finding one having on its stigma a beetle of the species just captured, also covered with pollen, some of which had been retained by the viscid surface of the stigma. I examined the base of the corolla-tubes, wondering whether the insects confined themselves to the upper series of stamens and pistils, or penetrated to the lower series; they seemed, however, to confine themselves to the mouth of the tube. In most of the flowers examined the insects were *in copula*.—*George T. Harris.*

The Study of Mosses.—Mr. Robert Anslow has published his paper on the above subject (Wellington, R. Hobson). It has a well-written introduction to the structures of mosses, and contains a copious list of all the species found about the Wrekin. It is, therefore, a welcome contribution to the Bryology of Shropshire.

The Exploration of Socotra.—Dr. Balfour has returned from his very short exploration of Socotra. Among his prizes is a large plant of the *Dracæna*, which yields the "Dragon's blood" of Socotra, and which until lately was unknown to botanical science.

Notes on Occurrence of Rare Flowers.—A few notes as to some scarce and local flowers found in my neighbourhood, may not prove altogether uninteresting to the readers of Science-Gossip. The rare *Carum verticillatum*, or whorled caraway, occurs not uncommonly in some of the damp meadows in the neighbourhood, while at Ferryside, a little watering-place at the mouth of the Towy, the Sea spurge

(*Euphorbia paralias*), and Spring vetch (*Vicia lathyroides*) occur. At Solva in Pembrokeshire, a few miles from the cathedral town of St. David's, the Vernal squill (*Scilla verna*) and the Sea storksbill (*Erodium maritimum*) are to be found; while near St. David's itself some years ago I discovered a plant of the rare *Erodium moschatum*.— *T. W. Barker.*

New (?) Caterpillar Fungus.—As my name is mentioned at page 98 in connection with some fungus on the larvæ of Melolontha, I may be permitted to state that the specimens I had from Mr. D. Morris, and which I presume are those alluded to, are not a new, but a very old species, and the same which Tulasne called *Torrubia Melolonthæ*. This is probably the same species as *Torrubia Miquelii*. I do not see the slightest reason for considering it to be a distinct species. I told Mr. Morris at once, immediately I saw the specimens, the species to which it belonged, and referred him to Fougeroux's figures. As far as I know, he entirely concurred in this opinion. I am afraid that we have already too many new species on insufficient grounds.—*M. C. Cooke.*

GEOLOGY.

On the occurrence of the Starfish (Ophiolepis Damesii) Bed in the Irish Rhætic Strata.—In the March number of Science-Gossip Mr. W. J. Harrison, F.G.S., gave a very interesting account of the occurrence of a starfish bed in the Rhætic strata of England. It may perhaps be interesting to our geological readers to know that the same species of starfish (*Ophiolepis Damesii*, Wright) has also been found in the Rhætic strata of the Co. Antrim, Ireland. In the fine section at Collin Glen, near Belfast, I have found portions of this species in a layer of sandy marl about 12 inches higher in the section than the celebrated "bone bed," and about 9 inches below the first layer of argillaceous limestone with *Pecten Valoniensis*, *Avicula contorta*, *Trochus Waltoni*, *Natica Oppelli*, and scattered fish remains. This marl is very friable, and does not bear removal. In the section at Woodburn, near the Salt Mines, four miles from Carrickfergus, there is another thin layer of the same marl interlaminated with "paper shales," containing *Avicula contorta*, *Cardium rhæticum*, *Trochus Waltoni*, *Natica Oppelli* (mistaken by the Geological Survey for *Solarium Thomsoni* (Tate), a fossil which only occurs in the Lower Lias zone of *Ammonites angulatus*, at White House, west coast of Islandmagee, Co. Antrim), *Gyrolepis Alberti*, *Gyrolepsi tenuistriatus*, *Acrodus Tatei*, *Saurichthys apicalis*, &c. &c. In this marl, and associated with these fossils, fragments of *Ophiolepis Damesii* occur. I have found a joint and a portion of the disc. On the sea shore at Waterloo, near Larne, Co. Antrim, there is a section of the Rhætic beds about 100 feet thick. And in a marly layer near the base there was found a perfect specimen of *Ophiolepis Damesii*, as noticed by Mr. W. H. Bailey, F.G.S., Palæontologist to the Geological Survey for Ireland (see Explanatory Memoir to accompany sheets 21, 28, 29 of the maps of the Geological Survey of Ireland, page 43). In this locality, the starfish was found associated with *Cardium rhæticum*, *Pecten valoniensis*, *Avicula contorta*, *Axinopsis Ewaldi*, *Natica Oppelli* and numerous fish remains. In the indurated Rhætic beds of the Cave Hill, Belfast, I have detected small portions of the disc and joints mixed up among the other fossils, viz., *Mytilus Hillanus*, *Placunopis* sp., *Pleuromya crassa*, *Cardium rhæticum* and *Monotis decussata*. I quite agree with Mr. Harrison in his opinion concerning the value of the discovery of this starfish as attesting the undoubtedly marine origin of the Rhætic strata, and I believe it will yet be detected in the other localities in Ireland where beds of Rhætic age occur.—*Wm. Gault.*

The Classification of the Tertiary Period by means of the Mammalia.—A paper on this subject was recently read at the Geological Society, by Prof. W. Boyd Dawkins, who pointed out that the Mammalia become of especial value in the Tertiary period as undergoing more rapid change than the other classes, from their being, as it is happily termed, *en pleine évolution*. He discussed the characteristics of each of the great periods, as defined and limited by their Mammalia, pointed out that throughout the Eocene these frequently exhibit relations more or less marsupial. Indeed, it is not till the close of the Lower Miocene that the traces of this relationship are lost. In the Middle Miocene, *Sus*, *Cervus*, *Antilope*, *Felis*, *Lutra*, and *Castor* appear for the first time, and the higher Apes are present in European forests. In the Upper Miocene *Camelopardalis*, *Gazella*, *Hyæna*, and *Hystrix* appear. During the Pliocene several important genera disappear from the world or from Europe—among the latter the Apes, at the close of the Upper Pliocene. Oxen, horses, bears, and elephants appear. Great changes took place in the Pleistocene; seven species survived into it which are now extinct, and of newcomers there were fourteen living and seven extinct species. *Cervus megaceros* is the sole survivor from the Pleistocene to the prehistoric period which has since become extinct. The paper concluded with some remarks on the latter part of the first and the second period, which, however, as forming the subject of previous notices, was treated more briefly. The author remarked that a study of the development of the Mammalia renders it hopeless to expect to find Man in the Eocene or Miocene, and improbable in the Pliocene.

The Animals of the Norfolk Forest Bed.—A new and very interesting fossil animal has been added to the collection already procured from the

"Pre-Glacial Forest Bed" of Norfolk. The specimen, which was discovered by Mr. Robert Fitch, F.S.A., of Norwich, was submitted by him to Mr. E. T. Newton, F.G.S., of Jermyn Street, who shows it to precisely agree (so far as it is preserved) with the same parts in the Glutton, and therefore *Gulo luscus* has been added, as a new "Forest Bed" species. This specimen is doubly interesting, since it adds additional evidence of the cold climate which was creeping over the northern hemisphere when the "Forest Bed" was forming.

Discovery of Fossil Fish in the Eocene Strata of Ryde, I. W.—The cliffs (if they may be so designated) are about 3 feet high. To the height, on an average, of about 20 feet and for 30 feet inland there is a slipping talus covered with vegetation, and composed of clay of various colours, with blocks of irregular laminated fresh-water Binstead limestone with ripple marks, and containing *Limnei*, *Planorbes*, &c., and rolled fragments of the bones and carapaces of turtles with a few small teeth (rare) of evidently a species of reptile and small mammalian teeth. The slippery soft clay contains no organic remains as far as I am aware. On the shore level with the shingle are strata of clay *in situ*, the whole series not being more than three feet thick as far as I can judge. The following is a list of the strata with their characteristic fossils :—1. A layer of bluish or reddish soft tenacious clay with the nodules of hard laminated clay, in which are found the *small fossil fish*, with scales, bones, vertebræ, &c., of larger fish, leaves of ferns, &c., and rushes, &c., and fragments of araucaria. 2. Strata containing masses of *paludinæ* crushed or perfect, containing vertebræ from one-eighth to three-quarters of an inch in diameter at widest part, turtles, bones and portions of wood, &c., also small nodules of hard laminated clay with cyprides. Small slabs of comminuted fragments of *paludinæ* held together by being impregnated with iron pyrite.—*G. W. Colenutt.*

[Mr. Colenutt's discovery of these fossil fish is of great value. We have not seen more perfect specimens, even from Monte Bolca, than those he sent us, and which we hope will shortly be described.—Ed. *S. G.*]

Topographical Geology.—The *Scottish Naturalist* for April contains a most interesting article by the Rev. A. Milroy, D.D., "On the Value of the Names of Places in indicating the Ancient Surface-features of the Country." The article deals with the Celtic and Saxon names or terminations found in Scottish topographical nomenclature, and some very interesting facts are shown, such as the position of ancient river-courses, or old sea levels, etc. Thus, the word "Inch" means an island, and where we find the term used probably an island once existed there, and Dr. Milroy proves that this is frequently the case, and that since the names were given the sea has greatly receded.

"The Geological Antiquity of Insects."—We are pleased to see that Mr. H. Goss has published (price 1*s.* 6*d.*) the twelve papers on Fossil Entomology which, under the above title, have from time to time appeared in the *Entomologists' Monthly Magazine.* We have at various times expressed a high opinion of the merits of these extraordinary papers, and can now only repeat our gratification at their re-issue in their present handy and useful form.

The Modern Doctrine of Evolution.—Professor E. D. Cope has kindly forwarded us a copy of his lecture on the above subject delivered before the California Academy of Sciences last October. It is one of the best popular philosophical summaries which has yet appeared on this doctrine, and reviews the Evidence for Evolution, the Laws of Evolution, the Metaphysics of Evolution, and the Morals of Evolution.

The Geology of Nottingham.—Under the title of "Notes on the Alluvial and Drift Deposits of the Trent Valley, Nottingham," Mr. James Shipman has republished the lecture he delivered before the Nottingham Naturalists' Society in November last. The paper is illustrated with three woodcuts, and it is a very carefully worked out and valuable guide to the surface geology of the town where the lecture was delivered.

NOTES AND QUERIES.

How Flowers can be prevented from losing their Colour.—If R. B. L. will leave the flowers for about a quarter of an hour in a mixture composed of equal parts of water and spirits of wine, he will find that the colour is preserved in drying.—*C. B.*

Hybridism and Evolution.—I am aware that hybridism is not considered the most important feature of evolution, but I think that two successive "casual variations" might result in the production of an animal so unlike the ancestors that it is called a new species. I will not attempt to define such all important terms as genus, species, &c., leaving such definitions to be enunciated by abler men. I cannot, however, see that a discussion on the origin of species is identical with that of reason in man and animals.—*E. A. Brunetti.*

Poisonous properties of Yew Trees.—Some years ago, the proprietor of the house I live in lost two valuable horses in the following circumstances. The animals had been left standing under yew-trees while the carters were filling the cart. In the meantime, the horses had browsed on the dangerous foliage, but they repented for having done that; they died on the way, in the course of two hours. The animals had not drunk after eating the leaves. Another case: I am told that three valuable cows have died in a neighbouring parish, in consequence of eating cuttings of yew-trees; that branches had been carelessly thrown out in a yard through which the animals passed. Many persons have affirmed to me that the foliage of yew is only hurtful in a withered state. The berries of yew-trees are always eaten with impunity by children in many localities, spoons and dishes are made from the wood of the yew-tree, and no harm ensues. It is generally allowed throughout Brittany that the planting of yew-trees in churchyards is an emblem of the resurrection of the dead and the immortality of the soul, from its perpetual verdure and the incorruptibility of its wood.—*A Subscriber*, *Ploërmel* (*Morbihan*) *France.*

Green Tree-frogs.—When I was abroad in April 1879, in the north of Italy, I soon became acquainted with the green tree-frogs so common in those parts. I very soon caught some, and brought them back to England in a glass jar, half filled with water, and with a few twigs for them to sit on. I had seven. When I got to England, I put them in a large glass aquarium, at the bottom of which I placed a plant in a pot, and then water up to the neck of the pot. They soon made themselves at home, and I have now had them exactly a year. They are most interesting. They feed on any insects, but I generally give them flies. They will never eat an insect unless it is moving. If a fly crawls up to a frog and then stops, the frog will stick its eye on it and the minute it moves, will jump at it, will dart out its tongue, and swallow it. They can jump a great height; I have often seen one jump from the bottom to the top of the aquarium after a fly. They seldom miss the insect that they dart after; but if they do, they invariably go after it again. They hybernate during the winter, and it is best to put some damp moss for them. They can climb up anything; I have seen one climb up a window pane, clinging to it with the suckers at the end of its legs. The female is a good deal bigger than the male, and is whiter on its throat and belly. They change colour wonderfully; one day one will be as black as soot, and the next day as green as a leaf. I do not know whether they shed their skins or not; I have tried to find out, but have not succeeded. I have got one so tame that it will take flies out of my hand.—*R. Crossley.*

Query as to a Bird.—In a book that I have been reading, called "A Discourse on the Emigration of British Birds; or, This Question at Last Solved," &c., by a Naturalist, published by I. Walker, 44 Paternoster Row, in 1795, I came across the following sentence, "The birds that leave us at the commencement of winter, and make their regular returns in the spring, are the goatsucker, cuckoo, swallow, stork, ... willow-wren, etoboli," &c. Which bird is the *etoboli;* is it a provincial name?—*W. H. Newberry.*

Shrew-mice.—Cats, though they kill, will never eat these little creatures. I know of a large white cat, a most determined sporting cat, which climbs trees and actually brings down the birds'-nests in his mouth, eating the young or eggs, as the case may be, when he gets to the ground. He will crouch down on the grass of an evening and springing up as the stag-beetles or moths fly over his head strike them down with his paw and devour them. He will pretend to sleep in the sunshine in order to catch butterflies, devouring them with great relish; mice in winter-time are his venison, but although I have often seen him kill a shrew-mouse in both field and garden, I have never known Mr. Tom taste one.—*Helen Watney.*

Bees' Nest in a Wren's Nest.—Some time ago (in the month of May) on putting my finger into a wren's nest, which I had found built in the ivy covering a large apple-tree, I was much surprised to find it tenanted by a community of little black, red-tipped bumble-bees, which came buzzing out all round me when I withdrew my hand. The nest was strongly-built and in good condition, and did not appear to me to be a last year's one. The bees had quite filled the interior with comb, composed of a mass of irregularly-shaped cells. I have no doubt this nest had been deserted by its owners when the bees found and took possession of it. Can any reader of Science-Gossip tell me to what species the insects probably belonged?—*C. Candler.*

Skin Preserving.—In common with many other readers of Science-Gossip, I should be glad to see the very able paper on this subject by Mr. Whistler, which appeared in the number for March, supplemented by a few hints as to the best mode of skinning and setting-up fish, particularly those species which have very thin skins—the mackerel, for instance, the skin of which is little thicker or stronger than tissue paper; and even if one is successful in skinning it, the beauty is left behind on the flesh. If Mr. W. can help me over the difficulty, I shall be obliged.—*G. B.*

Urticating Moths.—I think if W. H. Newberry were to handle the cocoons of *Auriflua*, which are covered with the cast-off hairs of the larvæ, he would most probably be affected. I myself reared last year, nearly a score of these moths, and, although the larvæ did not produce the least irritation, by touching the cocoons I experienced acute irritation. I may also add that on passing my hand over my face, the rash was communicated to it.—*C. H. Saunders.*

Appearance of Lepidoptera.—Perhaps the following list of the appearance of a few Lepidoptera, up to the present date, may interest some of your readers. *Vanessa urticæ* first appeared 11th March; *Pieris napi*, 20th March; *Plusia gamma*, 20th March; *Vanessa cardui*, 26th March; *Satyrus Janira*, 29th March.—*W. H. Newberry.*

Sagacity of a Dog.—The other day I met with a very remarkable instance of the sagacity of the dog. I know it is true, and think it is worthy of notice. One of my parishioners, a farmer, who also has carts for drawing coals, was standing not long ago in the street of a neighbouring town, having just delivered a load of coal. There were a good many people about him, and his empty cart with the dog near it was standing not far off, and while engaged in talking to his friends he was astonished by a sudden commotion, his dog barking most fiercely at some one on the other side of the dray. Going round to see what was the matter he saw an old friend of his whom he had not seen for three years. "Why," he said, addressing the dog, "Gyp, what's the matter?" "Oh, said his friend, "I know what's the matter; she remembers me." It appears that when this man lived near the owner of Gyp, he had tried to pluck some hairs from the horse's tail. Now this horse was a particular favourite of Gyp's, and she resented the act, and would have bitten the man had not some one interfered. Ever after she growled at him and would not allow him to go near the horses; but after three years one would scarcely think she could have remembered him, but, as the story shows, she did.—*Gobbo.*

Query as to Falcon.—The passage in Wordsworth quoted by your correspondent P. Q. Keegan, in the current number of Science-Gossip admirably describes the actions and habitat of the peregrine falcon (*Falco peregrinus*) during the nesting season, several pairs of which species annually breed in the high cliffs and rocks on the coasts of Devon and Cornwall, constantly wheeling round in "clamorous agitation," as the poet says, until the intruder leaves the spot. The peregrine is, however, by no means restricted to the neighbourhood of the sea, but breeds inland, provided suitable and inaccessible localities can be found. However, I am sorry I cannot answer your correspondent's query as to whether the peregrine still frequents the precipices of Little Langdale Valley in Westmoreland. The stock-dove (*C. œnas*) is rare in South Devon and Cornwall, but I am informed that large flocks annually visit parts of Somersetshire and the adjoining county of Devonshire, near Tiverton, during November, to feed on the beech mast, but I have never met with a specimen so far down as Plymouth. I think "stock" dove rather a misnomer, as the rock dove (*C. livia*), found occasionally on the cliffs on the coast of Devon and Cornwall, is now allowed to be the parent stock of our domestic pigeons.—*J. Gatcombe.*

Query as to Falcon.—The passage from Wordsworth, Science-Gossip, page 119, appears to me to refer to the peregrine falcon, as it describes exactly the habits of that species when disturbed in the breeding season. Not being acquainted with Westmoreland, I cannot answer Mr. Keegan's second query, but it may be interesting to him and others to know that the peregrine still nests annually on the rocks in the Bizzle glen, Cheviot, Northumberland. Regarding the query relating to the stock-dove, he is mistaken in his "impression that this bird was confined exclusively to the south of England." The stock-dove seems to be one of those birds that are gradually extending their northward range. The farthest north that I have seen any record of its breeding in Scotland, was at Cardney, Dunkeld ("Scot. Nat." v. 136). It has been known to nest for several years past near Dunse in Berwickshire, from which district I received an adult male in August last. Mr. G. Bolam, Berwick, "came upon the stock-dove breeding at Paxton, and got two fine eggs from a rabbit-hole on a steep bank near Hutton Bridge" (Proc. Ber. Nat. Club, viii. 598). Mr. R. Gray, Edinburgh, records two in the same volume, p. 354, shot on the "Brankston Grange and Tulliallan estates." One of these was exhibited at a meeting of the Royal Physical Society of Edinburgh. They have also been seen at various places in Northumberland.—*Andrew Brotherston, Kelso.*

Unusual Smallness of Birds' Eggs.—I think the following incident may perhaps interest some of your readers. In June, 1877, I found several linnets' nests on a furze common. Four of these nests each contained from three to five eggs, the largest of which hardly exceeded the egg of the minute golden-crested wren. Some years ago I saw a whitethroat's nest with eggs of this description for sale in an egg-dealer's shop in Brighton. A friend of mine has a song thrush's far below the average size. Can any of your readers give any explanation of this curious circumstance?—*S. Dewan.*

Canariensis or Nasturtiums?—Last autumn I gathered half-a-dozen seeds of canariensis, and sowed them in a pot in March. The seeds have grown, but four of them are nasturtiums, with the round leaves peculiar to that class of plants; the other two are canariensis. If I had not gathered the seeds myself, I should have imagined there had been some mistake, but they have never been out of my possession. How can the deviation be accounted for?—*W. T. Greene.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

To Anonymous Querists.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

A. G. Wright.—The polyanthus you sent us was affected by what Dr. Masters, in his "Vegetable Teratology," calls *virescence*—meaning thereby, that the petals of flowers occasionally assume a green colour, by the development of chlorophyll in place of the colouring matter proper to the flower.

T. Christian.—Your Alpine plants belong to the following orders: 1, *Biscutella lævigata* (Cruciferæ); 2, *Androsace jasmine* (Primulaceæ); 3, *Astrantia major* (Umbelliferæ); 4, *Astrantia minor* (Umbelliferæ); 5, *Hepatia triloba* (Ranunculaceæ); 6, *Soldanella alpina* (Primulaceæ); 7, *Globularia vulgaris* (Globulariæ); 8, *Globularia vulgaris* (Globulariæ).

S. E. Phillips.—You will find the full outline of Haeckel's division of the Exogens on page 82 of vol. i. of his "History of Creation," and at page 112 of the same work, a complete table of the phylogenetic arrangements of the vegetable kingdom.

W. R. Tagart.—Your grubs were all dried up when they reached us. Please send us some packed in damp moss. They appear to be wire worms.

J. R. D.—The insects found floating in chocolate are weevils.

Microscopical Cement.—We have received from Mr. A. Smith, Essex Road, Islington, a small bottle of cover cement, for microscopic slides, which promises well for closing slides mounted in balsam. It resists the action of acids, and sets hard in about an hour.

A. G. Wright.—Your specimens are: No. 1, *Limnæa stagnalis*; 2, *Limnæa pereger*; 3, Tooth of Ichthyosaurus; 4, Tooth of shark (*Lamna*); 5, Ditto. Get Tate's "British Molluscs, Land and Freshwater," with plates, price 6*s*. London: D. Bogue, 3 St. Martin's Place, Trafalgar Square, W.C.

M. W. Norman.—The article and drawings are under consideration, and in safe keeping. We will let you hear further on the matter.

J. H. B.—The "Feuille des Jeunes Naturalistes" may be obtained of Mr. A. Siegle, Bookseller, 110 Leadenhall Street, London, E.C., price per number (with plates) 40 cents.

"List of Assisting Naturalists."—A mistake occurs in the spelling of the name of one of our assisting naturalists last month. Instead of John Walker, read "John Walter."

M. Parkinson.—White cockroaches are simply the newly-hatched young of the ordinary black insects, and eventually turn darker in colour.

A. Johnson.—For information as to localities for Sphagnum near London, see the "Saturday Half-Holiday Guide," price 6*d*., which gives full botanical, entomological, and geological information of the metropolitan localities.

R. T. W.—Your specimens are (1), *Polypodium Phegopteris*, (2), *P. calcareum*; (3), *Lastrea thelyptera* (or marsh fern); and (4), *Lastrea dilatata*.

John R.—You cannot do better than get Hayward's "Botanist's Pocket Book." Its backs are of limp cloth, so that the book can readily be carried in the pocket.

T. W. J.—You will find descriptions of the commonest British Sertularians (with illustrations of the same) in Taylor's "Half Hours at the Sea-side," price 4*s*., published by David Bogue, 3 St. Martin's Place, Trafalgar Square, W.C.

EXCHANGES.

Wanted, starfishes, crabs, Algæ, and marine objects generally; micro objects, minerals, polished stones, &c., in exchange.—J. P. Wright, Sunnybank Terrace, Undercliff Lane, Bradford, Yorkshire.

Morris's "British Birds" wanted in exchange for "Eminent and Illustrious Englishmen," 8 vols., illustrated, or cash.—G. Balding, Victoria Road, Wisbeach.

Duplicates of about twenty species foreign marine shells, (generic names and localities of nearly all). Wanted British marine, land, or freshwater shells.—A. H. Hinton, Hillside, Walthamstow, Essex.

Wanted, mounted or unmounted flukes for crystals, or other objects.—A. Smith, Laboratory, Essex Road, London.

For specimen of *Catoscopium nigritum* in fruit, send stamped envelope to B. B. Scott, 24 Seldon Street, Kensington, Liverpool.

Wanted, microscopic material and accessories; give in exchange well-mounted slides.—F. S. Lyddon, 32 High Street, Warminster.

GOOD slides of raphides and starch of narcissus or hyacinth, for any other good slide. Sent lists to H. S., Fairoak, Palatine Road, Didsburg, near Manchester.

A NUMBER of well-mounted slides, including various Gorgonia spicules, zoophytes, &c., to be had for other mounted objects of interest, or for unmounted diatom deposit.—P. Z., Lilly Villa, Victoria Park, Manchester.

WANTED, the last edition of the "Micrographic Dictionary," offered in exchange 2 volumes of Fresenius' "Analysis Quantitative and Qualitative," also other chemical works or microscopic well-mounted slides.—R. L. H., Hillside, Hastings.

WANTED, British and foreign mosses, especially sphagnum in fruit, well-dried specimens of ferns and seaweeds, micro slides of mosses; exchange books on Natural History, all in good condition, or cash.—J. R. Mendoch, 40 Leighton Lane, Leeds.

GOOD polarising slides of plates of *Primnoa australis*, for other well-mounted slides. Also others for exchange; micrometer wanted, cash or exchange.—E. Clover, Springfield, Sudbury, Suffolk.

I WILL collect and forward (carriage paid) the diatoms desmids, &c., of this district to any gentleman who in return will send me a well-mounted slide of each variety. I will send him also a recently gathered specimen, in flower, of *Chrysosplenium alternifolium* for any plant found in Scotland.—F. C. King, Old Meldrim, Aberdeen.

WANTED, Cooke's "Handbook of British Fungi," for either of the three following: herbarium of 200 species of British mosses and hepaticæ, or herbarium of 300 species of British phanerogams, or 30 microscopic slides of British freshwater Algæ. Good microscopic material wanted in exchange for slides.—X., 14 Sherborne Road, Bradford.

HARDWICKE'S SCIENCE-GOSSIP, in numbers from 1873 to 1879 inclusive, for Geological books.—J. W. Handley, Chipping Norton, Oxford.

SIX-DRAWER cabinet, containing nearly 150 butterflies, 6 store-boxes containing about 500 moths, and complete set of entomological apparatus. Desiderata some good scientific books.—Address H. G., 55 Lausanne Road, Peckham, London.

SIX volumes of "Nature" in good condition, for "Wild Flowers, Grasses, and Ferns," illustrated; by Miss Anne Pratt.—Elizabeth Edwards, Mayfield House, Newcastle, Staffordshire.

WANTED, good silurian fossils, trilobites, encrinites, fish, corals, starfish, crabs, lobsters; will give in exchange, Haldon greensand fossils, polished slabs of madrepore coral sections, worth 24*s*. per dozen, or other kind of fossils.—A. J. R. Delater, 4 Bank Street, Teignmouth.

WANTED, growing roots of *Asplenium fontanum* and *Asplenium marinum*; in exchange for one of each I will send half-a-dozen three year old *Asplenium bulbiferum*.—A. F. Kitching, 8 Prospect Street, Hull.

I DESIRE any papers, books, or cuttings from lectures, &c., on recent and fossil Polyzoa (Bryozoa). Any odd numbers of Annals and Magazine of Natural History, of Geological Journal, of Geological Magazine. State what is wanted in micro-material in exchange.—G. R. Vine, Attercliffe, Sheffield.

WANTED, fossil Polyzoa (Bryozoa or Zoophytes) from any formation, and from any locality in England or America. State what micro-material, slides, &c., are required in exchange.—G. R. Vine, Attercliffe, Sheffield.

WELL-MOUNTED slides of diatoms *in situ* on marine Algæ, in exchange for good slides of freshwater Algæ or selected diatoms, also test scales of Podura, Lepisma, Spicula, &c.—T. Forty, Buckingham.

FOR exchange, Pluttner on the "Blowpipe," Richter & Cookesley's edition, 1875, new; and Fresenius' "Chemical Analysis," vol. i., last edition, new; either of them for Rye's "Beetles," or Cox's "Coleoptera."—J. H. Walker, Heath, Stourbridge.

EGGS of sedge warbler, willow warbler, pied wagtail, tree sparrow, tree pipit, carrion crow, jackdaw, magpie, jay, rook, sand martin, turtle-dove, pheasant, partridge, coot, common fern, guillemot, and a few American eggs, for other good eggs.—A. Wheldon, South Parade, Northallerton.

WANTED, in flower and fruit the following British pond-weeds: Nos. 1222, 1223, 1226, 1240, or any forms of the other species. Other Potamogetons or rare British plants (living or dried) in exchange.—A. B., 107 High Street, Croydon, Surrey.

WANTED, English coins or tokens, and Roman or Greek, or antiquities, rubbings of monumental brasses, old china, &c., in exchange for fossils from chalk or Thanet sand, or other natural objects.—Frederick Stanley, Margate.

WANTED, either Babington's "British Flora," or Hooker's "Student's Flora;" will give forty-five numbers of the "Countries of the World," up to the present month, in good condition, most of them have never been cut.—Edwin T. Turner, Mr. Day's, Printer, Witham, Essex.

MICRO object cabinet in pine, stained to imitate mahogany, will contain 448 objects in thirty-two drawers, will exchange for either Carpenter's, Griffiths', or Hogg's work on the Microscope, or small induction coil.—H. W. Wager, Middle Street, Stroud, Gloucester.

FOR exchange a perfect and almost new set of best gramme weights for double nosepiece, or other microscopic appliances.—J. H. Walker, Heath, Stourbridge.

RICH floatings from Lough Foyle estuarine clays, found to contain over 100 species of Foraminifera, in exchange for any any other micro geological objects.—William Gray, Mount Charles, Belfast.

EGGS.—Exchange black grouse, peregrine falcon, fork-tailed petrel, red winged starling, Sandwich tern, Caspian tern, osprey, greenshank, &c. Desiderata numerous.

FINE chalk fossils in exchange for fine fluor spars, rock crystals, agate, &c.—A. Butt, Vine Cottage, Perry Vale, Forest Hill, S.E.

PLUMATELLA, Paludicella, Oesistes, Melicerta, Stephanon, Vaginicola, &c., in exchange for *Lophopus crystallinus*.—A. Butt, Vine Cottage, Perry Vale, Forest Hill, S.E.

WANTED, either ova or larvæ of *Saturna Pavonia minor* (emperor moth), *Trichiura Cratægi* (oak egger), *Vanessa atalanta* (red admiral), *Vanessa io*, or any of hawk-moth species. Will exchange setting boards, and a cabinet set mounted on cardboard, of the names of all British butterflies, family, &c.—W. E. Watkins, 32 Huntingdon Street, Barnsbury Park.

FOR slides of the following sponge spicules, viz.:—*Raphiophora gordia*, *Isodictya cinerea*, *Tethea lynemesia*, *Ophales seriata*, *Spongilla fluviatilis*, and *gemmule spicules* of same, and six slides of spicules, selected diatoms or fragments of Gargania, Hyalonema, and Euplectella, to J. Smith, 94 Dundas Street, Glasgow.

BINOCULAR microscope, with a quantity of apparatus, including $\frac{1}{4}$, $\frac{1}{12}$th, and $\frac{1}{16}$th objectives by Powell and Lealand. Exchange good astronomical telescope, £30 to value.—S., 364 Kennington Road, S.E.

PAIR of tourmalines and 12 polarising objects in case, cost £3 3*s*. Exchange good injected micro objects.—S., 364 Kennington Road, S.E.

Pupa ringens and *Helix obvoluta* offered for *Testacella haliotoidea* and *Clausilia Rolphii*; also duplicates of the following offered in exchange:—*Lim. Burnetti*, *Succinea oblonga*, *Vertigo pusilla*, *V. substriata*, *V. alpestris*, *V. minutissima*, *V. angustior*, *V. moulinsiana*. Desiderata, British birds' eggs, British marine shells, or foreign land shells.—W. Sutton, Upper Claremont, Newcastle-on-Tyne.

WANTED, Allman's "Freshwater Polyzoa," standard botanical works or books illustrated by Turner, or separate plates, for the following:—Gosse's "Devonshire Coast," Herschel's "Astronomy," Quekett's "Histology," Berkeley's "Cryptogamic Botany," Ruskin's "Oxford Lectures," and the following books of the Ray Society:—Burmeister's "Trilobites," "Correspondence of John Ray," Mayen's "Botanical Geography," Oken's "Elements of Physiophilosophy," "Reports on Zoology," "Reports on Botany."—B. G. Whiteman, Laurel Cottage, 116 Poplar Walk Road, Loughborough Junction, S.E.

LARVA of *dominula*, *potatoria*, *auriflua*, *chrysorrhœa*, and *Neustria*. Pupæ of 5 or 6 spotted burnet moth. Desiderata—larvæ or pupæ of other species of lepidoptora.—Address, S. Smith, Castle Street, Walmer, Kent.

BOOKS, ETC., RECEIVED.

"The Seasonable Dimorphism of Butterflies." By Dr. A. Wiesmann. London: Sampson Low & Co.

"Epidemiology." By John Parkin, M.D. Part II., second edition. London: D. Bogue.

"Nature's Hygiene." By C. T. Kingzett, F.C.S. London: Baillière, Tindall, & Cox.

"Degeneration: a Chapter in Darwinism." By Professor E. Ray Lankester, F.R.S. London: Macmillan & Co.

"American Naturalist." May.

"The American Monthly Microscopical Journal." March and April.

"The American Journal of Microscopy." April.

"American Entomologist."

"Canadian Entomologist," Nos. 2 & 3.

"Annual Report of the Entomological Society of Ontario," for 1879.

"Midland Naturalist." May.

"Journal of Conchology."

"Proceedings of Geologists' Association," Nos. 5 & 6.

"Land and Water." May.

"Ben Brierley's Journal."

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 11TH ULT. FROM:—J. P. W.—A. H. H.—A. B.—L. E. A.—J. G.—M. E. T.—S. E. P.—W. B. T.—W. J. O.—W. R. T.—E. E.—A. S.—R. W. C.—G. B.—M. M.—J. R. D.—F. B.—W. T. G.—A. F. K.—G. D.—R. L. H.—T. C. M.—A. S.—J. F.—G. T. H.—J. H.—E. C.—A. C. R.—A. B.—J. M. O.—F. C. K.—B. B. S.—F. H. A.—H. W.—J. F.—T. S.—T. B.—W. R. T.—P. Z.—F. S. L.—E. J. C.—F. W. B.—J. G.—H. S.—W. S. T.—E. F. S.—J. R. M.—M. R.—C. F.—Miss C. F.—J. M. B.—G. R. V.—E. C.—J. R. S.—T. C.—A. F. K.—W. W.—E. E.—J. W. H.—T. J. L.—R. H.—H. G.—J. J.—J. W.—H. W. K.—F. J. G.—L. E. A.—F. E. A.—A. E. W.—J. A. W.—E. E. T.—R. F. T.—S. S.—H. W.—J. S.—J. H.—B. G. W.—W. D. S.—F. S.—D. C.—M. W. N.—A. B.—M. E. W.—J. A. W.—W. S.—J. H. W.—H. W. D.—T. F.—A. B.—A. F.—&c.

A NEW DEPARTURE IN BOTANY.*

PERHAPS it is impossible for Mr. Ruskin to do anything commonplace. In his most whimsical moods his mastery over the form and framework of language is complete, and he never lapses into dulness or mediocrity.

Whatever subject he touches he illuminates by the beauty of his style, and makes interesting by his wide grasp and analytic power. His love for the quiet processes of nature, and his lifelong study of natural objects, fit him admirably to expound the science of botany, and vivify the old teachings from a new standpoint. His own account of the origin and aim of "Proserpina" is, "that it was undertaken to put, if it might be, some elements of the science of botany into a form more tenable by ordinary human and childish faculties; or—for I can scarcely say I have any tenure of it myself—to make the paths of approach to it more pleasant. In fact, I only know of it the pleasant distant effects, which it bears to simple eyes; and some pretty mists and mysteries, which I invite my young readers to pierce, as they may, for themselves, my power of guiding them being only for a little way."

The first step Mr. Ruskin takes is to reform the nomenclature at present in vogue, and his chief reason for this is very characteristic, namely, that the current names of many flowers are founded on unclean and debasing associations, of the Devil's own contriving, and he assures his readers that he is always quite serious when he speaks of the Devil. He gives a very amusing account of the existing confusion of names, and tells us, with a touch of comic seriousness, that the Hemdrocallis is now to be called Funkia, in honour of Mr. Funk, a Prussian apothecary!

As might be expected, through the whole system of plant names proposed by Mr. Ruskin, there runs a distinct didactic no less than an æsthetic purpose. The terminations of the Latin family names will be for the most part of the masculine, feminine, and neuter forms. "Those terminating in *us* will indicate real masculine strength (Quercus, Laurus) or conditions of dominant majesty (Cedrus), of stubbornness and enduring force (Cratægus), or of peasant-like commonalty and hardship (Juncus), softened, as it may sometimes happen, into gentleness and beneficence (Thymus). The occasional forms in *er* and *il* will have similar power (Acer, Basil). Names with the feminine termination *a*, if they are real names of girls, will always mean flowers that are perfectly pretty and perfectly good (Lucia, Viola, Margarita, Clarissa). Names terminating in *a*, which are not also accepted names of girls, may sometimes be none the less honourable (Primula, Campanula), but for the most part will signify either plants that are only good and worthy in a nursery sort of way (Salvia), or that are good without being pretty (Lavandula), or pretty without being good (Kalmia). But no name terminating in *a* will be attached to a plant that is neither good nor pretty.

"The neuter names terminating in *um* will always indicate some power either of active or suggestive evil (Conium, Solanum, Satyrium), or a relation more or less definite to death; but this relation to death may sometimes be noble or pathetic—'which to-day is and to-morrow is cast into the oven'—(Lilium).

"Names terminating in *is* and *e*, if definite names of women (Iris, Amaryllis, Alcestis, Daphne), will always signify flowers of great beauty, and noble historic association. If not definitely names of women they will yet indicate some specialty of sensitiveness or association of legend (Berberis, Clematis)."

* "Proserpina. Studies of Wayside Flowers, while the air was yet pure among the Alps, and in the Scotland and England which my father knew." By John Ruskin, LL.D., vol. i.—George Allen, Sunnyside, Orpington, 1879.

These extracts will show the sort of ethical botany which Mr. Ruskin proposes. It will very likely appear to many to be more eccentric than useful, more fanciful than practical, yet it seems to me to be a sound principle that there should be a correspondence between the word and the thing, the nature, the essence of anything, and the word which labels it and fixes it in the storehouse of our language and literature.

The literature of flowers is very extensive, and the highest ranges of poetry are adorned with flowers and floral emblems; it is fit, therefore, that every grace of language and idea should group round the bright tribes, "the stars which in earth's firmament do shine."

"Proserpina" has clearly been a labour of love; the pathetic affectionateness of Mr. Ruskin's nature, always more or less apparent in his works, and singularly, though naturally, allied with a noble scorn, is very evident in this book. In my opinion there are few writers whose individuality creeps over and possesses one as does Mr. Ruskin's, once having surrendered oneself to its mastership. There are fourteen chapters in this first volume of "Proserpina," and the titles of some of them are typical of Mr. Ruskin's fondness for Biblical illustrations and allusions — as "The Parable of Joash," "The Parable of Jotham"; in other chapters he deals with "The Root," "The Leaf," "The Flower," "The Genealogy," etc. Throughout the book there is that peculiar fastidiousness and delicacy in the choice of words and the application of them, which always marks every line of Mr. Ruskin's writings; also a special fondness for the ancient and most picturesque verbal forms. It is a favourite way with him to draw up suddenly in alarm at his own ignorance, a fashion of dealing with his readers that awakens sympathy and stimulates curiosity. For instance, in the first chapter, entitled "Moss," and dated from Denmark Hill, November 3, 1868, he opens thus:

"It is mortifying enough to write—but I think thus much ought to be written—concerning myself as the author of 'Modern Painters.' In three months I shall be fifty years old; and I don't at this hour—ten o'clock in the morning of the 268th day of my forty-ninth year—know what moss is."

And again in the twelfth chapter, "Cora and Kronos":

"We describe a plant as small or great; and think we have given account enough of its nature and being. But the chief question for the plant as for the human creature is the number of its days; for to the tree as to its master, the words are for ever true, 'As thy day is, so shall thy strength be.'

"I am astonished truly, more and more, at the apathy and stupidity which have prevented me hitherto from learning the most simple facts at the base of this question! Here is this myrtille bush in my hand—its cluster of fifteen or twenty delicate green branches knitting themselves downwards into the stubborn brown of a stem on which my knife makes little impression. I have not the slightest idea how old it is, still less how old it might one day have been if I had not gathered it; and less than the least what hinders it from becoming as old as it likes! What doom is there over these bright green sprays that they may never win to any height or space of verdure, nor persist beyond their narrow scope of years?

"And the more I think the more I bewilder myself; for these bushes, which are pruned and clipped by the deathless gardener into these lowly thickets of bloom, do not strew the ground with fallen branches and faded clippings in any wise—it is the pining umbrage of the patriarchal trees that tinges the ground and betrays the foot beneath them—but, under the heather and the Alpine rose—— Well, what *is* under them then? I never saw nor thought of looking—will look presently under my own bosquets and beds of lingering heather-blossom: beds indeed they were only a month since, a foot deep in flowers, and close in tufted cushions, and the mountain air that floated over them rich in honey like a draught of metheglin."

"Proserpina" is a book calculated to drive mad any exact, methodical person imbued with reverence for traditional scientific manners and customs. Its vagarious incursions into all sorts of regions, fairy-land or cloudland, its deft references to moralities, and its melodious outbursts of rhythmic prose, would certainly anger any such methodist. Mr. Ruskin is often represented as a half-insane rhetorician, posing as a critical Jupiter, and wielding theatrical thunders. Any such picture of him is as false as it is foolish. Where any core of truth is to be found, where any "false-seeming shewes" are to be dispersed, he is always ready to take you by the arm, as it were, and unlock the cabinets of his golden counsels. This book, disconnected, informal, of doubtful doctrine (as many will say), has a charm and vigour about it which will ensure for it a warm reception wherever such a reception would be valued or valuable. Mr. Ruskin avows that it is compounded of fragments, and warns his readers "that while his other books endeavour and claim, so far as they reach, to give trustworthy knowledge of their subjects, this one only shows how much knowledge may be obtained, and that it is little more than a history of efforts and plans."

He is most careful to point out that the book is one of studies, not of statements, and that it will be nothing but process, and that, from first to last, he does not mean to assert anything positively in it. To the folk who can feed on nothing but fixed dogmas, doctrines, and definitions—these will be hard sayings, but to more fluent natures, this absence of rigidity, this ebb and flow, will betoken a true vitality. The greatest teacher is perforce the greatest learner, and to learn with a great teacher, to follow the evolutions of his reasoning as he makes them plain, is the finest form of a fine education.

Mr. Ruskin's philological definitions are always interesting: here is his description of the leaf:

"'The thing that is born' or 'put forth.' 'When the branch is tender and putteth forth her leaves, ye know that summer is nigh.' The botanists say 'The leaf is an expansion of the bark of the stem.' More accurately, the bark is a contraction of the tissue of the leaf. For every leaf is born out of the earth and breathes out of the air; and there are many leaves that have no stems but only roots. It is 'the springing thing' this thin film of life; rising with its *edge* out of the ground—infinitely feeble, infinitely fair. With 'folium' in Latin is rightly associated the word 'flos'; for the flower is only a group of singularly happy leaves. From these two roots come 'foglio,' 'feuille,' 'feuillage,' and 'fleur'; 'blume,' 'blossom,' and 'bloom'; our 'foliage,' and the borrowed 'foil,' and the connected technical groups of words in architecture and the sciences."

"Proserpina" treats pedants very cavalierly, and the following passage is an amusing sample of Mr. Ruskin's difficulties in getting rudimentary information from accredited text-books:

"1. Dresser's 'Rudiments of Botany.' Sap not in the index; only Samara and Sarcocup—about neither of which I feel the slightest curiosity. 2. Figuier's 'Histoire des Plantes.' Sève not in index; only Serpolet and *Sherardia arvensis*, which also have no help in them for me. 3. Balfour's 'Manual of Botany.' Sap—yes, at last. 'Article 257. Course of fluids in exogenous stems.' I don't care about the course just now: I want to know where the fluids come from. 'If a plant be plunged into a weak solution of acetate of lead——' I don't in the least want to know what happens. 'From the minuteness of the tissue it is not easy to determine the vessels through which the sap moves.' Who said it was? If it had been easy I should have done it myself. 'Changes take place in the composition of the sap in its upward course.' I dare say; but I don't know yet what its composition is before it begins going up. 'The elaborated sap by Mr. Schultz has been called *latex*.' I wish Mr. Schultz were in a hogshead of it with the top on. 'On account of these movements in the latex, the laticiferous vessels have been denominated cinenchymatous.' I do not venture to print the expressions which I here mentally make use of."

From this same chapter on the leaf, which is full of mythology, philology, and theology of the brightest and gracefullest character, take the following:

"There are some (leaves) like paws, and some like claws; some like fingers and some like feet; there are endlessly cleft ones, and endlessly clustered ones, and inscrutable divisions within divisions of the fretted verdure; and wrinkles, and ripples, and stitchings, and hemmings, and pinchings, and gatherings, and crumplings, and clippings, and what not. But there is nothing so constantly noble as the pure leaf of the laurel, bay, orange, and olive; numerable, sequent, perfect in setting, divinely simple and serene. I shall call these noble leaves 'Apolline' leaves. They characterize many orders of plants, great and small—from the magnolia to the myrtle, and exquisite 'myrtille' of the hills (bilberry); but wherever you find them, strong, lustrous, dark green, simply formed, richly scented or stored—you have nearly always kindly and lovely vegetation, in healthy ground and air."

These extracts will serve the general scope and temper of this practical work on botanical science, and Mr. Ruskin throughout works on his idea that real botany is not so much the description of plants as their biography. "Proserpina" is spiced with frequent references to the old herbalist Gerarde and the older herbalist Dioscorides. There are numberless passages in this work which compete for quotation—little idylls about daisies, poppies, and the like, but the reader must seek and find them in their own pure setting. Mr. Ruskin asks that any writer who may look kindly upon his book will add such names suggested in it as they think deserving of acceptance to their own lists of synonyms under the head of *Schol. Art. Oxon.*, as he wishes his own name kept well out of the way.

I cannot leave this book without bearing my humble testimony to the very great value of the illustrations, drawn all of them by Mr. Ruskin himself and engraved by his rural publisher. It needs not to be said that they are exquisitely accurate, and finished down to the minutest details with a carefulness as rare as it is laudable.

Whatever opinion scientific botanists may form of this extraordinary work, certain it is that from its pages they may, if they will, glean many useful suggestions, and in addition enjoy a rich literary performance by the greatest master of English prose now living.

It may be thought that with a strain of almost unadulterated eulogy I have damned where I came to bless, and it would be easy to vindicate my acumen by girding at small flaws and matters of sentiment which lend themselves to cheap ridicule, but I prefer that a wholesome and noble, though unfinished, work should appear in the brightest colours, rather than spotted here and there with tarnishes which every mean hand can lay on.

JAMES HOOPER.

"CARNATION GRASS."—A report of the Gloucestershire Chamber of Agriculture, asserts that "sheep are more liable to the fluke when kept on land where the sedge called 'Carnation Grass' grows." What species of carex is this? Can any Gloucestershire botanist kindly give information?—*F. H. Arnold.*

NOTE ON *ASPLENIUM LANCEOLATUM* (SINELII).

TO Mr. J. Sinel, of Bagot, Jersey, belongs the honour of having first discovered and recognised this pretty fern, which is exactly intermediate between lanceolatum and microdon, and forms a perfect connecting link between those forms. It differs from microdon in having bipinnate fronds, and from lanceolatum in its more stunted habit and obtuse, finely and evenly serrated pinnæ. For some time, the var. microdon was supposed to be a form of *A. marinum*; how any one could for a moment make this mistake, we are puzzled to tell. All the above-mentioned forms are of a peculiar green, not unlike that seen in the young herbage on a newly mown hayfield; only one other British species shows the same colouring, *A. viride*.

lanceolatum.	*Sinelii.*	*microdon.*
bipinnate.	bipinnate.	pinnate.
pinnæ linear, toothed.	p. broadly ovate, serrate.	margin dentate.
rachis flat.	r. rounded.	r. winged.
sori oblong, near margin.	s. oblong, in the centre of pinnules.	s. small.

Characters of *A. lanceolatum* (Sinelii).

Fronds but few, from the crown of the root, scaly below, free above, lanceolate in outline in the young fronds, evidently broadly linear; rachis round, without the least appearance of raised marginal wings; bipinnate throughout, lower pinnæ of three to five pinnules, central of three distinctly stalked pinnæ in the old fronds. Pinnules rounded or obtuse at the apex, evenly serrated, terminal cordate, lower (or those nearest the rachis) orbicular, the teeth of lower pinnules slightly mucronate. Sori oblong, springing from midrib, numerous, white in early fronds, dark brown when ripe.

The entire habit of the fern is robust, though dwarf, with a free growth, which will render it a valuable acquisition to a window fern-case.

Several roots have been found by Mr. Sinel on old walls, near to Bagot, Jersey. Fronds have been submitted to our best authorities on British Pteridology; all declare it to be a new and very distinct variety. We have thus been induced to make it known, so that it may be looked for in the south of England.

JAS. F. ROBINSON.

THE *EUGLENA VIRIDIS.*

IN SCIENCE-GOSSIP for August, 1879 (No. 176), I hinted at a suspicion I then entertained of the possibility of what is sometimes described as a variety of Protococcus—the *Euglena viridis*—really being the larvæ of the common funnel rotifer (*Hydatina senta*). That suspicion had grown out of the results of observed phenomena, and was strengthened by what was seemingly corroborative evidence from other quarters. There still existed, however, an element of doubtfulness about the matter which required elimination. With a view, therefore, of clearing away such uncertainty, if it were possible, I undertook a series of observations, and pursued them with as much continuity as circumstances would permit. And, in order the more fully and completely to solve the doubt, I obtained samples of Euglenæ from different localities, separated from each other in some cases by many miles.

The first conclusion to which the results of my observations lead me is, that the bulbous termination of the flagellum is not an accidental appendage; but is really co-existent with the flagellum itself. It is true, its visibility varies in different specimens; sometimes being clearly discernible with a power of 200 linear; at others, needing an enlargement of about 500 linear, careful adjustment of the achromatic condenser, and no little "coaxing" to make it at all apparent. Nevertheless, I have always succeeded in discovering the bulb whenever the flagellum has been present. Sometimes, however, the flagellum itself is absent, without apparently causing the little organism any inconvenience.

The second conclusion to which my observations lead, is, that the *Euglena viridis* does not develope into the common funnel rotifer (*Hydatina senta*), but is an altogether independent organism. And, although I have many times during my watchings met with forms of Euglena identical in shape and structure with those I figured in SCIENCE-GOSSIP last August, yet the most patient and continuous watching of them has not enabled me to trace that development which I then supposed had occurred: the presence of such large numbers of *H. senta* as, after a time, showed themselves in my gatherings of *Euglena viridis* last year, being readily accounted for by supposing such gatherings to have contained a quantity of undeveloped ova of *H. senta* which escaped detection, or were overlooked until, owing to their gradual enlargement, their presence could no longer be ignored.

The internal structure of the Euglena is varied. In some specimens an enlargement of nearly 600 linear reveals a granular appearance (see No. 1 of Fig. 86); whilst in other examples a very much lower power shows a clearly defined cellular arrangement (see Nos. 2, 3, 4, 5, 6, and 7 of fig. 86). The head is, in many cases, perfectly transparent and nearly "structureless." In some instances, however, this is not so; there being a large number of cells in the head (identical with those in other parts of the body), the only really transparent portion being a small space immediately surrounding the eyespot. The eyespot itself is an irregularly shaped body, of a pale red colour, and involved form. When the organism bursts (which occurs some time after the still condition has been developed) and the spores issued forth in swarms, the eyespot comes out intact, its investing membrane being ruptured only when comparatively great pressure has been exerted upon the covering-glass. The colouring matter of the eyespot, under such circumstances, is seen to be a clear and apparently semi-fluid substance, which, when examined with a power bordering upon 2000 diameters, is perfectly devoid of anything like granules or cells, and presents an appearance of perfect homogeneity.

The extreme delicacy of the flagellum and its bulbous termination renders it very difficult accurately to make out their structure. Nevertheless, after a prolonged examination of them, and cautiously watching the effects of what may be not inaptly termed "transactional focussing," it would appear that their structure is, at least, duplex; the outer membrane being much less opaque than the material encased in it.

Sometimes near the centre of the organism, but oftenest near the tail, is a circular vesicle or vacuole,

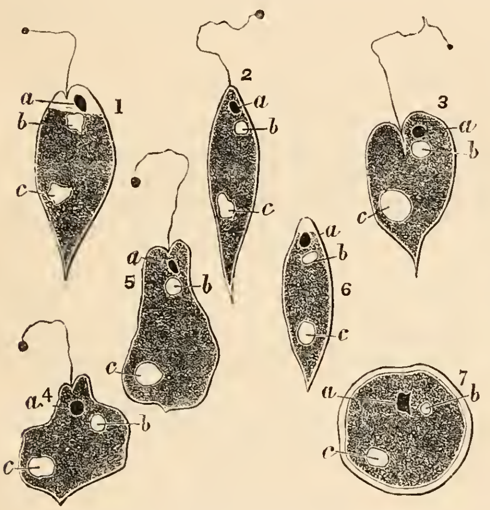


Fig. 86.—Various stages in the development of *Euglena viridis*.

the interior of which is of a much paler hue than the rest of the body. This vesicle, however, does not seem to be endowed with the power of contracting independently of the whole body. But, as the state of maturity is approached, and the "still" condition is attained (at which time the flagellum disappears altogether) a second vesicle developes very near to the eyespot. This vesicle, or vacuole, possesses the power of independent contraction. It is much less than the one near the tail, being generally no bigger than the eyespot itself; and its pallid hue renders it almost invisible except under moderately high powers. It certainly can be seen with a good $\frac{1}{4}$ inch and No. 2 eyepiece, but its movements under such a combination are very indistinct; such movements being best seen by an enlargement of about 2000 linear. The rate of contraction is nearly $1\frac{1}{2}$ per minute. The systole is very sudden, but the diastole is gradual, the combined action very closely resembling the sudden collapse and slow subsequent dilation of a vorticella. The presence of this contractile vesicle is very significant, and is of vastly more importance than the bulbed flagellum in fixing the real position occupied by *Euglena viridis* in the world of life; and it goes very far towards solving the somewhat vexed question, "Is the *Euglena viridis* an animal or merely a plant?"

Had I not seen this contractile vesicle, and carefully watched its movements to make sure that they were real, I should have been inclined to class the *Euglena viridis* (as do the editors of the "Micrographic Dictionary") with Algæ; but I cannot now do so. Indeed, I feel no hesitancy in following the lead of M. Lachmann and others, who, by virtue of having witnessed the motions of this contractile vesicle, ascribe a true animal nature to *Euglena viridis*.

Several observers, and amongst them Mr. Slack, in his excellent little book on the "Marvels of Pond Life," speak of the rotifers and the higher infusoria "greedily gulping down" these creatures. If this be so common an occurrence as those observers would lead one to infer, if the *Euglena viridis* in its various stages of development forms one of the foodstuffs of the inhabitants of the rotiferal and infusorial worlds, I have been singularly unfortunate in my researches; for during the past eight months (a great part of which time has been spent in the observation of these organisms) I have never seen one of them, in any stage whatever, swallowed either by rotifers or infusoria; although ferocious-looking monsters frequently invaded the peaceful domain of the Euglenæ. Indeed, upon only two occasions have I seen within the stomachs of animalcula anything at all resembling them. My experience in this matter, however, does not disprove the accuracy of the statements of those observers to whom I have referred, as it is quite possible that those voracious feedings may have occurred during such intervals of repose as I have found it necessary to take after several hours' continuous watching, and thus they may have escaped observation.

I append a sketch (fig. 86) of some of the "motile" forms in various stages of contraction, with and without bulbed flagellum; and also the "still" form.

Various forms of *Euglena viridis*. Nos. 1, 2, 3, 4, 5, show motile forms in various stages of contraction with bulbed flagellum; *a*, red eye-spot; *b*, contractile vesicle; *c*, non-contractile vesicle. No. 6, shows motile form without the flagellum; *a*, red eye-spot; *b*, contractile vesicle; *c*, non-contractile vesicle. No. 7 is the "still" condition of the *Euglena viridis*; *a*, red eye-spot; *b*, contractile vesicle; *c*, non-contractile vesicle. No. 1 also shows the granular appearance referred to above; with an enlargement of about 1500 linear, the granules turn out to be very minute cells, which fact would seem to indicate that the organism containing them has not yet attained maturity as a motile form.

F. Jas. George.

Chorley, Lanc.

LIST OF LOCAL FLORAS.

I HAPPENED by an accident to miss seeing the January number of Science-Gossip until this week, or I should have sooner noticed a "List of Local Floras of the British Isles." Such a list would be very useful if made as perfect as possible; but for that purpose extensive inquiry is necessary, and the Secretaries of Natural History Clubs, of which there are now one or two in almost every county, might be asked for information as to their respective localities. An incomplete list is but of little use; for thus work that has been done is left unnoticed, and it is certainly advantageous to know what has been already accomplished. Thus, as to Worcestershire, only one work is mentioned with reference to its plants, while I could have added as under:—

Worcestershire.

"Rarer Plants and their Localities," in Dr. Nash's "History of Worcestershire," 2 vols. folio, 1790.

Plants recorded in Pitt's "Agriculture of Worcestershire," 8vo. (about fifty years since.)

Scott's "History of Stourbridge," 8vo.

Dr. Hastings' "Illustrations of Natural History of Worcestershire," 8vo.

Roberts's "Habberley Valley, near Kidderminster," 12mo.

Stanley's "Guide to Worcester," with list of plants, by T. Baxter, 12mo.

"History of Tenbury," 8vo.

"Botany of Worcestershire, with enumeration of all its Plants," published by the Worcester Naturalists' Club, 8vo. 1867.

"Worcestershire Fungi," in "Transactions of Malvern Field Club," 8vo. 1870.

"Rubi of Worcestershire," in "Babington's British Rubi."

Then as to other counties of which I have knowledge, additions might be made.

Gloucestershire.

Buckman's "Flora of Cheltenham," 8vo.

Plants of Symond's "Nat-on-the-Wye," in "Botanical Looker-Out in England and Wales," 8vo. 1851.

"Plants Growing in the Parish of Forthampton, near Tewkesbury," by Captain Seracald, 8vo.

"Plants of Tewkesbury in Tewkesbury Register," 8vo.

Herefordshire.

"Flora of Herefordshire," by Rev. W. H. Purchas, in "Transactions of Woolhope Club," 8vo. 1866, and subsequent years.

Hampshire.

Wise's "History of the New Forest," 4to. and 8vo. 1863.

Kent.

"The Flowering Plants of Tunbridge Wells," by R. Deakin, M.D.; Groombridge, London, 1871. Descriptions of 782 species, and engravings.

Leicestershire.

Potter's "Charnwood Forest," the Botany by Rev. Andrew Bloxam, 4to.

Monmouthshire.

"Rarer Monmouth Plants" in "Purton's Midland Flora."

Staffordshire.

"Botany of Staffordshire," in Garner's "Natural History of the County of Stafford," 8vo. 1844.

"Flora of Staffordshire," by Dr. Fraser, in "Transactions of the Staffordshire Naturalists' Club," 8vo.

Warwickshire.

Bagnall's "Plants Growing in Sutton Park, near Birmingham."

"Remarkable Plants Growing in the Vicinity of Birmingham," by Dr. W. Ick, in "The Analyst," for 1837.

"Cryptogamic Flora of Warwickshire," by J. E. Bagnall, in "Midland Naturalist," 1879.

WALES.

Merionethshire. "Plants of the Great Orme's Head," by T. Baxter, in "Llandudno Guide."

Much information as to local works and lists of plants might be obtained from the Secretaries of the various Natural History Clubs, now so numerous; and if a list of these officers could be obtained and published in Science-Gossip, it would much facilitate botanical correspondence. Local observers should be known, and their information acted upon, and so many omissions would not then be made. The design of Watson's "Topographical Botany" is admirable, but it is very incomplete from want of that local assistance and evidence that the officers of county Naturalists' Clubs could have supplied. The same observation applies to "Local Floras," and the plants of particular places, which can only be fully known by information from resident observers.

Edwin Lees, F.L.S.

Green Hill Summit, Worcester.

SOME COMMON WADING-BIRDS.

By P. Quin Keegan, LL.D.

A LONG, desolate tract of seaboard, a waste of surfy sand far out in mid-channel, where the mussel and the grass-wrack flourish, these are the homes and haunts of the long-shanked wading-birds. No sooner has the ebbing tide laid bare the weed-clad shore, than flocks of birds, strung in long lines or dilated in wedge-shaped fashion, and flying freshly with hot haste and swiftness, suddenly alight upon the slimy, pool-dimpled land just won from the sea. Immediately they scatter themselves abroad, and commence assiduously to work in quest of food. Manageable molluscs, tiny crustaceans, even grass-wrack or other stranded seaweeds, are greedily devoured. These shore birds have a physical organisation marvellously adapted to their peculiar habits of life: long, thin, agile legs and feet eminently convenient for wading; long, thin, sensitive bills exceedingly well qualified for probing the depths of wet sand and slimy ooze, are immediately perceptible. Their powers of flight are extremely capable, their senses are piercingly keen, acute, well-practised, so that they are eminently fitted, when danger threatens, to take care of "number one." They are at once patient and indefatigable, and live in harmony with birds of a different degree. Beautiful is their aspect, their movements are easy and nimble, and their carriage and gait are characterised by supreme gracefulness.

The wandering lover of shore scenery, the frequenter of wild moorland wastes, of desolate inland lakes, or of old ancestral park woods, soon becomes familiar with the extraordinary and most interesting aspect of these wading-birds. To all others they are almost wholly unknown. Their haunts are local, and comparatively few situations are suitable to their characteristic habits or mode of life. They are not of a roving disposition; their range of migration is comparatively limited, and, save during the breeding season, they rigidly eschew the human presence as much as possible, so that to many the book of their nature is sealed up. The stern and unrelenting persecution by human sportsmen reiterated for centuries has rendered them excessively shy and suspicious. Marvellously fashioned by nature for the pursuit of a career under peculiar circumstances of situation, &c., the artificial hostility of man has superinduced upon their original nature an acuteness and readiness of perception, a fertility of precautionary resource, and an ingeniousness of device which happily is not common amongst their feathered mates of sea or land.

In the whole range of British ornithology there is no grander or more interesting bird than the common Heron (*Ardea cinerea*). At the extreme verge of the shore when the tide has ebbed, he stands, his tall, gaunt, erect figure relieved conspicuously against the clear background of sea. On the margin of extensive plots of slimy ooze where the grass-wrack grows, near pools where the active and pugnacious shore-crab lurks, where the whelk and mussel abound, away at a secure precautionary distance from the haunts of man, there he may be observed. Motionless and silent for the most part is his aspect. Sometimes balanced securely on one leg, with his long snake-like neck shrunken down to his breast, he stands, crouched and lowly, upon some outlying ledge of sand, his ashy-blue plumage gleaming in the sun. Again, with neck and limbs outstretched to their utmost limit, and in a curious, contemplative attitude, motionless as a statue, he stands over some slimy pool where some moving crab or other edible morsel has aroused his expectations with the prospect of something tasty. The cold piercing sea-wind blows over his arched form, but, save the long crest, ruffles not a feather of his plumage; or mayhap the rain pours lavishly, yet it occasions no dripping discomfort to him.

Strong light appears to act as a sedative upon the heron's native activity. Occasionally indeed, in the day-time he may be observed to fly with a heavy lumbering wing from place to place; but, generally speaking, his occupation is simply to stand at ease upon the verge of the sea near low-water mark in a relaxed drowsy attitude. Sometimes he wanders about listlessly, sometimes, attracted by some distant object, with his gaze riveted thereon, he stands contemplating it for several minutes. It is his period of rest and relaxation. Nevertheless, the tide in its everlasting flow comes pouring in. He is loth to move from his position, though the waters, still surging higher and higher, entirely surround him, and bathe his legs even up to his body. At length his time has come, the tide has advanced sufficiently far. He arouses himself, and culminating an effort, spreading his broad, arched sail-vans with a flap, and uttering a loud harsh cry, he wings his way to some more removed ground—some neighbouring pasture, some inland loch or quiet sea-haven, or some more lonely deserted wood, where perched on a tall tree he may placidly await until the waters shall have receded once again from his sea-side haunts. The beauty and grace of his wing-ascent has often been noticed with admiration. In a series of expanded concentric circles he carves out his track through the liquid ether, most frequently silent, but occasionally uttering a harsh cry, and presenting to the astonished spectator below the appearance of an arrowy line carrying some wide and solid substance in the middle.

During the night-time, however, his sloth evaporates, and his activity being aroused, his conduct is remarkable. By the clear light of the moon, he searches with eye-piercing acuteness for crabs, fish, frogs, rats, &c., and devours them with an insatiable voracity, and a rapid and vigorous digestion. His zest for food seems, however, to be periodical. Occasionally, when a long course of dark nights occurs, he becomes thin and lean ; but when the moon is propitious, he consumes vast quantities of victuals, thereby inducing a plumpness and fatness of body. The flesh when young tastes, it is said, like hare ; but more frequently it is foul, tough, and fishy. We have had no personal experience of the flavour of cooked heron. He certainly does not "look" like as if competent to furnish a "most excellent dish."

We have read somewhere an elaborate French recipe for the cooking of sea-anemones ; but one would just as soon think of appeasing his appetite with their flabby flesh, as of experimenting upon the tasty or nutritious qualities of a sauced or fricasseed heronshaw.

A heronry is a spectacle of exceeding interest. The incubating period is attended with much fuss and consequence. Sometimes the birds build their nests on the ground ; but more commonly the dead branch or extreme summit of some tree is selected for the purpose. Any tree sufficiently tall and strong is deemed suitable. A larch, birch, fir, willow, oak, beech, sycamore, elm, have each been seen tenanted

Fig. 87.—The Heron *(Ardea cinerea)*.

by an incubating heron. As many as eighty nests have been seen on one oak and frequently the branches are bent considerably earthwards by reason of the great number and weight of the nests. The nest is composed of small branches of dry herbs, rushes, and feathers, and its form is like that of the rook, only larger and coated with a white and plastery exudation. Sometimes indeed they build in a rookery, or in very low trees, and occasionally on an island of some desolate mountain tarn. They are very early breeders, and the process is attended with much daring and confidence. The human presence deters or affrights them not. The birds fly to and fro with great energy and assiduity, bearing eels, &c., to the young brood. When alighting they carefully place their legs on the branch, then flap their wings, and so-wise settle down to business. When a strong wind blows with violence over the forest there is often seen a ludicrous effort on the part of the devoted bird to maintain its equilibrium. The wings are alternately raised this way and that way, but the bird clings on perversely, notwithstanding the apparent discomfort of its position.

The Heron is described as of a "melancholy deportment, as a silent and patient creature," &c., and unquestionably his aspect when posted at low-water mark during the day-time amply substantiates this account. He certainly lives in good fellowship with the various gulls, curlews, dunlins, &c., which frequent the same haunts with him. Frequently, even before or after the breeding period, some fifty or sixty have been observed associating in agreeable companionship. More commonly, as we can attest, they lead a solitary life, even when comparatively young and immature. Save the forcible stab of the bayonet-like bill, and the bill grasp, which is exceedingly powerful, the creature possesses no other instruments of hostile offence; the claws are always much worn and blunted. In the instance of a tame bird which came under my notice it was seen that he was very gentle and caressing towards his master and those whom he knew, but he attacked strangers with great fierceness. Nevertheless, and in a general way, we by no means opine that this system of attacking strangers, pursued by dogs and other animals, argues an excessive warmth of attachment to their masters or to anything else. Now and then the heron is vigorously attacked by a party of irate crows, but on such occasions he trusts to flight, and executes a somersault or two rather than resort to energetic repellent or defensive measures.

(*To be continued.*)

BOTANICAL WORK FOR JULY.

PERHAPS the following notes may prove useful to earnest botanical students:—

Asperula odorata: minima. A very small form of the woodruff is found in woods, Westmoreland, flowering the early part of this month. It is about two inches high, but with the flowers of the ordinary size, and petals tinged with pink. Would our readers kindly look up this plant in other districts?

Ulmus glandulosa (Lind.). This form, or probably species, of the common elm, is pointed out in Flora of Shropshire. It is recognised by the leaves being glandular beneath, especially along the veins; they have a sweet odour, not unlike the sweet briar, which is very conspicuous when dried.

Poa annua: villosa (Leight.). Pales clothed with white hairs, a very distinct variety, much larger than the type found in cornfields.

Pimpinella Saxifraga (L.). α. Poterifolia (L.), similar to poterium.

Pimpinella Saxifraga (L.). β. Intermedia; leaflets inciso-serrate.

Pimpinella Saxifraga (L.). γ. dissecta; leaflets cut, or laciniate.

The above are all met with in the Midland counties. Would our botanical readers carefully compare the specimens they meet with?—they are not well known.

Calluna hirsuta. Leaves densely hairy.

Calluna alba. Leaves hairy on veins; flowers white. There are many intermediate forms of the common ling in flower this month—we can find about ten in our district. When first we commenced collecting, each of these received an herbarium sheet—this tends to make any British collection unique as well as deeply interesting.

Betula pendula. Weeping birch. Is this variety ever seen outside the shrubbery? A question worth working out.

Ornithopus depauperatus (Leight.). A small variety, with flowers double the size of the type; petals often pure white.

Ballota alba. This is a most striking form of the plant. In this state it loses the unpleasant characteristic odour. Why, or what is the cause for this?

Bidens minima (Huds.). Another dwarf species found in southern counties. We believe this to be a very distinct species, and not a mere variety.

Lotus major: glabriuscula. Whole plant; smooth.

Littorella hirsuta (Leight.). Leaves hairy; a more spreading plant than the lacustris (L.)

Symphytum patens (Sibth.). This plant, during the past few years, has been entirely overlooked; until last year a correspondent of SCIENCE-GOSSIP sent a specimen as something novel. It must not, however, be confounded with the *S. officinale.* When the carpels of the latter are beginning to ripen the petals assume a dull reddish appearance, whilst the true *patens* has pale pink petals, and widely-spreading calyx teeth; whole plant covered with rough pubescence.

Arrhenatherum bulbosum (Lind.). It is worthy of inquiry—does this variety, described by Lindley many years since, simply assume the bulbous habit only when growing in stiff clay or rich marly soils? Our experience is but limited, though we are tempted to think it is so.

Campanula rotundifolia (L.). The white-flowered plant, also the one with single-flowered stem, are not accidents. On this occasion we notice them to incite others to their study as worthy objects. The only plan is to compare them carefully through a perfect series. Both in leaves, stems, and flowers, they widely differ. Has a pink form ever been found in this country? Mr. Macmillan speaks of finding it on the Swiss Alps.

Ilex Aquifolium (L.). Mr. Leighton observes a yellow berried form, or variety, on the Wrekin, Shropshire. Is this the same as found in cultivation?

Potamogeton pusillus, *major*. We have herbarium specimens, gathered at Ellesmere, that have compressed stem and broader leaves. We unhesitatingly name it major, as found on the continent.

LIST OF ASSISTING NATURALISTS.

[*Continued from p.* 111.]

IRELAND.

Monkstown, Co. Dublin. Greenwood Pim, M.A., F.L.S. *Flowering plants, ferns, fungi.*

ENGLAND.

London, 171 Fleet Street, Lewis Castle, *Botany.*

ON THE ARRANGEMENT AND GROWTH OF BUDS.

By John Gibbs.

As buds are found in the axils of leaves, it may be inferred that whatever be the method of leaf-arrangement would regulate the disposition of buds, and as from these buds the branches grow, the form and habit of a plant would depend on the arrangement of its leaves. It is, however, found in practice, that other principles enter into the growth of branches, which is determined by laws different in different plants, but generally constant in each species.

If the leaf-buds on a stem were developed in the same regular order of succession as is observed in the flower-buds of a stock, wallflower, or antirrhinum, the lowest first and then the next above it, and so on to the top, the buds at the base of a stem, on a level with the ground or below it, would begin to grow before those higher up on the stem, and might be expected to grow more vigorously, the effect of which would be to form a bush, as we see in the currant and gooseberry bushes. Plants in which this mode of growth prevails cannot become trees, though having woody stems. To obtain large and well-grown bushes or shrubs, it is necessary to check the tendency to throw up shoots from the lower part of the stem by destroying buds found there. In the stem of a young plum-tree, which we may suppose as tall as that of a currant-bush, we may see a difference in the following year, when its uppermost buds will grow into vigorous branches, those below them remaining undeveloped. This will continue till the plant shall have become a tree.

In every sort of plant there is a tendency to develope buds from certain parts of the stem, leaving those in other places latent or undeveloped, unless called into activity by special circumstances, as for instance, if the buds which take precedence of them should be destroyed by accident, or by design in pruning. The particular places on a stem from which buds will grow most vigorously are determined by the specific or individual character of the plant. The stem of an elder-tree often grows erect for a few feet, when it curves, forming in its upper part an arc of a circle. About the spot where the stem begins to curve the most vigorous branches grow, also erect or nearly so, increasing the height of the tree in proportion to their vigour, and each ending in a curve above. It is on this curve in the upper part of a stem that the branches grow, which in the following year bear flowers and fruit; leafy branches rising from the upper part of the straight portion of the stem, or the lower part of the curve, and diminishing in vigour as the stem on which they grow inclines to a horizontal position. This habit of curving in the upper part of the stem and branches gives an aspect of rotundity to a well-grown elder-tree, in which it is rather like a gooseberry-bush on a larger scale. A similar habit is observable in some of our wild roses, of which erect shoots rise out of the ground several feet when they curve, forming, if let alone, beautiful arches to be covered with bloom in the following years. The stems are straight for a sufficient length, to serve as stocks whereon to graft superior sorts of roses for standards, the natural curve above being pruned away.

In many larger trees the tendency to curve does not appear, but the stem grows erect for several years, as in the horse-chestnut-tree; there, as the leaves are opposite, it is not uncommon to find branches on the opposite sides of a stem equal in size and vigour. In other cases two opposite branches differ according as one of them is more exposed to light than the other, that on the shady side being small, while that on the sunny side is larger. When a tree has attained such a size as to have large branches, which themselves continually branch again, it is evident that many buds would be on the side next the central stem, so that if they were developed equally, with the buds placed externally, they would make a thicket of interlacing branches that would come into contact with each other till the growth were stopped by the limits of the space to be occupied. It is, therefore, well for the figure of the tree that buds on the inner, and, therefore, shady side of a branch, should either not lengthen at all, or only to a very limited extent, while those in lateral, or external places, grow to a considerable size. The flowers being in a terminal panicle, the flowering stem often forms two branches below them, which grow equally. This tendency to regularity of growth, only modified by the degree of light or other external conditions, makes the horse-chestnut tree assume a tolerably symmetrical shape.

There are, however, plants mostly herbaceous, in which the buds in the axils of opposite leaves do not grow equally, that on one side being alone developed or growing much more rapidly than its opposite neighbour. Plants of the order Caryophyllaceæ often display this character, along with an alternation of the sides where vigorous branches grow. The leaves being decussate, the branch in the axil of one of them grows in a plane, at right angles with that of the one immediately below it, and that next above it on the opposite side. So then, though the leaves are opposite, the branches growing on alternate sides form a spire, including those axillary to four leaves, the fifth being above the first. On the opposite sides the leaf-buds are either undeveloped, or are much more backward in their growth. The common weed called cleavers (*Galium Aparine*) also shows this mode of branching very well. That of the whorl of leaf-like organs which surround the stem of this plant, only two contain buds in their axils, is an argument in support of the position that only those are true leaves and the others stipules. That the leaf-bud on one side is always in advance of that on the other side, and that in this they show a similarity to our pinks and chickweeds, is a matter of additional interest.

RESEARCHES IN POND LIFE.

No. II.

REFERRING to my previous communication respecting the Acineta, I have now a few more interesting facts to state, being the result of a series of careful observations, and I think they throw some light on a few hitherto doubtful points. I stated in my last paper that I believed the perfect forms of Acineta, which were in such large numbers upon the filaments of the Alga, were developed from the rudimentary gelatinous masses, or more properly, perhaps, we should call them the Amœboid form of Acineta as observed last autumn. This, of course, it is impossible to state as a fact, not having seen them so develop, but there is very strong and reasonable ground to infer such was the case, the Amœboid forms having disappeared and these swarms of perfect Acineta taking their place on that identical Alga and that only. I stated also that I believed the Acineta to be attached parasitically as it were to the stems of the tree form of Epistylis as there figured and that they formed no part of the organism itself; that I think is clearly established by the following observations. Upon watching a large number of the Acineta, I found in several, an egg-like body or zoospore developing in the interior (see fig. 88 A).

Keeping in view one in a forward condition, in a short time the ovule escaped and was furnished with a ring of cilia round the centre (see fig. 88 B) by means of which it rapidly whirls about for some few minutes; it then attached itself close to one of the clusters of Epistylis cups, so numerous on the filament of weed, and then commenced a most interesting development. The ovule in half-an-hour after its attachment had developed a short pedicle (see fig. 89 A), and in two hours it had assumed the form represented in the "Micrographic Dictionary," and named the *Podophyra fixa* (see fig. 90). The description there given is somewhat vague, but it is stated to be the Podophyra stage of Vorticella, as I think erroneously, for in the course of about two hours more it had assumed the form of a perfect Acineta, the body becoming triangular in form with the radiations projecting from the corners (see fig. 91), and those projecting in its earlier stage from other parts of the globular body being absorbed.

This development was watched throughout, not in one instance only, but in a great number of cases, thus clearly showing that these perfect Acineta forms develop others by means of these ovules or zoospores and that they in this active ovoid form attach themselves to other bodies, and doubtless in this way became attached to the stems of the tree Epistyles, Carchecium, &c., as represented in my former paper.

Now, although these observations seemed very clear and satisfactory, I still felt a doubt as to whether it might not be possible to discover some connection between the Acineta and the Vorticella, as there were so many clusters of those of Epistylis cups, as well as *Vorticella nebulifera*, &c., attached to the Algæ. And while watching the development of these Acineta ovules on two occasions there came into view one or two active ciliated ovules of a somewhat different appearance, being much longer in form with the cilia near to one end. In two instances they attached themselves by the ciliated end to the glass cell, which was a bad position for observing their development, having to look end on. In a short time they seemed to assume the form of an Epistylis cup, the cilia round the base being gradually absorbed, a short pedicle then developed and the free end eventually opened with the cilia round the mouth of the cup. This seemed so clearly the development of an Epistylis, or Vorticella, that it made it most important to discover where these long-shaped ovules came from, and to get a more favourable view of their development. Was it possible that they also were developed from the Acineta; that in fact the Acineta produced two kinds of ovules, the one developing into Acineta, and the other into an Epistylis or Vorticella?

By much searching, and many nights' watching, I fortunately discovered their origin. After examining a number of the filaments of the weed, I found one piece with a large number of *Vorticella nebulifera* attached, and fortunately several of them were in various stages of fission (see fig. 92), and it occurred to me that it would be very interesting to watch the entire process, from the division to the perfect development, these being the finest specimens I had ever had for the purpose. At A (fig. 92) is a Vorticella cup, closed up, showing the first stage in an approaching division, at B it is somewhat farther advanced; at C the division has taken place, and they appear as two balls on one stalk; at D the one has opened the mouth of the cup, and the cilia is again active round the rim; the other still retains its rounded form, and cilium is being developed round its base. In the course of about an hour the cilium has increased in length and activity. The body then assumes an elongated form (see at E). It is then in a few minutes whisked off the stem, apparently by the becomes a perfect individual. This was not only very interesting to observe, but it most satisfactorily cleared up the question of the origin of these long-shaped ovules and that they were not evolved from the Acineta. I have written out this observation somewhat at length, not that it is anything new probably to some, but it was exceedingly curious and may be acceptable to many of your readers who may not have had an opportunity of so well watching it.

I must now again refer to the little clusters of Epistylis cups attached to the Algæ as represented in fig. 51 in my last paper, and also at fig. 89 in this paper; these clusters are of a species of Epistylis which I cannot identify as specially named; at first sight they appeared to be those named in Pritchard's

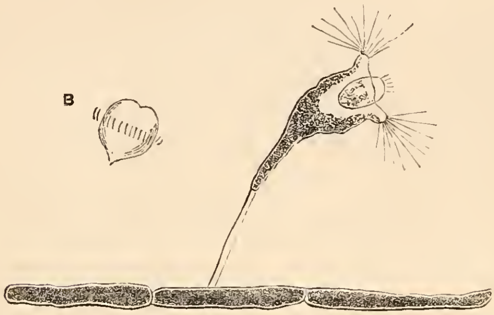


Fig. 88.

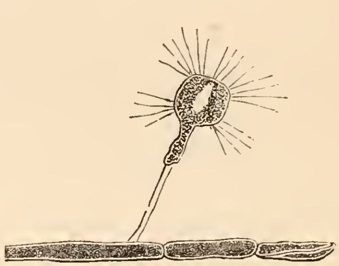


Fig. 90.

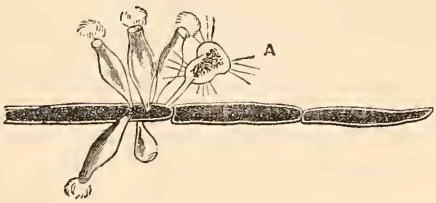


Fig. 89.

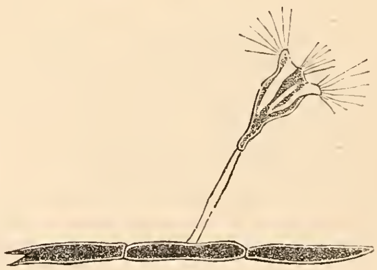


Fig. 91.

force of the cilium at its base, and off it goes whirling about, the identical form of ovule I had before seen (see at F) and the origin of which it was important to discover. I was now enabled to watch its development most favourably. I saw a number of these break away, and in some cases they attached themselves to the glass, as before observed, by the ciliated end, and others buzzed about among the stems of the Vorticella, very soon attaching themselves by their ciliated end to the weed (see at G).

This cilium at the base seems to be developed entirely for the purpose of enabling them to whirl through the water and find a place to settle upon, and then to fix themselves by it, as it is then very quickly absorbed, and a stalk begins to develop. In about a couple of hours the cup opens and the cilium appears round the rim, the stalk continuing to elongate (see at H), till it

Infusoria as the *Epistylis microstoma*, but upon closer examination they do not appear to be the same. As there were such numbers of these clusters on the Algæ, I wished to discover also, if possible, whether these were in any way connected with the Acineta, but thus far have discovered nothing to lead to that conclusion. When closely examined they are clearly a distinct species from the tree form; they are of a long vase shape, somewhat rigid, and the cilium is not, as in many species, round the rim of the cup, but is attached to a retractile organ, which is protruded from the mouth of the cup and opens out a ring of cilia which is held at a slight angle and in some aspects appears like a lid (see fig. 89 A). The body is somewhat contractile, and with the cilia withdrawn, assumes a short thick figure. They increase by fission, as I observed numbers divide down the centre (see at B), but they did not in any case detach themselves from their position after the division took place.

These observations which I have been able to make under such favourable circumstances do not seem to show in any way that the Acineta is a stage in the life-history of any of the species of Vorticella, Epistylis, &c., but that it is a distinct organism in itself. Possibly further investigation may prove this

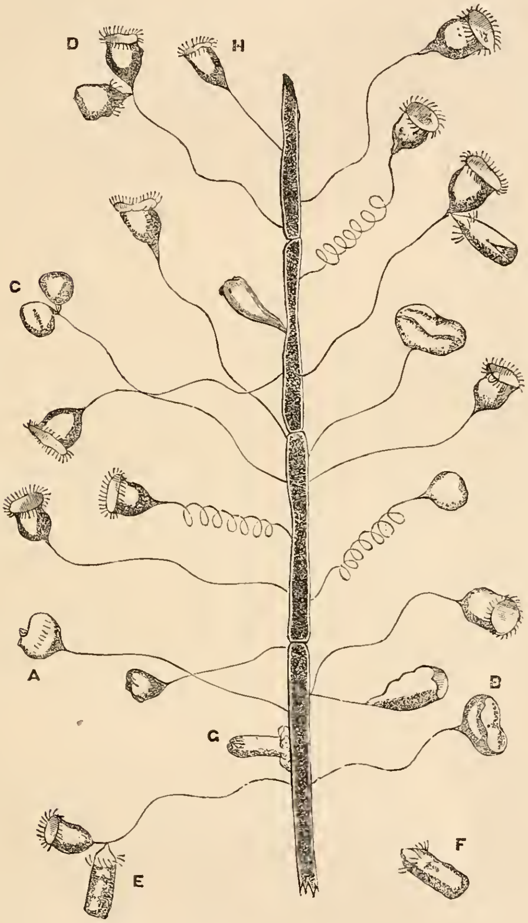


Fig. 92.

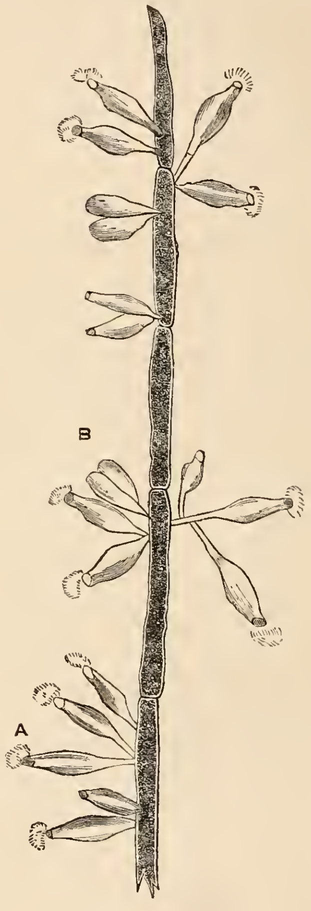


Fig. 93.

not to be the case. I trust some of your readers will be able to throw some additional light upon the true nature of this singular organism.

I should mention that I used a $\frac{2}{3}$ objective with the B eyepieces, equal to 120 diameters, but the figures are not drawn to scale; I thought it better to enlarge them somewhat.

W. G. Cocks.

[We are sorry that, owing to pressure of long-standing articles, we could not insert Mr. Cocks's important communication sooner.—Ed. S.-G.]

DEVELOPMENT OF THE PRIMULAS.

An article in the Science-Gossip headed, "Some Probabilities respecting Organic Species," having caught my eye, I found on perusal a remark concerning the probable derivation of the primrose from the cowslip. As I could not feel sure whether attention had been directed to the British flora by Sir William Jackson Hooker (second edition, page 105); I beg to enclose *résumé* of his scientific and doubtlessly well-weighed diagnosis of three of our native primulas.

According to this popular author, the common primrose (*P. vulgaris*) has its leaves toothed, wrinkled, with the scape single-flowered and the limb of the corolla flat. It is abundant in woods, hedge-banks, and pastures, flowering in April and May, but on the mountains of Scotland as late as June. If its scapes are traced to their very base, they will be found to spring from one common point and to constitute a sessile *umbel*. The oxlip primrose (*P. elatior*) has likewise the leaves toothed and wrinkled, but they are contracted below the middle ; the scape is umbellate and the limb of the corolla flat. It is found, but not commonly, in England in woods and thickets, and in Scotland it is still rarer (in the margin of the page of my copy is inscribed "Found at Frog Green"). Mr. Wilson finds specimens of this with some scapes bearing solitary flowers and others umbellate ; so that whatever may be thought of the following species, this cannot be considered really distinct from *P. acaulis*. Lastly the cowslip or paigle (*P. veris*) differs from the preceding in having the calycine teeth obtuse, and the limb of the corolla concave. It is found in meadows and pastures, and is frequent in England in a claycy soil ; but in Scotland it is rare, being only found about Edinburgh.

To this description the author adds : "Various are the opinions respecting the above three Primulas, as to the permanence of their specific characters. Professor Henslow has seen them all produced from the same root : and thus in his useful little catalogue of British plants, arranged according to the natural system, has reduced them to varieties of *P. veris*, as Linnæus has done." The primrose is thus *P. veris* γ. *acaulis* of Linnæns and Henslow, the Oxlip *P. veris* β. *elatior* of Linnæus and Henslow, the cowslip *P. veris* α. *officinalis* of Henslow. "Few plants are, however, more constant to the characters here laid down than these are, as generally seen growing in their wild stations. They are rarely found intermixed—and in Scotland the last two kinds are scarcely known. Some are of opinion that the *P. elatior* is a hybrid between the other two : but Mr. H. F. Talbot found upon the summit of a high mountain, near the lake of Thun, in Switzerland, *P. elatior* in abundance, while *P. veris* was confined to the base of the hill, and *P. vulgaris* was not found within fifty miles of it."

We have, then, three plants, the primrose, oxlip, and cowslip. The principal, as every child knows, is partial to the tufted shade of the coppice and hedgebank ; the oxlip is likewise partial to shade, but probably not in the same degree, and in Switzerland it grows at a greater elevation on a mountain than the cowslip ; which in turn owes its distribution to a clayey, or as I surmise to an open and cretaceous soil. Locality, then, is here what is technically termed the environment, and it exerts its influence whether physical, chemical or meteorological. Again, it is stated the three plants have umbels, which in the case of the primrose are sessile. But this last I know is no constant character, as I had a primrose that was picked in the Loseley Woods at the foot of the chalk ridge known as the Hog's Back, with a stalked umbel, only last season. Neither, then, is the scape invariably sessile. We are thus reduced to find the permanent characters of the oxlip in "leaves contracted" below the middle, and of the cowslip in "teeth" of the calyx "obtuse" and "limb" of the corolla "concave." But if we enquire what is the effect of the environment in any flower that grows in the shade and in the open, we shall find in the shade it runs to luxuriance, and is pale in colour, and in the open it is dwarfed and richer in hue. And this is the very point that has been already emphasised. The cowslip is dwarfed in its foliage and inflorescence as regards the oxlip, and much more so when compared with the obscure primrose hiding in its mossy couch ; while to the bees, as has been often noticed, belongs the honour of crossing the genus and propagating and maintaining the sports insensibly induced by the environment. Lastly, to Professor Henslow and Linnæus, we are indebted for showing the identity of the species, and this makes one tempted to ask, Could not some botanist repeat the experience, and raise a primrose, an oxlip, and a cowslip, from the same root ?

A. H. SWINTON.

MICROSCOPY.

THE QUEKETT MICROSCOPICAL CLUB.—We have received No. 23, for May, of the Journal of this well-known club, containing, amongst other matter, the following articles : "On the Resting Spores of *Protococcus pluvialis*," by T. Charters White, M.R.C.S.; "On the Association of Bodies resembling Psorospermia, with the Degeneration of Hydatid Cysts," by H. T. Whittell, M.D., F.R.M.S. ; "On Bleaching and Washing Microscopical Sections," by Sylvester Marsh, jun., L.R.C.P., &c. ; "On Filariæ ; Communications by Drs. Manson, Somerville, Bancroft, Da Silva Lima, Paterson, Magalhaês, and Mortimer Gourville, with an Introduction by the President ;" "Description of a Turntable," by Chas. G. Dunning ; "Description of Dr. Matthews' Machine for Cutting Hard Sections."

NEW COLLECTING-BOTTLE.—Mr. Row will find this figured and described in J. Queen & Co.'s (New York and Philadelphia) Catalogue for 1870, page 51, figure 1871. It is there called the "Wright collecting-bottle," and is thus described : "It consists of a bottle with a movable brass cap, in which are fastened two small tubes with screw tops ; one of these projects a little higher than the other, in which is fixed a funnel when in use ; the other has a trumpet-shaped form, over which a piece of fine muslin is stretched." Mr. Row's bottle is of course a much less costly affair. Messrs. Queen's price is 3 dollars, including case.—*F. K.*

ON THE ENDOCHROME OF DIATOMS.—A very interesting paper, illustrated with a plate of the spectral bands of chlorophyl, phycoxanthine, &c., by M. Paul Petit, has just appeared in "Brebissonia."* The coloured matter (Endochrome) of the Diato-

* Brebissonia, 2e année, No. 6.

maceæ was considered by the earlier observers to be a simple coloured material, to which Naegeli gave the name Diatomine. More recent observations have determined that this material (Endochrome) is not the simple coloured matter it was at first supposed to be, and for those of our readers who may be desirous of investigating this substance the following directions, extracted from the above paper, will be of service. In order to obtain it pure it is necessary that the diatoms should be quite free from other Algæ, and if marine, should be many times washed with fresh water, and lastly in distilled water, filtered and dried rapidly on the filtering paper. The diatoms thus prepared are then placed in a sufficient quantity of alcohol of 90° strength to cover them and left (protected from the light) to macerate. After being a short time in the alcohol they become a very decided green, and the alcohol appears of a golden yellow colour. After six to eight days the alcohol assumes a dark green, with a more or less brown tinge, and the diatoms will have lost a greater part of their colour; but it requires about a month to deprive the plasm entirely of its colour. The alcohol after eight days should be filtered, and we now obtain a concentrated alcoholic solution of the pigment. In order to obtain the two principal colouring-matters of which Diatomine is composed, M. Petit employs the following method. The diatoms are to be macerated in alcohol as before described; he then adds to the filtered solution sufficient distilled water to reduce its strength to 36°; he now adds chloroform equal to $\frac{1}{3}$ of the entire volume. After agitating the mixture for a minute or two, it is allowed to settle. After some hours the separation is complete; the chloroform has taken up all the green colouring matter (chlorophyl), and has sunk to the bottom of the tube or vial, whilst the yellow (phycoxanthine) being more soluble in the weak alcohol, floats on the surface. After decantation he washes a second time in chloroform, and proceeds as before. Ordinarily this second washing suffices to remove all the chlorophyl. If the supernatant part is not clear, add a few drops of 90° alcohol, which will render it transparent. We now have the two principicipals isolated, and by evaporating the solutions we can obtain them in solid state. The green matter (chlorophyl) possesses a vinous red fluorescence by transmitted light; it is of an emerald green, but the colour is always more or less dark. MM. Kraus and Millardet say that this green principal is in no degree different from the chlorophyl of the larger plants. The yellow matter (phycoxanthine) has a brick-red fluorescence, but less intense than that of diatomine; by transmitted light it is of a beautiful golden yellow, but which soon disappears even in diffused light.—*F. K.*

Highbury Microscopical and Scientific Society.—The syllabus of this society for 1880 includes papers on "The Skin and Hair," "Microscopic Sections of Rocks," "Collecting Microscopic Objects," "Missing Links," &c. The conversazione, which was very successful, was held on June 10. The following are the officers: President, Frederick Fitch, F.R.M.S., Hon. Sec. B. H. Woodward.

Deutzia scabra.—The exquisite beauty of this leaf as a low-power object may not be familiar to all your readers, especially when the stellate hairs are viewed with strong condensed light, as from a good lamp intensified by a bull's-eye condenser. The under side has this hair much denser than the upper, and seen there, resembles a rock covered with green seaweed and dotted with glittering silvery sea anemones. A portion of the epidermis mounted as a transparent object polarises well, the hairs polarising while the ground does not. I shall be happy to send a leaf to any one, in stamped addressed envelope.—*G. Pim, Monkstown, Dublin.*

Dull Objectives.—It would be a good thing if some really authoritative decision could be obtained on the subject, "What is the best substance with which to wipe object-glasses?" There is, at present, such "glorious uncertainty" in connection with the matter, that young microscopists are utterly bewildered. In your last issue Mr. W. E. Penny recommends an old silk handkerchief as the best for the purpose. Messrs. Beck recommend a clean cambric handkerchief or a piece of soft wash-leather, as most suitable for cleaning the surfaces of eye-pieces, and, I suppose, the surface of the front lens of an object-glass. Dr. Carpenter says, "The best material for wiping glass is a piece of soft wash-leather from which the dust it generally contains has been well beaten out." Mr. Jabez Hogg says: "Keep a piece of well-dusted and very dry chamois leather, slightly impregnated with the finest tripoli or rottenstone powder, in a small box, to wipe your glasses; a small piece of dried elder-pith is preferred by some for the purpose." It would seem from the above that nothing short of a "Royal Commission" will be able to settle the point. After a careful consideration of Mr. Woolcombe's remarks, it would appear that the cause of the dimness of which he complains, is somewhat deeper than Mr. Penny suspects: the real cause being, more probably, cracking of the cement by which the two parts of an achromatic combination are joined; or, the insinuation of moisture between them giving rise to what is known as "sweating." In either of these cases, the only safe course is to send the object-glass to the maker for repair.—*G. J. George, Chorley, Lanc.*

Ants killing Snakes.—A friend lately staying in Devonshire, on noticing to a workman the quantity of ant-hills, was told that they did a great deal of good by killing snakes. I should be glad to know if ants do really kill snakes, and if so, how they do it. —*V. V. S.*

ZOOLOGY.

INHABITANTS OF CYNIPS KOLLARI GALLS.—In answer to Mr. E. C. Goody's inquiries, it may be as well to observe that "oak-apple" is a misnomer as applied to the Devonshire gall of *Cynips Kollari*. The name oak-apple properly belongs to one indigenous, spongy, many-celled, globose gall, which appears in May. *Cynips Kollari* was not known in England until 1849, or, perhaps, as early as 1824. The oak-apple of *Andinus terminalis* is tinged with pink when young. The young galls of *C. Kollari* appear in July, and are a deep green in colour and very solid in their texture, changing to a rich brown in autumn. The metallic greenfly Mr. G. mentions is evidently a parasite—most likely the *Callimome Devoniensis*—while the small brown insects like cynips are inquilines, or lodgers, of the genus Synergus, which belong to the Cynipidæ, though only feeding on the substance of the gall, not on the larva of the cynips, like the true parasite larva. If Mr. G. will take the trouble next winter to keep the well-developed galls and the stunted ones apart, he will find that very few Synergus come from the former, but hosts from the latter, as also a small species of Callimome (*C. elegans*), the larva of which feeds, I presume, on the larva of the Synergus, and not on that of the cynips, as the *Calimome Devoniensis* does. All this confusion, or perhaps I should say order, occurs in other oak-galls, and the near affinity of Synergus to cynips causes great perplexity at times.—*H. W. Kidd, Godalming.*

OAR-FISH IN ST. ANDREW'S BAY.—A very fine specimen of the oar-fish was found on the beach near the Middle Fishings, at Tent's Muir, by some salmon fishers on the 10th of April last. It was 12½ feet long, 26 inches in girth at the thickest part, and had a uniform, silvery, granulated appearance. The pectoral fins, which were about 4 feet long, resembled wires in shape, and terminated in a lobe. The dorsal fin extended the whole length of the fish, which had no caudal or ventral fins. Specimens of the oar-fish are extremely rare, and this is said to be the only one found on the British Islands. It was secured by the directors of the University Museum at St. Andrews.—*A. F.*

"THE ENTOMOLOGIST'S MONTHLY MAGAZINE."—We are glad to see that with the commencement of vol. xvii. of this well-known magazine, the already powerful editorial staff will be further strengthened by the names of Messrs. Charles G. Barrett and Edward Saunders.

AN ENTOMOSTRACON LIVING IN TREE-TOPS.—Under this title "Nature," May 20th, 1880, has given a translation of the account which appeared in "Kosmos," relating to Fritz Müller's discovery of a little crustacean, whose relations one is accustomed to find among the seaweeds, living in the moist and shady hiding-places between the leaves of the Bromeliads. It belongs to the family of the Cytheridæ, and was found on the trees of Dr. Müller's wood at Itajahy, in the Brazils. He has given to it the name of *Elpidium bromeliarum*, for though it possesses no very marked peculiarities in its feet, still it does not fit into any of the genera into which the old genus Cythere has been of late subdivided.

"THE FORESTER" is the title of a magazine published by the Nottingham High School. In the last number (Easter 1800) we have an ably-written and lengthy article on "Tennyson as an Interpreter of Nature," and a capital paper on "The Origin of Sandstones."

OXFORD NATURAL HISTORY SOCIETY. — A Society for the university town and county of Oxford has been formed, the Botanical presidents being Professor Lawson, M.A. (Phanerogams), H. Boswell, Esq. (Cryptogams); Ornithology, Oliver V. Aplin, Esq.; Entomology, Professor Westwood, F.R.S.; Geology, E. B. Boulton, Esq.; Hon. Secretary, G. C. Druce, F.L.S. The meetings will be held, by the kind permission of Professor Lawson, in the lecture rooms at the Botanical Gardens; the society already numbers more than fifty members.

PROVINCIAL SOCIETIES.—We have received the annual reports and proceedings of the "Belfast Naturalists' Field Club" for the two years ending 1879. Besides some interesting accounts of trips to various places for scientific purposes, there are abstracts of papers on "Water as an Agent of Denudation," by the Rev. Canon MacIlwaine, D.D., M.R.I.A., in which the author showed how water performs its work as a denuding agent, (1) as ice, in which form glaciers grind away the rocks by their constant, though slow, movement; (2) as rain, which washes the disintegrated rock into the rivers, and thus to the sea; (3) its chemical action, when it contains carbonic acid, dissolves the hardest calcareous rocks, and often deposits them as stalagmites. Two papers are published, one entitled "Notes on Birds," by Mr. Thomas Darragh; and the other "Our Northern Rocks, and where to find them," by Mr. W. Gray, M.R.I.A., and an abstract from a paper on "The supposed Pliocene Fossiliferous Clays near Lough Neagh," by Mr. William Swanston, F.G.S., in which the author says that having had reason to doubt the correctness of the supposition that these beds were Pliocene, he submitted some of the shells, which had been referred to the genus Unio, to Dr. J. G. Jeffreys, F.R.S., who after examining them came to the conclusion that they were the shells of *Mytilus edulis*, which occurs in all newer tertiary formations. Mr. Swanston also forwarded a quantity of the material to Mr. Joseph Wright, F.G.S., of Belfast, for microscopic examination, and that gentleman detected several Foraminifera. From these data, and from the stratigraphical position of the beds, Mr. Swanston concludes that they were not of lacustrine but of marine origin, and, as they repose on a Boulder clay, that they must be glacial or inter-glacial deposits. We find also published the notes of a paper "On the mode of Occurrence and probable Origin of the *Hullite* and other silicious Minerals found in the Volcanic Neck of Carnmoney, and elsewhere in the County Antrim," by Mr. William Gault; and one by Mr. W. Phillips, entitled, "Ferns and Fern-collecting." The "Journal of Proceedings of the Winchester and Hampshire Scientific and Literary Society" for 1879 is also to hand, containing an elaborate paper by Dr. Joseph Stevens on the "Hampshire Inn Signs, and their probable Origin." The Annual Report of the "North Staffordshire Naturalists' Field Club and Archæological Society," for 1879, is unusually rich in archæological subjects, but still we find a paper by Mr. Freeston, entitled, "Ericaceæ and Coniferæ," one by Mr. T. S. Wilkins, "On some of the Pond life of a North Staffordshire District"—where to look for, how to find, how to view, Infusoria, Hydrozoa, Rotifera, Polyzoa, etc., and a paper by Dr. M'Aldowie, on "Design, as exhibited in the nests and eggs of Birds."

Parasites of the House-fly.—Under the head of Zoology, in Science-Gossip for January, 1875, is a description of a worm that infests the common house-fly. About seven years ago my attention was first called to this parasite. Being one morning more than usually persecuted by the pertinacious attacks of a house-fly that would settle on one particular spot of my face, although frequently driven away, I was at last so greatly irritated that I could stand it no longer. Bent upon the destruction of the annoying insect, it was soon at my mercy. My microscope was at hand, and thinking that a post-mortem examination might reveal something interesting that would account for the obstinacy of its attacks, I speedily placed it between two strips of glass and crushed it. The microscope at once solved the mystery. Radiating from the miserable creature's shattered head were about a dozen long, slender, transparent worms, wriggling about, medusa-like, with great activity. The suffering of a fly under such an infliction is clearly shown by its extreme restlessness. Its flight is heavy, and I think the peculiar irritation to the skin, when one of these unhappy insects settles upon it, is caused by the unhealthy state of the creature's proboscis. The question is, under what circumstances do these worms become the guests of the fly? I am inclined to believe that the insect, being a very dirty feeder, may in taking its food admit the worm, which declines to go any further than its host's proboscis. I have examined many of these flies, and in no instance have I found the worm beyond the head. In localities where the scavenger does his work properly, these troubled flies are comparatively scarce, but I have been in places, not far from native dwelling-houses, where their attacks have been positively unbearable and most uncompromising. I have not found the worms in flies that follow their instincts in a reasonable way, so I fancy the afflicted ones suffer from a kind of madness which ends only in the death of the poor insect. I have counted the worms as microscopical objects, but with indifferent success, owing to the delicacy of their organisation.—*S. Green, Colombo.*

BOTANY.

Notes on Sutton Park.—At a recent meeting of the Birmingham Natural History and Microscopical Society a paper on the above subject was read by Mr. James Bagnall, one of the editors of the "Midland Naturalist," and has since been separately published. It gives a very complete list of flowering plants, ferns, and mosses found growing in Sutton Park, and also contains an important catalogue of the Rubi and Rosæ of Warwickshire.

The Rose of Jericho.—If Mr. Jackson will turn to my paper in your March number, he will see that I was quite aware that the plant I figured was a Mesembryanthemum. It is probably *M. nodiflorum*, but in its dried state it might be difficult to determine this. The interest of the matter, such as it is, centres in the fact that the very unroselike and straggling Anastatica has usurped the name of "Rose of Jericho" which rightfully belonged to this plant, as far more roselike—probably *very* far more so when clothed with its petals—and which expands more readily under the influence of warmth and moisture, thus possessing more of the attributes which would connect it with the superstitions and legends with which we are familiar. It is evidently this plant which De Saulcy describes. Mr. Jackson refers me to "Lindley and Moore's Treasury of Botany" and to "Smith's History of Bible Plants." In the former work there is only allusion to the well-known hygrometrical properties of some of the Mesembryaceæ, but in Smith's interesting book, which I have only now seen for the first time, the relative claims of Anastatica and Mesembryanthemum to the title of the "Rose of Jericho" are considered, and decided in favour of Anastatica. With the two plants before me, however, I confess my utter inability to understand the decision, and I fancy that any of your reads who will examine them will share in my difficulty. The "Rose-plant of Jericho" mentioned in the Apocrypha does not appear to me to be that alluded to in the 83rd Psalm, or in Isaiah xvii. 13.—*T. E. Amyot.*

A "Freak" of Nature.—In the course of my rambles, a few days since, I came across a plant of the bulbous crowfoot (*Ranunculus bulbosus*) showing abnormal development of the floral axis. The height of it was 6 inches from the neck of the root to the apex of the flower-head, ⅝ of an inch broad at the base of the stem, graduated to ½ inch at the thalamus. The flowering portion consisted of a conglomeration of six ordinary flowers on the top of a fasciated peduncle, arranged in such a manner that most of the productive organs were in the centre, the floral envelopes encircling them, thus giving it at a little distance the appearance of one large flower. I have never seen one so peculiar before, although aware that the genus is liable to deviation from the normal growth.—*Teratologist.*

On the Designation of Spiral Curves.—In the "Academy" of the 27th of January, 1877, is a paragraph on the use of the terms "dextrorse" and "sinistrorse" employed by some writers in the opposite sense to that in which others use them, according as the writer imagines himself to be in the centre of the spiral or outside it. It seems to me that much confusion would be avoided, if, instead of imagining oneself either inside or outside the spiral, one put oneself in the place of the spiral. To make my meaning clear, suppose a man to be ascending a tower by a spiral staircase, he either keeps to *his* right or keeps to *his* left, according to the manner in which the staircase twists. In the same way, by the use of the locutions "twining to *its* right" and "twining to *its* left" with regard to plants, all ambiguity would be obviated.—*B. Hobson.*

Organs of Mosses.—After reading several accounts of mosses I fail to find information on the following points, and shall be glad if any readers can give it. 1. Use of the calyptra *after* being torn away from the vaginula. 2. Use of the paraphyses. 3. Use of the apophysis. 4. Whether the vaginula is merely the base of the archegonium from which the calyptra has been torn away, or a special and separately developed tissue. 5. The manner in which the antherozoids, after leaving the antheridia, are conveyed to the archegonia.—*Inquisitive.*

New Plants.—We have received part 3 of "Diagnoses Plantarum novarum vel minus cognitarum Mexicanarum et Centrali-Americanarum," by Mr. W. B. Hemsley, A.L.S.

The British Moss-Flora.—We have received Part I. of this important work by Dr. Braithwaite, F.L.S., &c. The author's reputation as a bryologist is world-wide, and this book is worthy of his name. We can only sincerely wish the author health and leisure sufficient to complete it. The present part is in reality the monograph of the Andreaceæ, and it is illustrated by two beautiful plates, giving structural details of the five different species. Author, artist, and publisher are all represented in Dr. Braithwaite, of whom these half-crown parts can be obtained, at 303 Clapham Road. When completed it will be the most thorough work of the kind yet undertaken, and by the most capable of living bryologists. We may add that each family of British Mosses will occupy a monograph and be illustrated by plates of all the species, with microscopic details of structure.

GEOLOGY.

Ancient Glacial Condition in India.—Mr. V. Ball, M.A., F.G.S., read a paper at a recent meeting of the Royal Dublin Geographical Society on this subject. In this communication the author gave a brief *résumé* of the facts which are held by Indian geologists to prove that during a part of the Talchir period the climate of Peninsular India was sufficiently cold, during the winters at least, to cause the formation of land-ice on the margins of the great lakes which then existed. The facts are similar to those employed to establish the glacial period of Europe. There is a boulder bed which contains huge masses of rock enveloped in fine silt. In some cases it is demonstrable that these boulders have been carried from long distances in a direction contrary to the present slope of the surface. In others, but less commonly, polished and striated boulders have been found resting on scored and striated surfaces. The fossils of the Talchir rocks, consisting of a few ferns and Equisetaceæ—all previous periods having been azoic—are not inconsistent with a mild, temperate climate. Reference was made by the author to the Karroo beds of South Africa and the Permian breccias of England, which are likewise believed to have had a glacial origin.

Transactions of the Watford Natural History Society and Hertfordshire Field Club.—We have received vol. ii., part 7, of the above Transactions, containing "Remarks on the Winter of 1878-79." By William Marriot, Esq., F.M.S., and an important paper on "The Recent Discovery of Silurian Rocks in Hertfordshire, and their relation to the Water-bearing Strata of the London Basin." By the Hon. Sec., Mr. John Hopkinson, F.L.S., F.G.S.

The Mineralisation of Coal Plants.—I have often been struck with the appearance of the matrix surrounding our coal plants while preparing sections for examination with the microscope. Some sections are surrounded with little of anything but carbonate of lime, others are surrounded with fragments of rootlets of stigmaria, bundles of scalariform tissues, broken pieces of woody fibre, &c. Others again are surrounded with the pinnules of fern which are cut at every angle owing to the position in which they lie, and frequently these pinnules are shown bent back at the edges as is seen in some recent species, and in these particular sections the spore cases of ferns are frequently found with the annulus as perfect as when living and the spores *in situ*. Again we find other sections surrounded with masses of detached spores of ferns, Calamites, Lepidostrobus, as well as large quantities of macrospores from the last named fruit. Intermixed with the above wreck of vegetable matter we have many very peculiar forms, some of which have been described by Professor Williamson under the generic name of Sporocarpum. Other forms however still remain a puzzle, and before we can understand these very minute forms "which require a good ¼ inch objective to view them distinctly" we shall be compelled to study plants in decay, especially the aquatic species. I was forcibly struck with this fact while on a recent visit to Liverpool. Mr. Chantrell, with whom I stayed, has been engaged in this study "which he pleases to call the borderland of animal and vegetable life" for ten or twelve years, and he showed me an extensive collection of drawings illustrating the changes he has observed while engaged in watching this decay of vegetable matter. He also put me preparations under the microscope of the same forms arrested in decay and mounted permanently for examination. I have no doubt that many of the forms Mr. Chantrell showed me are the winter states of different plants; see, for instance, the winter state of Volvox, as illustrated in works on Algæ, &c. I have no doubt that many of the strange fossil forms that we find were the winter states of some of the aquatic vegetable forms of the coal period, while further development was arrested by fossilisation.—*John Butterworth.*

Railway Cutting through Peat-Moss.—A railway cutting through the moss near Ashton-under-Lyne, has recently opened out an interesting section not only to geologists but also to botanists. The greatest thickness of the turf is shown to be about eleven feet. In the lowest stratum of about five feet numerous branches of birch-trees are found, the bark is well preserved, but the wood is quite rotten. The turf immediately above and around the branches is mainly composed of a black fibrous material, evidently of woody origin. In spots near the surface are accumulations of a much paler material, which on close examination prove to be the remains of the well-known bog-moss Sphagnum. On washing a small portion, the minute floating leaves—in the opinion of our local bryologist Mr. Whitehead—give evidence of the species Cymbifolium. Under a medium power the cell structure is found to retain all its wonderful perfection, the pores and spirals being distinct and clear, and with a power of 700 diameters the cell walls present a well-marked fimbriated appearance, affording, as far as cell structure is concerned, one of the most beautiful objects for the microscope. It would appear from the evidence of the section that our turf-mosses are not of very ancient origin, which view is supported by the prevalence of birch-trees now growing on Chat Moss, and other mosses near Manchester.—*J. E. Sunderland.*

Fossil Trees in the Coal Measure.—On Tuesday evening, May 4, the members of the Oldham Microscopical Society were conducted by Mr. Nield to the brickworks, near Oldham Edge, for the purpose of viewing the now famous "fossil trees." Hammers were industriously plied in extricating the various fossils, stigmarian roots, Halonia, Ulodendron, Calamites, Sigillaria, lepidodendroid twigs and fruits, Lepidostrobi, fern fronds, and other leaves, believed to be new, or at the least unascertained relationships. A number of stumps of fossil trees, leafless and branchless, are to be seen. There is the trunk invested with a thin layer of coal, the remains of its bark, and there are its roots stretching and ramifying far and wide. Many of them are unmistakably Sigillaria (gigantic lycopods—club mosses), for here are the characteristic longitudinal flutings, in long parallel rows, and the roots are truly stigmarian, full of punctures, and from which bristle their thousands of rootlets. All are now but casts of once living members of an extensive "carboniferous forest." During the last two years some scores of these trees have been unearthed. They are of various dimensions, measuring in height from 3 to 10 feet, and from 6 inches to 2 feet 4 inches at six feet from the base. During the evening Mr. Nield addressed the members on the subject of "The Fossil Trees."

Tusks of the Fossil Walrus.—At a recent meeting of the Linnean Society of London, Professor E. Ray Lankester read a paper "On the Tusks of the Fossil Walrus found in the Red Crag of Suffolk," in which he withdraws the generic name of Trichecodon instituted by him in 1865, and referred a series of later discovered large tusks in the Ipswich Museum (including the former specimens) to the living genus Trichechus; but he specially distinguishes them as *T. Huxleyi.* Professor Lankester is inclined to think there is very insufficient ground for the generic subdivisions Alachtherium and Trichecodon as used by Professor Van Beneden, and that there is no evidence for the association of the Suffolk and Antwerp tusks.

Guide to the Geology of London.—We are glad to see that this ably-compiled handbook, by W. Whitaker, B.A., F.G.S. (entitled "A Guide to the Geology of London and the Neighbourhood," but which is in reality an explanation of the geological survey map of "London and its Environs," and of the geological model of London in the Museum of Practical Geology), has reached its *third* edition.

Eruptive, etc., Rocks.—I should be greatly obliged to any petrologist who will send to my address his experience in regard to the rocks called "Gneissen," by Cotta or "Quartz rock" by Jukes and others, the rocks which, in the geology of Ireland, I have classed among the eruptive rocks. Such a classification I am aware is scoffed at by very many chemists and geologists, notwithstanding that in every place in which I have examined them in Ireland, they seem to partake more of the nature of eruptive than of metamorphic rocks.—*G. H. Kinahan, Ovoca, Ireland.*

Large Glacial Block in the River Wye.—While walking down the valley of the Wye, on May 17 of this year, from Rhayadr to Builth, and the water being exceptionally low from long-continued dry weather, I passed under a boldly-curved line of cliff, doubtless eaten back by the river, and about one-third of a mile north of the village of Newbridge. Walking in the bed of the stream, I came upon a remarkably fine glacial block, several yards in the river, and mostly covered, or at least partly covered, by the water. The precise position is indicated by 3° 26′ 40″ west longitude, 52° 13′ 20″ north latitude, for the curving cliff. The block is about two yards and a half long, by about one and a half high, roughly estimated, and has its lower surface—facing rather down stream—well exposed to view, *at such low water*, by resting on a few points unevenly. This lower surface is largely and smoothly planed over in beautiful curves by ice action, in that distinct and peculiar manner so characteristic of travelled ice-blocks; and running along this are numerous well-defined striæ passing right along the face and following its beautiful curves over large spaces. The block appears to be Lower Silurian, of some measure of the district, and may have travelled with the ice out of one of the large cwms, or hollows, in the lofty mountain range of central Wales. Its large size would lead me to suppose it has not been rolled far by the present action of the picturesque river.—*Horace Pearce, F.G.S., Stourbridge.*

Archæopteryx Macrurus.—In the May number of "Le Monde de la Science et de l'Industrie," under the above title appeared an interesting account of the discovery of *Archæopteryx macrurus* in the lithographic limestones of Solenhofen in Bavaria. This is the second specimen which has been obtained of this early bird, the contemporary of the great saurians of the lias. The first specimen was also found in the same beds in the year 1862, and is now in the British Museum. This is far from complete, while the former specimen (which is exhibited in Berlin) is marvellously preserved. It has been bought for £1000, and is now on view. A person who has seen this magnificent fossil gives the following description of it: "The bird stands out of the stone in good relief; its outlines are so well marked that there is little to cause one to suppose it was a creature which had lived millions of years ago. Imagine a bird lying on its back, whose wings measure about seven and a half inches from tip to tip; whose extreme length from the beak to the end of the tail is about ten inches; an animal as large as an average-sized hen. The feathers of the wings are so clearly preserved that one is able to follow out the minutest details; we have counted six beautiful plumes for each wing. The neck was found underneath the breast-bone, bent round like a note of interrogation; the head, which resembled a fowl's, was in such a position as to clearly show the right eye; the beak (the point of which is not yet completely divested of stone) is larger and much stronger than a fowl's, and with a glass we can see the teeth of this curious winged animal. Perhaps the parts most accurately preserved are the four limbs which are complete in every respect. The front pair have each two hollow bones (radius and cubitus) while the hinder have only one (tibia). Each of the four limbs has three very sharp talons at the ends of the long four-boned fingers. The structural details of the feet resemble those of the lizard. The feathers of the tail—of which we have counted twenty-eight—are also well preserved, and are grouped as admirably as though prepared by a naturalist. The tail itself is very long; and fourteen caudal vertebræ, which are extended amongst two lines of feathers, dividing them on each side, can be clearly distinguished."

NOTES AND QUERIES.

Can a Parrot reason?—In the December number one of your correspondents gives an "anecdote of a parrot," which has just now come under my observation, and has brought to my recollection the following circumstance. Some years ago I was on a visit to my brother-in-law, who is a "fiscal," in a town not far from Glasgow. Late one evening he received the intelligence that a murder had been committed in a lonely spot some miles away in the country. He had to proceed that night to investigate the case, and I went with him. We arrived there at midnight. The murder had been committed in a solitary house (of two floors), in the upper floor, communicating with the road by a staircase, in the occupation of a married couple. The wife was the victim, and the husband was charged with the murder. The woman had been most brutally treated, ribs were broken, and the body otherwise frightfully injured. Marks of blood were found on the floor and wall. It was necessary to have a post-mortem examination, and for the purpose the fiscal instructed a doctor to make the examination the next day. While he was doing it he was suddenly startled by hearing a voice saying, "It's a bad job. Puir body, puir body!" He looked round to learn who had uttered the words, and found that they had come from a parrot in the room, which he had not before noticed. Query: Were the words the result of the parrot's reflections in the struggle it must have witnessed?—*John Lee.*

Morbid Sensations.—It so happens that I have the literal sentiments of a common man, written down some considerable time ago, upon the precise question in discussion between your correspondents. At the risk of being unintelligible to those unacquainted with the dialect of Wessex, I venture to give them in his own words: "I da mind, when I were up to the Zological Gardins, I seed um put a passel of young runnin' rabbits in along wi' they gurt sarpents. They did 'tend to be asleep, till the rabbits comed handy to um, and then they soon snopped um up. Did nāt'ral meak my heart yache to see um. I da call it terrible barb'rous work to put young runnin' rabbits in among such gurt nasty things a-curdled up like they be." He added, from his own experience: "Oonce, when we was a-mowin', we seed a gurt sneak a-scufflin' along, and a hop-frog a-hoppin' afore un: and massy! how thick there hop-frog did holler and squall! And, another time, we seed a sneak wi' a gurt knob in the neck o' un, and we cut open with the scythe, and sure enow, there were a gurt twoad he'd a-swallered. We tookt un out, and hooked un about a bit in the dew, and he soon croped off." Vouching for the genuineness of these revelations.—*C. W. Bingham.*

Climbing Powers of the Toad.—I never knew, until I read Mr. Shirley Hibberd's note in the March number of Science-Gossip, that there was any doubt as to the common toad's being able to climb (for a short distance at any rate) perpendicular rough surfaces, such as a low garden-wall, or a couple of doorsteps, for I know of one old country-house which a very venerable fat toad especially patronised. He was constantly discovered in the hall close to the dining-room mat, and as constantly ejected into the front garden, for the owner of the place never allowed a toad to be destroyed, he knew their value as gardeners too well. Now this toad must always have climbed up two steep steps in order to gain the broad slab which was level with the door. I believe it is the rough surface that enables them to mount, for they certainly have not places under their toes as a tree-frog has.—*Helen Watney.*

Stock Doves.—These birds (*Columba œnas*) are a species, are they not?—of the same family as the ring doves or cushats (*Columba palumbus*) which are certainly found in the north, for Sir Walter Scott alludes to them in his poems. See "Lady of the Lake:"

> "The blackbird and the speckled thrush
> Good morrow gave from brake and bush;
> In answer coo'd the cushat-dove
> Her notes of peace and rest and love."

and I believe there are other passages in which this bird is mentioned, only I cannot remember them sufficiently well to quote at present. Stock doves are migrants; they are smaller than the wood queest, and hence they are called in some places the "little queest;" they build in trees, but select the hollow places in preference to the branches. — *Helen E. Watney.*

Dara Asiatica.—I have some seed of this plant, sent from Australia, with the statement that it is used in the same manner as the pea. The small size of the seed must render it a very troublesome vegetable to prepare in this way; perhaps the whole pod is eaten. Any hints as to use or culture would oblige.—*W. G. Tux.*

Frog in Stone.—In the "Birmingham Half-Holiday Guide" I find in the description of the museum the following: "may be seen, among the other curious objects, the lump of rock in which a live frog was found at a depth of many feet in the ground, in the formation of the Beechwood tunnel, near Coventry."—*W. G. Tux.*

Calamagrostis epigejos. — If any reader of Science-Gossip will kindly tell me where, in the London districts, I can certainly find the wood-small-reed (*Calamagrostis epigejos*) I shall feel much obliged. And still more so if he will communicate the desired information by letter.—*E. Cox*, 172, *Acre Lane Brixton, S.W.*

Preserving Birds' Eggs.—In reference to Mr. Southwell's remarks in last month's number of Science-Gossip regarding the mode I mentioned for preserving birds' eggs, allow me to state that I lay no claim to originality of method; it is one that has long been adopted both here and on the Continent. Were Mr. Southwell aware of its universality he certainly would not have made such a strong assertion as that "any kind of varnish absolutely destroys the character of the egg and renders it perfectly valueless," *i.e.*, "if under any kind of varnish" he included albumen as used in this case. I never yet found placing an egg near the fire injure the colour, and if he will only practically test the effect, he will not again say "it is very likely" to do so. Finally, if Mr. Southwell will inspect eggs collected even so recently as last season, especially song thrushes, startlings, and dunnocks—he will find that, whether there be "reason" or not, eggs will not "remain unchanged for an indefinite period" if they be simply "protected from damp and light;" those conditions not being all necessary.—*T. J. Lane.*

Viper swallowing its Young.—Having only recently become a subscriber to Science-Gossip, I was not aware this subject had been discussed in it before. With regard to the viper, I mentioned in April the young could easily have escaped from the stomach, had they been there; but, at the same time, I think it possible for them to have escaped from the oviduct, it was impossible to see from which they really did. I cannot doubt for a moment that vipers do swallow their young to afford them protection, when I have it from eye-witnesses whose word is fully to be depended upon. In all places where vipers abound it is asserted—and has been during the last century—amongst the agricultural community (of which I have the honour of being a juvenile member) that such is the case; it is highly improbable that so many would hold the opinion if there were no grounds for it, on the other hand it is to be wondered that no scientist has even witnessed such an occurrence. I live on a farm where vipers are by no means rare, and shall certainly be on the watch during the summer months. I hope all the readers of Science-Gossip who have the opportunity will do the same.—*J. J.*

Vipers swallowing their Young.— Having seen a note in Science-Gossip from F. M. Campbell expressing a doubt as to vipers being able to "house" their young ones, I take this opportunity of sending you a copy of a note taken by myself from a tenant of my father's who lives on the coast, and whose veracity is undoubted. Should you require his name and address, I would give it with pleasure. Note taken on September, 1878. "About two years ago I was in one of my fields, and observed on the hedge a large she-adder, a grey one, it appeared unusually large. I had heard that a large one had been seen there before. I kicked her off the hedge on to the grass field, and whilst there I stepped on her tail, when there immediately issued from her mouth nine young ones about four or five inches long, and which to all appearance must have been in and out of the dam several times before—they being well grown and apparently about five or six weeks old. They issued from the mouth of the dam one by one, and shortly afterwards many of them entered in again. They appeared from the size of the adder to be ensconced in the belly, not in a pouch. I am certain I was not deceived by any movement of the tongue of the adder, as I afterwards killed it and the nine young ones. The fact so struck me that I called some of my neighbours to see such a curious proceeding, and I could find at least one person who could testify to the fact." The locality is a favourite resort for adders, rocky boulders on high ground facing the sea and surrounded in many instances by furze. I had heard this farmer tell the story of the adder on successive shooting seasons, and seeing some discussion in one of the papers as to the viper's capabilities as aforesaid, I took the above note from the man himself thinking it might one day be useful as elucidating a vexed question. Of course I suggested that he might have been deceived by the action of the reptile's tongue, &c., as knowing this was one of the theories adduced by writers, although in this case the young ones were too large.—*Clement C. Carlyon.*

Bees dying in Spring.—If A. A. had noticed the long communications recently to the "Times," respecting the present aspect of bee culture in this country, he would not be much surprised to find deserted hives, more especially in April. It is caused by actual starvation, in many instances. But in the case cited in Science-Gossip, p. 118, it is probably owing to the loss of the queen; thus the hive population gradually dwindled away, until they were so small as to compel the last few to find refuge in a neighbouring colony. Our apiaries have suffered so much during the last year that it will take many years before they are again in the position of 1878; hundreds of stocks died during last autumn and winter. I can now go over twenty miles without seeing a bee-hive, where I saw perhaps 500 during 1877-8.—*I. F. R.*

Query as to Falcon.—I think there is not the slightest doubt but that Wordsworth alluded to the peregrine falcon (*Falco peregrinus*) in the passage quoted by your correspondent, P. Q. Keegan. That it still breeds in the Lake District, or I am sorry to say attempts to breed, the enclosed cutting from the "West Cumberland Times" of May 15, 1880, will show: "*The Peregrine Falcon.*—On Wednesday last, the Rev. Fullarton Smith, of Lincoln, and Mr. W. Wilson, coal merchant, Keswick, found a nest of that rare bird the peregrine falcon, at Raven Crag, Thirlmere Lake, from which they took two eggs. The eggs are as large as a hen's egg, and are what may be termed a dull white colour, marked with maroon streaks, principally towards the larger end of the egg. The nest was not reached without difficulty, the crag being noted in the district for its extreme roughness. It was reached by the rev. gentleman, who was let down to it with a rope, and it required the exertion of all the strength of Mr. Wilson and an assistant to haul him up." After the above it would be unwise even to hint where another pair of peregrine might be found. I believe it was during the winter of 1878-9 that two peregrines were trapped in the neighbourhood of Keswick, and a few years ago I was well acquainted with a female peregrine which as a young bird, was taken out of the nest, in one of the wildest parts of the Lake District; twice over, in two different seasons, the above bird laid two eggs during confinement. That Wordsworth should have been well acquainted with the stock-dove (*Columba œnas*) is quite probable, it is common enough round this district, and is often shot in winter in company with the ring-dove (*C. palumbus*). In breeding, it chooses sites much the same as those the Jack chooses when it builds away from houses, holes in trees, rocks and rabbit-holes.—*W. Duckworth, Stanwix.*

Mistaken Instinct.—A few days since, I had my attention drawn to an interesting instance of mistaken instinct. Several individuals of the common blow-fly were observed hovering about the flower of *Stapelia aridus.* I afterwards noticed clusters of their eggs in the centre of the corolla. The eggs developed into the larvæ which found themselves on an unpalatable mass wholly unfit for their food, and covered with close, short, stiff hairs that not a little incommoded their movements. After crawling about the petals a day or two, they eventually fell from the plant and perished. The flower of this plant is large and has a very fleshy appearance, with the addition of a slight odour of animal matter; which was the probable cause of the insect's instinct for perpetuating its species failing it in its object and causing the loss of the entire brood.—*Henry W. King.*

Insects and Light.—The predilection which fish, birds, the lepidoptera, &c., have for light or luminous points, formed the subject of several interesting papers in Science-Gossip, in 1869. Apropos of this—my son, whose natural history studies are just now, in common with those of most boys, particularly directed to the cultivation of silk-worms, has drawn my attention to the fact that if a leaf covered with larvæ be placed on white or light-coloured paper, or any other substance, there at once commences a general scramble from the leaf to the paper, which seems to demonstrate that even these humble worms prefer light to darkness.—*F. M. Habben.*

"Drip" heard in Aquaria.—With regard to the sound heard in a freshwater aquarium, I think I can give an explanation. If any one will watch *L. stagnalis* come to the surface he is almost sure to see the spiracle opened to the air, and hear a "snap." I have observed this in my aquarium scores of times. It occurs also with *L. peregra* and *L. palustris.* The larger the animal the louder the "snap." As far as I can observe, the phenomenon is caused as follows: The orifice of the siphon is put close to the top of the water, and a vacuum caused by muscular effort, when the air rushes in with the report in question.—*Lionel E. Adams.*

Confervoid growth in Aquaria.—Permit me to recommend to such novices as myself in aquarium keeping what my experience has proved to be a perfect remedy for the strangling confervoid growths which may infest their tanks as they did mine. I refer to the water snail (*Limnia auricularia*), which appears preferentially to select the confervæ for food, whilst other snails which I have seen recommended have apparently preferred the higher growths of vegetation. Last year my tank was a mass of tangled green slime; this year, thanks to my new friends, it is perfectly free. If the plants are touched, or if the conferva shows itself, the removal or addition of a few snails soon adjusts the balance. On the other hand I should greatly esteem any information as to keeping fish. I am loth to sacrifice any more little lives, as it seems my fate to do under present circumstances. My tank is wooden and pitched inside, its dimensions: length nearly 4 feet, and width nearly 2 feet, with about 12 or 15 inches depth of water planted with a considerable number of Vallisneria in wooden boxes and some Cape lilies. I can keep no fish; minnows, golden carp, gold fish, rudd, I have tried, and have just lost the last. Some live weeks, some months, some only days, but sooner or later they lose their playfulness, become dull, gasp at the surface, become subject to a filament of apparently fungoid growth, and in a day or two die. I have seen this all attributed to a want of oxygen, but, if it be so in this case, how is it some live so long before the deficiency manifests itself in them? I am anxious to keep fish of some kind; perhaps some one who has passed through the same experience will aid me.—*H.*

WEATHER-LORE.—An old distich says,

> "With a dry May, and a moist June,
> The farmer will whistle a merry tune."

May we not look forward hopefully to the result implied by the above lines?—*M. Moggridge.*

WREN'S NEST AT CHRISTMAS.—In SCIENCE-GOSSIP for February there is a note about a wren's nest found at Christmas—on February 18th, 1878, I perceived a wren building in a shed; on the 24th the nest was completed and contained one egg. The weather, however, becoming very severe the nest was forsaken. On March 20, 1879, I found a song-thrush's nest containing five eggs, upon which the female bird was sitting; in a day or two I visited the nest again, and found that it contained four young birds, but on the return of frost these birds all died. —*G. Dewar.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

B. J. W. (Southsea).—Procure "Adulteration of Food, &c.," published by Routledge, London. Price 1*s.*

NEMO.—*Luzula Borreri* and *Polygala oxyptera* (R.). The Luzula is a very imperfect specimen, but we believe it to be typical Borreri.

R. F. T. (Malvern Link).—Baker's monograph will be found in the "Naturalist," vol. i., published at Huddersfield.

J. J. (Shepherdswell).—You should secure Hooker's "Student's Flora;" the work you mention will not help you much. It is the wood geranium (*Geranium sylvaticum*, L.), with the flowers slightly altered in colour and size.

CORONILLA (Ringwood).—It is attacked by an insect called the scale by gardeners; afterwards when decaying it will probably be infested with some micro-fungi.

SALIX.—The willows are too young to be determined with certainty; No. 2 is *Salix cinerea.* Will you kindly send others more mature? and we shall be glad to help you.

HENRY COATES.—Your shells appear to be *Pisidium amnicum.*

M. E. T.—The "Rose of Jericho" was recently on sale in a shop at Brighton, but we cannot inform you which. You had best offer something in exchange for a specimen in our Exchange column.

V. G.—No flowers were in the letter containing your query.

A. L. B.—Article to hand; it shall appear next month.

EGGS.—We shall be glad if the exchanger who offered the eggs of black grouse, peregrine falcon, and other eggs in our Exchange column for June, but who failed to give his address, will send it to us, that we may forward letters addressed to us for him respecting exchange.

R. B.—The Anthropological Society is now merged in the Anthropological Institute. Write to the secretary of the latter for terms of membership, &c.

A. W.—The hair of the Persian cat had the eggs of fleas attached. You cannot do better than use the preparation of Pyrethrum.

F. L.—You should get cardboard cells for dry mounting from any of the dealers in microscopical material whose advertisements appear in our pages.

H. W. D. wishes to make some microscopical drawings on glass. Perhaps some of our readers can recommend him a book which gives the best mode of proceeding and the best kind of colours to use.

R. CRAMP.—You cannot do better than take in the "Popular Science Review," the oldest and best of our periodicals which deal chiefly with natural science.

BONACCORD.—The best elementary book on mosses (with 20 coloured plates of the chief species) is Stark's "British Mosses," published by Routledge at 7*s.* 6*d.*

H. G. KEIGHLEY.—Carpenter's "Physiology" is, we believe, now out of print, but we doubt not you could get a copy from W. Wesley, natural history bookseller, 28 Essex Street, Strand. Huxley's "Physiology" is published by Macmillan, at 4*s.* 6*d.* Flower's "Osteology of the Mammalia" is the best you could procure. It is published by Macmillan at (we believe) 7*s.* 6*d.*

J. T. A.—We presume you mean Yarmouth, in Norfolk. If so you will find no fossils in the cliffs there, as they are composed of Middle Drift sands. At Aldeby, a few miles away, you may find shells of the Upper Norwich crag (Pliocene), and at Southwold remains of the pre-glacial forest bed. The neighbourhood of Norwich is very rich in chalk and crag fossils. Felixstowe, near Ipswich, is a capital place for collecting red crag, London clay, and other fossils. The mineral fragments enclosed are quartz.

JAMES PARTINGTON.—You must mean sulphate of eserine, not of eresine, which latter we cannot hear of. Sulphate of eserine is an alkaloid, obtained from the Calabar bean, and is employed in ophthalmic practice. It is said to have the power of contracting the pupils of the eye, and is therefore the reverse of atropia, which dilates the pupil.

"SUBSCRIBER."—A cladode is a flattened branch or stem, as the leaf-like branches of *Ruscus aculeatus* ("Butcher's Broom"), *Epiphyllum*, &c. A sympode is a pseud-axis, when at each bifurcation one branch becomes more strongly developed than the other. The sympodium may consist of bifurcation belonging to the same side of the successive dichotomies, either to the left or the right.

EXCHANGES.

A GOOD triple nose-piece and a little cash, in exchange for a good one-inch objective.—J. S. Harrison, *The Gazette* office, Malton, Yorkshire.

MOUNTED slides of *Borago zeylanica* (Linn.), hairs rising from silvery calcareous tubercles; Mauritius. A most beautiful opaque object. Send list of slides for exchange to Rev. A. C. Smith, Crowboro', near Tunbridge Wells.

WILL any kind reader put me in correspondence with any one willing to supply some spawn of goldfish? Will give most liberal exchange to suit microscopists, amateur gardeners, botanists, algologists, or persons using the magic lantern, &c.—T. McGann, Burren, Co. Clare.

A LARGE number of plants as per 7th ed. L.C. Lists exchanged or sets of from 100 to 400 for offers.—B. M. O., 43 York Road, Hove, Brighton.

WANTED, British and foreign lepidoptera. Exchange shells, or would give cash.—J. P., 29 Great Coram Street, Brunswick Square, London, W.C.

WILL any of the readers of SCIENCE-GOSSIP be kind enough to let me have a good specimen of the English or Highgate copalite, in exchange for leaf fungi, or same of our local minerals?—H. W. Hollenburgh, 320 Spring Garden Street, Reading, Pa., United States.

THE "Geological Magazine" for 1877, perfectly clean, in exchange for geological or other science works.—T. Shipman, 34 St. Ann's Valley, Nottingham.

SETTING-BOARDS, store cases, *B. coleoptera*, mounted micro objects in exchange for unmounted material, slides, and accessories.—F. S. Lyddon, 32 High Street, Warminster.

A NUMBER of herbarium specimens of British mosses for exchange.—B. B. Scott, 24 Seldon Street, Kensington, Liverpool.

SUPERIOR anatomical and pathological sections, stained and ready for mounting, in exchange for living parasites and other unmounted micro material.—Henry Vial, Crediton.

SOUNDINGS from West Indian ports, also beautiful moss from West Indies. Send slide or good micro material of any description, especially diatoms, foraminifera, and lepidoptera.—B. B. Scott, 24 Seldon Street, Kensington, Liverpool.

WANTED, to purchase a few specimens of the *Bufo calamita*, commonly called or known by the name of the natterjack toad or mephitic toad.—W. B. Scott, Chudleigh, Devon.

FOR *Acarus*, *Trichinus*, or eggs of flies, spiders, or butterflies mounted, J. Aitken, of Urmston, Manchester, will give slides of mounted transparent sections of coal plants showing structure beautifully.

WANTED, Vol. I. of Cassell's "Magazine of Art" in exchange for either "Hogg on the Microscope" or Cassell's "Great Industries of Britain," vol. i., or one dozen slides.—R. Smith, 30 Great Russell Street, Bedford Square, W.

WILL exchange the following for books or slides:—"Origin of Lowest Organisms," Bastian; "Scientific London," Becker; Carpenter's "Zoology," 2 vols.; "Biology," Cooke; "Darwinism, and other Essays," Fiske; "Manuel d'Anatomie Comparée," Gegenbaur, translated by Carl Vogt, 1874; "Classification of Animals," Huxley; "Physiography," Huxley; "Degeneration," Ray Lankester; "Life, its Origin and Succession," Phillips; "Half-hours in the Green Lanes," 5th edition, Taylor; "Field Naturalist's Handbook," Wood. Wanted, Beale's "Protoplasm," last edition; "Descent of Man," Darwin; "Elements of Embryology," Foster and Balfour; "Principles of Science," Jevons; "Philosophie Zoologique," Lamarck; "Principles of Biology," Spencer. Cash or exchange. —W. Ernest Milner, 47 Park Road, Haverstock Hill, N.W.

Orchis militaris, Potamogeton zosterifolius, Mucunatus prælongus, etc., offered for *Fumaria vaillantii, Galium ochroleucum, Corallorrhiza innata, Erica mediterranea, Asperugo procumbens*, etc.—G. C. Druce, 118 High Street, Oxford.

SIX slides of carboniferous foraminifera offered for six slides of recent or fossil foraminifera.—E. Wilson, 18 Low Pavement, Nottingham.

DUPLICATES of *Helix obvoluta* and *Limnæa Burnetti*, offered for specimens of *Testacella haliotoidea* or good-sized specimens of *L. peregra*, var. *ovata*, also good British specimens (with localities where found), of *Succinea oblonga, V. pusilla, V. angustior, V. substriata, V. minutissima*, and *V. alpestris*, for numerous desiderata amongst British birds' eggs, and foreign land shells, and a few particular varieties of the British land shells.—W. Sutton, Upper Claremont, Newcastle-on-Tyne.

EIGHTY 2*s*. 6*d*. numbers "Philosophical Magazine," 1853–1858, and ten 2*s*. 6*d*. numbers "Popular Science Review," 1871–1877, offered in exchange for micro-cabinet or slides, minerals, or fossils.—E. Wilson, 18 Low Pavement, Nottingham.

SIDE-BLOWN eggs of lesser black-backed gull, black-headed gull, dipper, sedge warbler, redshank, little grebe, moorhen, common tern, and others in exchange, for other single-holed specimens not in collection.—E. F. Bell, 11 James Terrace, Tait Street, Carlisle.

WANTED, coins, antiquities, Kentish books, &c., birds' eggs, fossils or minerals, in exchange for fossils from chalk and Thanet sand, seaweeds, or other natural objects.—F. Stanley, 6 Clifton Gardens, Margate.

A FINE collection of about 200 flies and material for fly-fishing, also "Cotton and Walton on Angling," in exchange for a fern-case, or offers.—E. Cook, 2 St. Leonard's Villas, Granville Road, Child's Hill, Hendon.

DIATOMACEOUS earth from Monteroy, Richmond, Lower California, and Santa Barbara. Small packet of each sent for good material, ready for mounting.—T. Blackshaw, Cross Street South, Wolverhampton.

FOR specimens of *Azolla pinnata*, showing gonidia-like lichens, send stamped addressed envelope to G. Pim, Monkstown, Co. Dublin.

WANTED, Professor Ramsay's books and papers on geology of Merioneth and North Wales district, and papers on botany of ditto. Other books in exchange, or glad of loan of them.—F. R. G. S. I., 9 Royal Terrace, West Kingston, Co. Dublin.

OFFERED, Withering's "Botany," in 4 vols., SCIENCE-GOSSIP for 1865 (bound), also for 1878 (bound), and 1879 (not bound), in exchange for Hooker's "Flora of the British Isles," Hayward's "Botanist's Pocket Book," or other works on botany or agricultural chemistry. Will take cash.—H. P. Russell, Nassau School, Barnes, S.W.

SUPERIOR mahogany cabinet suitable for moths, butterflies, &c., 13 drawers 8×5. Cost £3 10*s*., exchange injected objects.—S., 364 Kennington Road, S.E.

BINOCULAR microscope with quantity of apparatus, and $\frac{1}{4}$, $\frac{1}{12}$, and $\frac{1}{16}$ objectives, by Powell and Lealand. Exchange astronomical telescope, £30 to value.—S., 364 Kennington Road, S.E.

GONIODORIS for others (not common), nudibranches, send name of offers for approval, in first instance to J. Turner, Davenport, Stockport.

SIDEBLOWN eggs of grasshopper warbler, sedge warbler, garden warbler, pied flycatcher, golden plover, curlew, oyster catcher, lesser tern, arctic tern, common sandpiper, &c.; unaccepted offers not answered.—Tom Duckworth, 58 Scotch Street, Carlisle.

WANTED, good living specimens of *L. oreopteris, P. phegopteris, P. dryopteris, P. calcareum, Allosorus crispus, Cystopteris fragilis, O. regalis*, and hardy and half-hardy exotic ferns, in exchange for Channel Island plants, or lepidoptera (*P. daplodice, S. euphorbia*, &c.).—Fred. Piquet, York Street, Jersey.

BRITISH eggs wanted in exchange for the following: white-tailed eagle, kestrel, tawny owl, oyster-catcher, snipe, curlew, buff-backed heron, Canada goose, wild duck, red-breasted merganser, eider-duck, goosander, gannet, arctic loon, kittiwake, lesser black-backed gull, common gull and others. All well identified; only undoubted specimens will be received in exchange.—W. Mark Tybus, Solicitor, 7 Poplar Crescent, Gateshead-on-Tyne.

WANTED, fleas and animal parasites in exchange for first-rate mounted objects; also diatomaceous gatherings, recent and fossil. —J. B., 24 Tilson Road, Tottenham.

FORTY-SIX parts of "Countries of the World," and Vol. iv. of "Races of Mankind" (bound) in exchange for microscope or fossils.—Alex. Shaw, Mrs. McKnight, 56 Dover Street, Glasgow.

THE following species of *Æcidia, crassum, Berberidis, Violæ, Rubellani*, offered in exchange for various Rœstelia and Peridermia, or *Æcidium Allii, Taraxaci, Orchidiarum, Thalictri, Galii*, or *Bunii*.—Address, H. J. Roper, 5 Lausanne Road, Peckham, S.E.

FOR slides of bramble brand, *Æcidium Tussilaginis, Æcidium Berberis* (Podura scales, two species), Lepisma, and *Fumaria hygrometrica*, send other slides of interest.—J. Forty, Well Street, Buckingham.

WANTED, to purchase "Class-book of Botany," by J. H. Balfour, 3rd ed., 1870, or other edition. State price, and what edition.—R. B. Lindsay, 1 St. Ann's Terrace, Stamford Hill, N.

EGGS. Will give micro slides, fossils, or eggs in exchange for British birds' eggs.—A. D. H., 53 Sheriff Street, Rochdale.

WANTED, named fragments of British or foreign sponges. Will return to sender a mounted slide of the spicules of each species of sponge lent me.—Send lists to J. Smith, 94 Dundas Street, Glasgow.

WANTED, eggs of hobby, merlin, kite, buzzard, tawny owl, nightjar and cuckoo. Will give micro slides, fossils, or cash.—Address, A. W. Chapman, 26 Oxford Street, C. on M., Manchester.

WANTED, a good work on the microscope. Will give in exchange Ledwick's "Anatomy" (nearly new) and "Dottings on the Roadside in Panama, Nicaragua, and Mosquito," by Capt. Bedford Pim, or other books, or will give cash. Please give name of book and price, when writing.—R. J. Hayes, Boyle, Co. Roscommon, Ireland.

ENGLISH fly-trap (*Drosera rotundifolia*). For living plants of above, in fine condition, send well-mounted slide, or unmounted diatoms, or foraminifera, with stamp, to John Lewis, 6 Shaftesbury Terrace, Westbourne, Bournemouth.

EGGS of the grasshopper warbler (side-blown) and nests in exchange for other rare species.—Thomas H. Hedworth, Dunston, Gateshead.

BOOKS, ETC., RECEIVED.

"Nature's Bye-paths: a Series of Recreative Papers in Natural History." By J. E. Taylor, Ph.D., F.L.S., &c. London: D. Bogue.

"Science a Stronghold of Belief." By R. B. Painter. London: Sampson Low & Co.

"Ponds and Ditches." By M. C. Cooke, LL.D. London: Society for Promoting Christian Knowledge.

"Text-Book of Botany." Translated from the German of Dr. Prantl, by S. H. Vines, D.Sc., &c. London: W. S. Sonnenschein & Allen.

"English Dogges." Reprint. "Bazaar" Office, 170 Strand.

"British Dogs." Parts X. and XI. Ditto.

"Practical Trapping." By W. Carnegie. Ditto.

"Bee-keeping for Amateurs." By Thomas Addey. Ditto.

"Practical Photography." By O. E. Wheeler. Ditto.

"Fancy Pigeons." Parts I. and II. By J. C. Lyell. Ditto.

"The British Moss-Flora." By R. Braithwaite, M.D., F.L.S., &c. Family I., "Andreaceæ."

"Midland Naturalist." June.

"Land and Water." June.

"Feuille des Jeunes Naturalistes." June.

"Le Monde de la Science," &c. June.

"American Naturalist." June.

"Canadian Entomologist."

"Twenty-second Report (1879) of the East Kent Natural Society."

"Transactions of the Eastbourne Natural History Society."

"Proceedings of the Royal Society of Tasmania for 1878."

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—J. E. S.—F. H. A.—B. M. O.—H. A. S.—J. S. H.—E. E.—F. H. A.—H. C.—H. G. K.—J. H.—J. N.—H. P. M.—C. D. W.—A. H.—B. J. W.—A. C. S.—E. J. C.—W. G. C.—T. McG.—A. W.—E. L.—J. B.—D. & C.—F. S.—J. S.—R. T. B.—J. F.—H. D. S.—J. J.—H. McK.—B. H.—C. P.—J. V.—W. J. H.—J. P.—J. W.—J. G.—H. V.—R. C.—S. E. P.—F. A. D.—J. C.—F. H. C.—C. C. W.—J. A.—G. H. K.—H. B. W.—J. F. R.—R. S.—H. B. R.—R. S.—G. M.—M. M.—W. A. F.—G. D.—C. C. W.—R. W.—T. E. A.—J. A.—F. S. L.—J. H. H.—F. H. H.—T. B.—W. D. S.—M. M. T.—A. N.—G. W.—J. K.—H. P. R.—J. T.—T. D.—W. D.—W. B. T.—F. J. G.—E. F. B.—F. S.—H. W. K.—Miss M.—J. T. A.—A. M. P.—F. P.—G. P.—F. R. G. S. I.—P. S.—H. P.—T. B. R.—T. F.—W. T. G.—W. S.—F. J.—J. L.—A. W. C.—R. J. H.—J. S.—C. W.—G. D.—J. B.—R. B. L.—H. J. R.—C. F. F.—A. S.—J. E. W.—&c.

A GOSSIP ABOUT NEW BOOKS.

EVIDENTLY the progress of scientific literature is influenced by the same depressive causes as those which affect commerce, for, the last three or four years have been notable for the relatively few books which have appeared. To a great extent, however, this has been compensated by the high character of the published works, and we are pleased to note the demand for good books which creates the supply. *Studies in the Theory of Descent*, by Dr. Aug. Weismann, translated and edited by R. Meldola, F.C.S. (London : Sampson Low & Co.), is a work of the highest biological interest. The present part deals with the "Seasonal Dimorphism of Butterflies;" by which term is implied those differences in colour and marking in certain butterflies which not long ago caused entomologists to regard them as distinct species. They are now known to be only summer and winter broods of the same species, and Dr. Weismann's experiments plainly show how they have arisen ; viz., by the gradually increasing warmth which has marked the northern hemisphere since the close of the glacial period. Here we have another illustration of the wonderful action of physical geography upon organic life. Dr. Weismann is fortunate in having an excellent editor and translator, and his book reads as attractively as one of Darwin's. The latter philosopher writes a prefatory notice to the work, recommending it to the attention of naturalists.

An Elementary Text Book of Botany, translated from the German by Dr. K. Prantl, the translation revised by Dr. S. H. Vines, F.L.S., is published by W. Swan Sonnenschein. Numerous though our botanical text-books are, there was room for the present work ; and the fact that Dr. Vines has taken it in hand is a sufficient recommendation of the merits of the original work. It is based on similar lines to Sachs' great work, to which it may be regarded as an introduction ; and it devotes the larger half to the morphology of plants. The illustrations are two hundred and seventy-five in number, and all are of excellent quality.

Degeneration: a Chapter in Darwinism, by Professor Ray Lankester F.R.S. (London : Macmillan). Those who were privileged to hear Professor Lankester deliver the evening discourse on this subject at the Sheffield Meeting of the British Association will be pleased to know that it has just been published, profusely illustrated, as a volume of the well-known "Nature" series. Its low price brings it within the reach of the poorest reader. Few works have lately appeared, even of a far more pretentious character, which have impressed us more than the little work before us. It is an eminently and solemnly thoughtful book, dealing with familiar zoological facts in the simplest manner, and yet making them illustrate the grandest of evolutional principles, no less than the progress and decay of nations. We sincerely commend it to all those of our readers who enjoy original research and clear inductive reasoning. To such it will be a rare treat.

Natural History Rambles: Ponds and Ditches, by M. C. Cooke, LL.D. (London : S.P.C.K. Society). Who among living naturalists could have been better intrusted with the task of writing a popular and attractive little handbook on this subject, than Dr. Cooke? The present work is one of the well-known "Natural History Rambles" series which the Christian Knowledge Society commenced last year, and to which Dr. Cooke's work is a recent addition. There can be no question that "Ponds and Ditches" is the best of the series. It is written in Dr. Cooke's animated style, and everywhere impresses us and inoculates us with his own love of the subject. Such a handbook has long been wanted, and there can be no doubt of the literary success of the present volume.

Introductory Science Primer, by Professor Huxley, (London: Macmillan & Co.), is one of Macmillan's Science Primers, and has been long promised. It deals with the general qualities of natural objects, organic and inorganic, making the most familiar things teach the profoundest and most extensive kinds of knowledge, physical, chemical, physiological, and even psychological, after the author's easy, attractive, and leading-on manner.

Nature's Hygiene, by C. T. Kingsett, F.C.S. (London: Baillière & Co.) is a series of Essays on popular scientific subjects with special reference to the chemistry and hygiene of the Eucalyptus and the pine-tree, in which we are shown the remarkable production of the peroxide of hydrogen by the latter trees. In many respects the chapters of this work are clear and thoughtful "studies;" notably those on the cause of malarial fever, and the relation which the Eucalyptus is said to bear to it as an antidote. The chapter dealing with the natural atmospherical oxidation of essential oils and perfumes, and the products they form—that on their antiseptic and disinfecting properties—and the last, on the geographical distribution of Eucalyptus and pine-forests, and their influence in nature, are most instructive and suggestive. All those persons who are concerned with the public health would do well to procure and study this original and interesting work.

Epidemical Diseases, by John Parkin, M.D., (London: David Bogue), is an able endeavour to trace the remote causes of epidemic diseases in the animal and vegetable kingdoms, as well as the causes of hurricanes and abnormal atmospherical vicissitudes. It will be seen, therefore, that the author has not failed because of the narrowness of the ground he has selected. He has, however, produced a very full and suggestive work, calling for more than a passing notice at the hands of all medical men.

Fossil Men and their modern Representatives, by Principal Dawson, LL.D. (London, Hodder & Stoughton), is a book which has disappointed us. It is written in the same attractive manner which has made the author's other works so deservedly popular, yet to our mind it is disfigured by that theological narrowness which endeavours to adapt modern ethnology to the accounts of individual and racial movements recorded in Genesis. Such an attempt at ethnological "reconciliation" cannot hope for a better fate than has attended the swarms of "geological reconciliations." Truth must be studied on every side for its own sake. It refuses to be coerced as much as to be coaxed. Nor do we think Professor Dawson helps his cause by the sharp artillery practice of raillery and invective which he directs against philosophical ethnologists. Fortunately the latter are armour-plated against such attacks, and the only sufferers will be those whom Professor Dawson represents.

Science a Stronghold of Belief, by R. B. Painter, M.D. (London: Sampson Low), is a large bulky book, dedicated "To the Praise, Honour, Glory, and worship of God," which is chiefly filled with very ignorant and abusive declamations against evolution generally, and Darwin, Huxley, Spencer, Tyndall, and others particularly. We endeavoured conscientiously to read the book for the sake of giving an opinion, but we were obliged to give it up. And yet the author promises and advertises four more volumes to follow on the same subject! One stands awed at the power and flexibility of the English language! Can all this farrago of nonsense, ignorance, and vituperation be necessary to the "honour and glory of God"? There must be something Divine in the Christian religion, or it could not survive such enemies as these of its own household, who thus bring common sense and Christian charity into discredit!

Climate and Time, by James Croll (London: David Bogue). We are frequently asked for explanations of the probable causes of those great changes in temperature, swinging alternately from tropical to glacial, with which the strata of the British Islands are crowded, and our answer is to refer readers to this fascinating work of Dr. Croll. Therein will be found, traced in the clearest and most patient manner, the relations between great astronomical and possible geological phenomena, wrought through the agencies of ocean currents, regular winds, &c. Speculations on the probable causes of climatal change, which were plentiful as blackberries before the publication of the present work, no longer issue, for Dr. Croll seems to have put the question at rest. This work is a magnificent Principia of Physical Geography which every student and teacher of that science cannot afford to leave unread.

Nature's Bye-paths, by J. E. Taylor, F.L.S., &c. (London: David Bogue). This is a series of twenty-seven chapters on Geological, Zoological, Botanical, and other subjects, contributed originally to various Reviews and Magazines. We leave it to others to express an opinion on the work, as our own position regarding it places us "out of court."

The Birds, Fishes, and Cetacea frequenting Belfast Lough, by R. L. Patterson (London: David Bogue). This attractively got-up book must necessarily interest all practical naturalists and sportsmen. Mr. Patterson is one of the vice-presidents of the well-known and active Belfast Natural History Society, and the son of the celebrated naturalist, Mr. Robert Patterson, F.R.S. The work is, in short, the result of many years' personal observations on the sea-birds and fishes of one of the most interesting parts of our British coasts. A good deal of the matter has already appeared as contributions to the natural history society of which the author is vice-president. The pleasant manner in which the book is written confirms Mr. Patterson's statement that most of it was prepared during the leisure afforded by quiet evenings in the country, and as a pleasant relaxation after the active business-life of the day. And to the "pleasant relaxation" of similar men we cordially recommend its perusal.

A Physical, Historical, Political, and Descriptive Geography, by Keith Johnston, F.R.G.S. (London: Edward Stanford). The geographical transformation in the territorial divisions of Europe which has taken place within the last ten years, as well as the numerous discoveries in Central and Southern Africa, Australia, New Guinea, &c., have almost turned our antiquated geographical manuals into so much dead-stock on the bookseller's shelves. A new manual was sorely needed, and perhaps nobody was better fitted in every way to prepare one than the unfortunate, but gifted author of the present volume. His name and that of his father have long been associated with publications concerning physical geography; and young Keith Johnston himself revised the proofs of the volume before us whilst conducting the Geographical Society's expedition in the exploration of the country north of Lake Nyassa. There now lie his bones, another victim to the brilliant fatality of African travel! In the work before us we have a manual which, for scientific accuracy and the clearness with which the facts are arranged, has never before been equalled. And we feel certain that for many a day to come it will hold its own against all comers.

A SKETCH OF THE GEOLOGY OF SWANSEA AND THE NEIGHBOURHOOD.

By Horace B. Woodward, F.G.S., of the Geological Survey of England and Wales.

SWANSEA is situated on the southern side of the great coal-field of South Wales which extends from Pontypool in Monmouthshire to the margin of St. Bride's Bay in Pembrokeshire. This is the largest coal-field in England and Wales; it occupies an area of 900 square miles, and its included strata have been estimated at 12,000 feet in thickness. Geologically speaking the Coal-measures lie in a "basin," perhaps the most uniform and well-marked in the country, although its continuity is broken by the bays of Swansea, Caermarthen, and St. Bride. This basin is formed of the Lower Carboniferous rocks and Old Red Sandstone, which make an elevated boundary on its northern side, where the Old Red Sandstone rises up in the Vans of Brecon to a height of 2800 feet; but the Coal-measures themselves stand up in bold hills and ridges, for the most part above the southern edge of the basin, which from Cardiff to Bridgend has been worn away and much concealed by Secondary and newer deposits.

The immediate neighbourhood of Swansea (including the peninsula of Gower, and the coast-line between Kidwelly and Aberafon) is represented on the Geological Survey map, sheet 37. The Survey commenced its labours in this district in 1837, and the work was done by Sir Henry De la Beche and Mr. (afterwards Sir William) Logan. It is only just to the latter to state that for several years previously he had been engaged in a careful survey of the district, and that with true public spirit he presented his maps to the Geological Survey.*

The rocks met with in the area embraced by sheet 37, and those in adjoining tracts, included within a range of twenty miles from Swansea, are the following:—Cambrian, Silurian, Old Red Sandstone, Carboniferous, Triassic, Liassic, and sundry Post-Pliocene deposits.

Cambrian and Silurian.

The north-western portion of the coal-basin is bounded by the Cambrian (or Lower Silurian) and the Silurian (or Upper Silurian) rocks of Caermarthen, Llandeilo, and Llangadock. These include the Llandeilo Flags, shales and sandstones with the trilobites *Ogygia Buchii*, *Trinucleus fimbriatus*, and mollusca of the genera Lingula, Leptæna, and Orthoceras. Wenlock beds are represented by shales with Orthoceras, and the trilobite Phacops; and the Ludlow beds are shown by purple grey and red sandstones and conglomerate, capped by grey laminated and micaceous sandstone (tilestone), with the mollusca *Athyris navicula*, *Chonetes lata*, &c.

The Silurian rocks rest unconformably upon those of Cambrian age, as shown near Builth; and in that neighbourhood De la Beche found it no easy task to determine a boundary-line between the Ludlow rocks and the Old Red Sandstone. The tilestones, which formed a convenient boundary westwards, did not extend so far, and he had to admit that the change from Silurian conditions to those attending the deposition of the Old Red Sandstone, though great, was gradual.† These facts become of particular interest when we turn to the alterations in opinion that within the last two years have been expressed concerning the Old Red Sandstone, to which reference may subsequently be made. The main geological features of the country around Swansea, however, demand our first attention.

Old Red Sandstone.

The Old Red Sandstone is divided into, *firstly*, an upper division of red sandstone and quartzose conglomerate, which is developed at Llanmadoc and Cefn-y-Bryn in Gower, and which forms the chief heights of South Wales (the Vans or Brecknock Beacons); and, *secondly*, a lower division of marls with the irregular mottled calcareous beds termed "cornstones," which division is not represented

* De la Beche, "On the Formation of the Rocks of South Wales and South-western England." Mem. Geol. Survey, vol. i. p. 145.

† De la Beche, *op. cit.* pp. 46, 47.

on the south side of the coal-basin, but forms the lower and more cultivated lands on the north. There the cornstones are generally marked by quarries, as they are used for road-metal, and burnt for lime. Specimens of the fishes Holoptychius and Pterichthys have been met with in the upper division, but not, I believe, in the neighbourhood of Swansea; the lower division, in which fossils are more abundant in the cornstones, has yielded specimens of the fishes Pteraspis and Cephalaspis, and also of the crustacean Pterygotus.

The total thickness of the Old Red Sandstone is estimated at about 5500 feet, of which about 4000 feet belong to the upper division.

Carboniferous.

Lower Limestone Shale.—The Lower or Carboniferous Limestone Shale forms a connecting link between the Old Red Sandstone and the Carboniferous Limestone, consisting of arenaceous shale with occasional beds of sandstone near its base, and of shale interspersed with nodular beds of limestone towards the top. The gradual change is well exhibited in a section drawn many years ago at Skrinkle Haven, near Tenby, by Professor Ramsay.* The sections at Caldy Island also show it.† In Pembrokeshire the thickness of the beds is estimated at nearly 600 feet. In some parts of the district they are not represented on the Survey maps, on account of their diminished thickness, nevertheless traces of them are usually to be detected around the borders of the Old Red Sandstone in the peninsula of Gower. Encrinites, and species of the mollusca Bellerophon and Rhynchonella, have been recorded from the district.

Carboniferous Limestone.—The Carboniferous or Mountain Limestone consists for the most part of grey and bluish-grey limestone and encrinital marble; broken encrinites being more abundant in the lower portion, corals in the upper. It forms the main portion of Gower, from the Mumbles to Worm's Head, where it is from 1200 to 1500 feet in thickness. At the latter place it is much disturbed and faulted. Near Oystermouth Castle the upper beds consist of a few feet of dark-coloured carbonaceous limestone intermingled with siliceous matter, and in places highly fossiliferous. This bed, described by De la Beche, is said to occur here and there along the boundary of the Carboniferous Limestone between Swansea and Caermarthen bays.

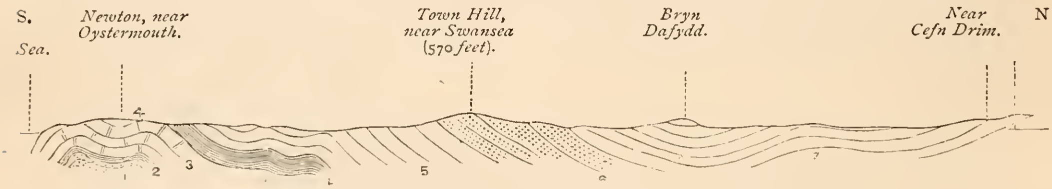
The thickness of the limestone is estimated at upwards of 2000 feet in Caldy Island; while near Llangadock, on the north side of the coal-basin, it becomes reduced to 510 feet.

Among the fossils recorded from the district are remains of fishes; mollusca of the genera Chonetes, Spirifer, Productus, Orthis, Retzia; polyzoa of the genus Ceriopora, the crinoid Actinocrinus, &c.

Here and there traces of galena have been met with in the limestone, and there are "Old lead works" between Llangan and Penlline, about four miles south-east of Bridgend.

Gower Series.—Immediately above the Carboniferous Limestone of Gower, at Penrice, and between Llanrhidian and Oystermouth, the place of the Millstone Grit is occupied by a series of "black shales mingled with sandstones," to which the name Gower series has been applied (see section). According to De la Beche they appear to form a lenticular mass interposed between the Coal-measures and the Carboniferous Limestone, rendering it difficult to draw fine lines of distinction between them.

Fig. 94.—Section of the southern side of the South Wales coal-basin, near Swansea (after Sir W. E. Logan). Scale 1 inch to 2 miles.



1. Old Red Sandstone. 2. Lower Limestone Shale. 3. Carboniferous Limestone. 4. Gower Series. 5. Lower Coal-measures. 6. Pennant Grit. 7. Upper Coal-measures.

The following section is abbreviated from one he recorded as taken along the course of the stream near Bishopston:—

		Feet	in.
Gower series.	Black shale with here and there thin bands of sandstone and limestone	797	10
	Grey sandstones and black shale	12	0
	Black shale with nodules of ironstone, &c.	527	0
	Fine-grained sandstone	75	0
	Black and grey flinty slate and shale, containing encrinites, Spirifer, &c.	210	0
	Grey marl	15	0
		1636	10

These beds rest on the Carboniferous Limestone. They were found but slightly developed to the east, while at Tenby they were but a few feet thick, consisting of carbonaceous shales and dark limestone, and containing Goniatites, as if (De la Beche remarked) they were a continuation of the Black-limestone group of Devonshire. It may be mentioned also that

* De la Beche, *op. cit.* pp. 108, 110.
† Salter, "On the Upper Old Red Sandstone and Upper Devonian Rocks." Quart. Journ. Geol. Soc. vol. xix. p. 476.

Logan detected among the hard siliceous beds of this series, specimens of Wavellite (hydrous phosphate of alumina), a mineral found at the base of the Coal-measures between Barnstaple and South Molton.*

While De la Beche hesitated whether to regard the beds as the equivalent of the Millstone Grit, or of the upper part of the Carboniferous Limestone, John Phillips placed them (doubtfully) in the Yoredale series.† Somewhat analogous beds are developed in Gloucestershire.‡

Millstone Grit.—The Millstone Grit, or "Farewell Rock," is of uncertain thickness and extension in the district. On the northern margin of the coal-basin it forms a continuous band and generally a marked feature, from near Haverfordwest to Pontypool, having at Merthyr Tydfil a thickness of 330 feet.

At Mynydd Garreg the lower portions consist of sandstone and conglomerate, the upper of arenaceous shales and flaggy sandstone; these indeed are its prevalent characters, the conglomerate being composed of quartz pebbles, the sandstone sometimes passing into quartzite. Large blocks of these rocks are generally scattered about on the line of outcrop. The shales and occasional coal-seams render the boundary line with the Coal-measures above very vague.

The Millstone Grit forms a thin and inconspicuous band north of Cardiff, but farther west, at Cefn Hirgoed and Cefn Crubwr, the beds stand out in bold ridges, and here the broad outcrop is probably duplicated by a fault. To the north-east of Pyle the beds are much concealed by Drift.

As before mentioned the Millstone Grit is not definitely identified in the Gower peninsula, and it remains to be proved whether the Gower shales should be correlated with it, or whether it be represented by certain sandstones above them and now included with the Coal-measures.

At Cwm Afon, near Aberafon, a seam of coal two feet in thickness, called the Crow's-foot vein, is worked in the Millstone Grit.

Coal-measures.—Coming now to the Coal-measures, we find them to be divided, as in the coal-fields of Bristol and Somerset, into two productive series separated by a comparatively unprofitable group of sandstones called the Pennant Grit.

The *Lower Coal-measures* comprise shales with beds of sandstone and seams of coal. They are known also as the "Ironstone series," being rich in clay-ironstone, an impure carbonate of iron which yields from 50 to 80 per cent. of ore. This renders the Lower Coal-measures of particular value, and fortunately the strata are rolled into two or more anticlinal axes, one of which running through the neighbourhood of Maesteg, brings the Lower Coal-measures near the surface, and thus renders them of easy access over a much larger area than would otherwise have been the case.

The total thickness of the division is about 850 feet; but it varies from 423 feet at Pontypool to 812 feet at Merthyr Tydfil.

The coal-seams are ordinarily from two to six feet in thickness, and rarely as much as nine feet. The junction of the Lower Coal-measures and Pennant Grit above, is marked near Maesteg, east of Neath, by two or three beds of quartz rock, known as the "Cockshoot Rock," and this is of local value in fixing the position of the seams.

A remarkable feature in connection with the coal, is that while bituminous in the neighbourhood of Swansea, and to the east of Neath, it becomes anthracitic westward, and northward. The changes, which appear to be gradual, are chiefly due to a loss of oxygen and hydrogen, and it is considered clear that similar changes must be going on where carbonic acid gas (choke damp) and carburetted-hydrogen (fire damp) are being given off. That the change from ordinary, or bituminous coal, to anthracite or stone coal,* might be connected with igneous eruption, has been suggested from the fact that in Pembrokeshire, eruptive rocks occur in proximity to the Coal-measures; but Mr. L. C. Miall has shown that coal altered by contact with igneous rocks does not form anthracite, but "cinder coal" or "soot coal." According to his experiments, coal loses its volatile constituents at ordinary temperatures, and this is facilitated by disturbance of the strata.† By the changes undergone, fuel of great variety, and suitable for numerous purposes, has been furnished.

The *Pennant Grit* is essentially a sandy series. At the Town Hill, Swansea, De la Beche described a section of 3246 feet of strata belonging to this series, of which 2125 feet were sandstone. It comprises besides, seams of workable coal, under-clay, and shale. Hughes's vein, one of the seams worked near Swansea, is about five feet in thickness. At Llanharry the thickness of the Pennant Grit is 2700 feet, while at Pontypool it becomes reduced to 1474 feet. Mr. E. Daniel divides it into three groups, in the sections he prepared for the Royal Coal Commission, under the direction of Mr. H. H. Vivian, M.P. And these sections, which were published by the Geological Survey, may be consulted for full details of the Coal-measures in the neighbourhood of Swansea.‡

One of the most remarkable beds in the South Wales coal-field is that discovered by Logan in the Pennant sandstones of the Town Hill, and of Cilfay Hill, on either side of the Tawe Valley, Swansea.

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* See De la Beche, *op. cit.* pp. 133, 134, 143, 144.
† Phillips, "Manual of Geology," pp. 169, 170.
‡ Buckland and Conybeare, Trans. Geol. Soc. 2nd series. Vol. i. pp. 223, 240, 248; Stoddart, Geol. Mag. vol. ii. p. 83.

* The term Culm is applied to the inferior kinds of anthracite, and sometimes to the small fragments of the better kinds.
† Proc. Geol. and Polytechnic Soc. W. Riding of Yorks. New series, part i. p. 22.
‡ They are numbered 53, 57, 58, and 59. See also vertical sections, Nos. 1, 2, 3, 4, and 6; and horizontal sections, Nos. 7, 8, and 9, previously published by the Geological Survey.

It consists of a conglomerate containing pebbles of coal, sometimes 4 inches in diameter, pebbles of ironstone, and boulders of granite and mica-slate, these latter very rarely. The presence of this bed indicates that the Lower Coal-measures must have been (at any rate locally) consolidated and upheaved prior to the accumulation of the Pennant Grit; a disturbance which might perhaps have had something to do with the production of the anthracite. Pebbles of anthracite have also been noticed in the Pennant Grit and Upper Coal-measures of the Bristol coal-field, where the coals above the Pennant Grit were bituminous, and those below it, anthracitic.*

The Pennant Grit forms, as a rule, a marked escarpment or range of hills above the Lower Coal-measures, from the Garth Hill (1650 feet in height), near Cardiff, by Llantrissant and Margam to the neighbourhood of Aberafon, and thence by Neath and Swansea to Mynydd Penbre. North of the coal-basin the Pennant Grit is conspicuous near Aberdare and Merthyr Tydfil.

The *Upper Coal-measures* comprise about 3000 feet of shales, sandstones, seams of bituminous coal, and underclay. They occupy large outlying masses in the centre of the trough, and may be seen at Mynydd Drumau and Mynydd March Howel. Near the upper part are the beds developed at Penllergare, north of Swansea, and those of Llanelly, which latter appear to constitute the highest beds in the coal-field. Although these names were employed by De la Beche to denote the uppermost beds of the Coal-measures, there is nothing distinctive about them. The seams of coal vary from one to seven feet in thickness.

Throughout the coal-field, indeed, the seams are very variable, and there is no evidence to show that any one bed of coal has been continuous over the whole South Wales coal-field; nor are the thickest seams spread over the widest areas.

When the Geological Survey commenced its labours in the Swansea district, Logan pointed out to De la Beche the constant occurrence of the underclay, penetrated by roots of Stigmaria, beneath each seam of coal.† These beds of underclay (known also as Bottom-stone, Pouncin, &c.) are generally of an argillaceous character, yielding a good fireclay (one capable of being made into bricks which stand the fire of a furnace), and they vary from a few inches to more than 10 feet in thickness. Sometimes, however, they become sandy, and two highly siliceous varieties are mentioned by De la Beche as occurring on the sea-shore near Lilyput, between Swansea and the Mumbles. The interesting point in connection with these beds of underclay, is the fact that they were evidently the ancient soils upon which grew the vegetation that gave rise to each overlying seam of coal.

* See Geol. Mag. vol. ii. p. 134.
† See Logan, Trans. Geol. Soc. 2nd series, vol. vi. p. 491.

At Cwm Llech, towards the head of the Swansea valley, a group of Sigillariæ was formerly noticed by Logan in a ravine, one of whose stems rose to the height of 13 feet; they were imbedded in the strata in the position in which they grew, and the largest stem was 5 feet 6 inches in circumference.*

Besides several species of Sigillaria, Lepidodendron and other forms have been met with in the Coal-measures. Of mollusca species of Nautilus, Goniatites, Spirifer, Modiola, and Pecten have been recorded chiefly from the iron-stones; and Anthracosia from the Upper Coal-measures. Specimens of the annelide Spirorbis, and fishes of the genera Rhizodus, Megalichthys, &c., were also obtained by Dr. G. P. Bevan.†

(*To be continued.*)

SOME COMMON WADING-BIRDS.

By P. Quin Keegan, LL.D.

[*Continued from page* 153.]

ASSOCIATED with the heron, but infinitely more active, vivacious, and agile, more graceful, though more shy and keen-witted, is the ever beautiful and interesting curlew (*Numenius arquatus*). The exquisite spectacle of a band of these birds flying in lengthy wedge-shaped rank and file from their retiring grounds of the flow to their feeding quarters of the ebb tide, cannot fail to impress the most heedless and superficial visitor to the seashore. Their flight is singularly smart, vigorous, and rapid. Immediately prior to alighting on the ground, they execute in the air with wings outspread yet motionless a long, closing skim of inimitable grace. While wandering over the tide-abandoned sandbanks, they search for shellfish, &c., with unwearied assiduity and an unappeasable appetite, ever probing their long, uncurved bills into the slimy mud or sand, but all the while keeping a sharp look-out to leeward for the advent of anything suspicious or dangerous. In this exercise of vigilance, however, they seem to exhibit an instinctive discrimination touching the actual quality or nature of the source of danger. Thus, for instance, an equestrian is less dreaded than a pedestrian; places are frequented at night or in early morning that would be shunned during the day; and often have we seen them feeding within a few yards of some poor harmless lighter-workers and mussel-gatherers, too indigent to purchase a gun, and too kind-hearted, it is to be hoped, to wantonly destroy seafowl. Sometimes we have noted when a shot was fired at some distance, but not at them, the birds momentarily upraised their wings as if for instant flight, but then, evidently aware

* De la Beche, Mem. Geol. Survey, vol. i. p. 183.
† Iron Ores of Great Britain, part 3; Bevan, "Geologist," vol. i. p. 505.

that no real danger was at hand, they let them fall again and prosecuted as before their victualling pursuit.

Thus it would appear that, not only is the curlew aware of the dangerous character of the report of a gun, but further, as to whether the particular shot fired was directed at it or not, as the case may be. A transmission of hereditary instinct supported by some species of nerve-sympathy as yet unexplained, will probably sufficiently account for this peculiar instinctive kind of foreknowledge and astuteness manifested by specially shy and apprehensive animals.

The wild beauty of the curlew's eye has frequently been noticed; and the extraordinary suppleness of his neck joints, whereby he can turn his bill and head round while the whole of the rest of the body remains motionless, is another beautiful feature in the aspect of the creature. Every movement of the bird is exquisitely graceful. As regards the feature of gracefulness in animal movement in general, it may be observed, that it seems certain that unless the joints are easy and supple no such consequence can be produced. Gymnasts tell us that in order to become a graceful and finished performer it is absolutely indispensable to study and practise what they term *free* exercises, i.e. exercises calculated to supple the joints, rather than to invigorate the muscles; and any one accustomed to observe circus acrobats can see that this provision is perfectly correct. With these facts before us, we are fairly warranted in presuming that the joints of the curlew are well oiled and limber, in fact, peculiarly freely and easily worked. The peculiar length and structure of limb is doubtless also specially adapted to this easy pliancy, mobility, and suppleness. The temperament of the bird, moreover, is decidedly active and vivacious. There is a great evolution of life-energy in his system; and this circumstance would doubtless contribute in the production of the graceful quality of action now under review.

Towards the end of March the curlew terminates his seaside sojourn, and betakes himself to wild moorland hills and lakes. On such occasions, frequently during the night-time, the dweller in the vicinity of the sea may observe the sky almost darkened by an imposing array of careering, whistling birds. Vast bands of curlews accumulate and fly away to their more retired and inland breeding grounds. In this situation their native shyness evaporates, and they become bold and intrusive, flying in the very face of the sportsman-wanderer of the moorland hills. Their cry and tones of voice become altered, their very mode of flight is changed, and they engage assiduously in the breeding duties. The nest is built near the edge of some reedy marsh or rushy lake; and it is said that when the young are first hatched, their bills are short and stumpy, and afford no earnest of the excessive length they attain to afterwards. The bill certainly requires a longer time to grow than the body does, whatever relation this fact may bear to adaptability for particular purposes, &c.; and we fancy that a Darwinite could make great capital out of this curious appendage and the quality of its development as regards the creature's habits, circumstances, and requirements. This bill, we may mention, is very thick, and has a narrow groove in the middle not occupied by the tongue. The nasal groove in the upper mandible is very long and narrow. The whole structure is from five to seven inches long, and is amply organic and lavishly furnished with sensitive nerves from the fifth pair, thereby apprising the creature of the nature and extent of its operations in the matter of obtaining food, &c. The excessive shyness of the curlew constitutes its principal feature of character. It acts as a most serviceable warning beacon to apprise its fellow mates of the vicinity of danger. The responsibilities of the breeding period, fire as we have seen, its hostile passions, and its vocal tones amply express this emotional condition. But, on the other hand, the bird is eminently social and sociable; and when congregated together for a common object, as when they marshal for flight, in beautiful circular and other manœuvres, they all the while, or at times, utter a soft guttural note exceedingly indicative of mutual trust and affection.

Of unwearied assiduity in the pursuit of food, of commendable attention to business, is the rotund and comfortable-looking little sea-pie or oyster-catcher (*Ostralegus hæmatopus*). When we observe their fat, dumpy, and well-stuffed bodies, we opine that they are abundantly replenished already; but, nevertheless, during almost the entire period of the tidal ebb, they most industriously labour in the procurement of sustenance. What incessant pecking and probing with their long, orange, ill-shaped bills! What eagerness do they exhibit, as if they had not a moment to spare, or as if they were half-starved through fasting too long from their last meal! Sometimes they are observed to stand like a pointer as if fascinated, and then they start forwards, and eagerly secure some coveted morsel. No doubt their period of feeding is rather less than that enjoyed by most other birds; and this fact may possibly account for their apparently excessive gluttony. The extreme wariness of the oyster-catcher induces it to keep at a very respectful distance from the shore, in fact, farther away than any of its congeners. Their well-contrasted piebald black and white plumage renders them very conspicuous, and ready marks for any sportsman on murderous thoughts intent. During the tidal flow they repair in large flocks to some quiet haven in the bay which they frequent, some retired sea pool let out of the reach of man's destructive arm where, secure and safe, they placidly await the fall of the waters, knowing instinctively the proper period to return. It is interesting to watch their deportment when the time comes for them to terminate the gormandising process. At some particular part of the shore they all stand in a detached flock, silent and motionless, their heads all turned in the same direction—"eyes front," as if awaiting the word of command from some recognised leader or director. Then some one growing impatient flutters his wings, the whole flock is stirred and moved, and the birds, rising one after the other in regular order, fall into wedge-shaped rank and file, and so-wise fly smartly and swiftly to their retiring-grounds. Be it observed that with birds the work of flying is not nearly so arduous or so exhausting as might at first sight be supposed. An examination of the wing muscles, the structure of the wings themselves, the mechanical manner of their operation, the amount of resistance to be overcome, &c., invincibly demonstrate this fact. And if we carefully review a flying flock of birds, and observe how, when once set a-going, they all can sustain an equal place and vigour, all the while mutually uttering notes of affection and sympathy, none lagging behind the others, or seemingly more wearied or harassed than his neighbour, but all, old and young, strictly preserving their allotted place and relative position, we perforce conclude that they do not experience much difficulty in acting thus-wise. The beautiful performances of these congregated bands of shore-birds might be similarly explained. The magnificent ascent of the heron we have already alluded to; and the exquisitely beautiful gyrations of a prodigious company of dunlins forms one of the most impressive features of wild seaboard scenery.

The amount of food which the oyster-catcher is able to consume is prodigious. Forty-one limpets have been found in the stomach of one whom we might say had "had a good dinner." They exhibit a most noteworthy dexterity in the unshelling of mollusca; and many a bungling conchologist has been put to shame by their clever feats in this line. Garden snails, slugs, and earthworms are exceedingly relished by these insatiable creatures. In fact, their chief business in life would seem to be to devour as much eatables as possible; and no doubt it is an admirable provision of nature that there exists some active and enterprising consumer of sea-animals which, more than any other, emit when in the state of carrion a most vile and offensive odour.

A circumstance about the oyster-catcher sufficient to stagger a teleologist is that when in extremity the bird, although unprovided with webbed feet, can nevertheless swim, and even dive with great dexterity. On one occasion, it dived repeatedly for the course of half an hour, thereby evincing a robustness of native vigour, and an exceeding tenacity of life which indeed might be expected, considering the insatiable appetite of the creature. Very conspicuous and picturesque is the adult apparel of this bird. The bill is vermilion, the feet purplish-red, the head, neck, fore part of back and wings and the terminal half of the tail are black; the rest of the body (which measures 17in. by 35in.) is white. The shape and texture of the bill are admirably adapted to, and eminently competent for, the manipulation of limpets, cockles, acorn-shells, bivalves, &c. It is long, slightly bent upwards beyond the middle, pentagonal in shape and about as high as it is broad at the base; beyond the middle it is extremely compressed, enlarging in front of the nasal groove, then gradually sloping to the extremity, which is blunt and abrupt, but as hard as ivory.

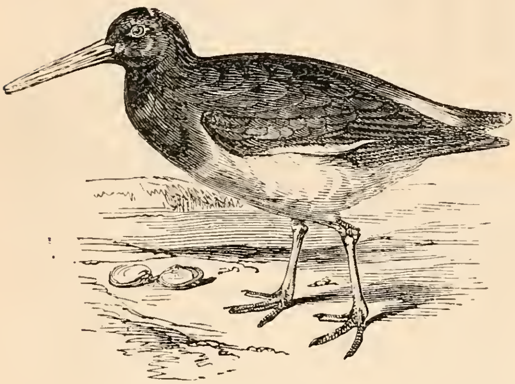

Fig. 95.—Oyster-catcher (*Hæmatopus ostralegus*).

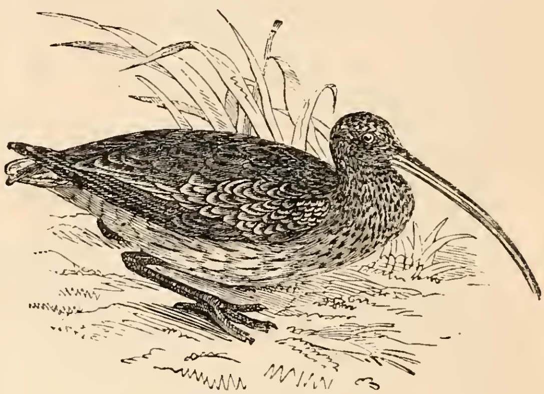

Fig. 96.—The Curlew (*Numenius arquatus*).

THE MEDUSA AQUARIUM.

In the early summer months we know of no occupation so pleasant as the study of the pretty Cydippe. By those who reside on tidal rivers, or by the seaside, it is easily pursued. All the requisites necessary for its successful pursuit is a large china coffee cup, and a tin, to hold about half a gallon of clear sea-water. To attempt their capture by means of fancy nets on long canes is worse than useless.

The plan we have adopted, is to watch, when the tide is low, from about 11 A.M. until 2 P.M., by the pier, or on the sands. When you observe the elegant creatures floating in or near the surface of the water, then gently dip the coffee cup beneath them.

They are thus easily caught, without in the least degree injuring the long and beautiful cilia. When you bring them home, make an aquarium from a good-sized brown glazed earthenware pan-mug, with a tolerably wide base, somewhat like those used by milk-dealers; it should contain not less than five gallons of sea-water. Before placing your Medusa in this improvised tank, purchase a plain colander, as used by the cook, from any ironmonger, and allow it always to rest in the aquarium, thus, by lifting it are flexible capillary tubes, having lateral short branches; these tentacles descend from the under part of the creature, and diverge from each other. We are told that their surface is covered with minute vesicles, by which they probably seize and hold their prey. In the evening, if disturbed suddenly, they throw out a faint phosphorescent light, appearing like a luminous twisted column continually changing with the varying gyrations of the Cydippe. The body is a little melon-shaped sphere, like pure crystal; thus, when they eat, the food may be watched traversing the whole of the transparent tissue. Their sides are fringed with mobile cilia, partly by which they move through the water like little balloons. They also rise in the water like bubbles, and as suddenly descend again; sometimes this is carried on

Fig. 97.—Cydippe, or *Pleurobrachia pileus* (from Taylor's "Half-hours at the Seaside").

gently, the Medusa can be taken out at any time without any permanent injury, and placed singly in a large confectioner's jar for immediate study. By means of the earthenware jar, they are kept at an equable temperature, and just sufficient light is admitted to be healthy for them, and without inconvenience or trouble they can be preserved all the summer months to be the delight of any visitor, or the joy of all the household.

Now, for a moment, allow us to give a quiet and homely lesson upon these wonderful jelly-fishes, or, as they are often named, sea-nettles. They are all glassy-looking, from the transparent gelatinous bodies which in the case of the one we are now noticing, the Cydippe, or *Pleurobrachia pileus*, very commonly seen floating on the surface of clear water in the sea, or tidal rivers they are furnished with two very fine and delicate tentacles, six times longer than its body; they slowly, but it is elegant indeed when they turn round, as it were on an axis, which was compared by one of my children to a dancing dervish; in these rapid motions, the tentacles float after it.

Nicholson thus describes the digestive apparatus: "The mouth of Pleurobrachia opens into a spindle-shaped digestive sac, or stomach, which in turn opens below into a wider and a shorter cavity termed the funnel; from this there proceed in the axis of the body two small canals, which open at the opposite pole of the body. The funnel communicates with a complicated system of canals, which are ciliated internally, and are filled with a nutrient fluid. In the angle between the two canals which run from the base of the funnel to the surface is a little vesicle, or sac, believed to be a rudimentary organ of hearing, and placed upon this is a little mass which is generally believed to be of a nervous nature. The reproductive organs are developed in the walls of the canal system."

The body by reflected light often assumes the varying tints of a rainbow; the emerald tint is especially striking. We hope we have now said enough to induce others to study it, in the homely colander aquarium.

J. F. ROBINSON.

NOTES ON DWARF EGGS.

MOST poultry fanciers are familiar with the small eggs sometimes laid by the domestic hen, and popularly known as "dwarfs"—the prevailing notion regarding which is, that they are the last eggs that will ever be laid by the fowl which produces them. They are also sometimes called centenine eggs—from the Italian *centenina*, the hundredth—because of the vulgar belief that when the fowl has laid about a hundred eggs, she lays one or two small ones, which are the last. It is probable that the frequent handling the fowls undergo at the hands of their owners may have something to do with these freaks of nature in domestic fowls by some injury to the ovary. This explanation, however, will hardly hold good with those instances more rarely met with amongst birds in a wild state, but which doubtless have often their origin in some accidental injury to the ovarian organs. I think, too, their origin may often be attributed to the great strain upon the productive powers of the bird when its eggs are repeatedly taken.

In some countries these "dwarfs" are looked upon with superstitious dread by the simple country people. In an article on the "Superstitions and Customs of Touraine," in "Chambers's Edinburgh Journal" for 1845, it is said that "the dwarf eggs laid by hens are believed to be produced by the cock, particularly by old cocks. These are called *les coquards*, or cock's eggs, and if submitted to incubation, and allowed to be hatched, they will produce that very formidable animal called a basilisk, which is a species of winged dragon, whose eyes by a single glance are able to destroy the unfortunate person who comes within their influence; if, however, a man is able to fix his eye first upon the basilisk, the latter dies immediately. The same superstition prevails in Bretagne, where is shown a well in which there once existed a crocodile which possessed the same destructive powers as the basilisk of Touraine, but which was at length fortunately destroyed by the powerful eye of some beholder, who was beforehand with the dreadful animal." "Old Bushaman," in the "Spring and Summer in Lapland," says, "You occasionally find in the nest of the ptarmigan one small egg, scarcely larger than a musket ball. This the Laps never take, for they fancy it is the egg of a *snake*." I am not aware that the "snake" theory prevails in any part of England, but in this district, dwarf eggs of domestic hens are mostly pronounced to be "cock's eggs," and it is considered extremely unlucky to attempt to hatch them.

I have always taken an interest in these monstrosities, and have many good examples in my cabinet. I have eggs of domestic hen no larger than that of a sparrow or robin. Amongst geese and turkeys they are of unfrequent occurrence, and I have never seen any that might really be called dwarfs; but I have seen some small ducks' eggs, and one I have is about the size of a song-thrush's. I have seen it stated that dwarfs are most commonly met with amongst the Rasores, and but very rarely amongst the Grallatores —but I have taken many good examples of lapwing (*V. cristatus*), some of them really curious ones. I have three the size of, and another a little less than, a thrush's egg. Two I took on the Langdale Fells are precisely like those of the dotterel (*C. Morinellus*), and I came very near admitting them into my collection as such. A shepherd had sent me word that a pair of birds, which from his description seemed to be dotterels, frequented the summits of some of the hills. Being very desirous to obtain authentic specimens of this rare egg, I agreed with him to spend several days in thoroughly searching the most likely places. In the course of our hunt he stumbled upon a nest containing the two small eggs I have mentioned, and at once signalled to me that he had found the dotterel's nest. I lost no time in joining him, but when I saw the eggs and nest I had a misgiving that they were not—what I would fain have had them be—dotterels, but merely dwarf lapwings. To be quite certain, we hid ourselves, and soon came the old lapwing and settled herself down upon the eggs—which appeared to have been some time incubated—thus destroying my hopes. I mention this as a warning to collectors that they cannot be too careful in determining species, especially such eggs as the dotterels'. I have two others, very singular-looking ones, being remarkably long in proportion to their breadth, measuring $1\frac{1}{4}$ inch by $\frac{1}{2}$ inch. They are exactly alike, well shaped, and are so darkly marked as to appear to be almost black. One of them I took on Fairsnape Fell, and in the same nest was an enormously large egg measuring 3 inches in length by $1\frac{1}{4}$ inch in breadth, which, on blowing, I found to contain two yolks. It is rather singular that all my "dwarf" lapwings were taken on the Fells. In 1877 I found a nest of snipe (*S. gallinago*), with five eggs, one of them being a "dwarf" little larger than a thrush's. The same year I took an egg of red grouse (*L. Scoticus*), exactly the size of a robin's egg, nearly round, and beautifully marked, the entire colouring of a full-sized egg appearing to be lavished upon it. I have an egg of blackbird (*T. merula*), no larger than a wren's egg, and another about as large as a robin's. This season I found a nest of song-thrush, containing three very small eggs, the size of a sparrow's, and I have another less than these. I have some eggs of chaffinch, and blue tit, as small as the egg of golden-crested wren (*R. cristatus*); and an egg of linnet (*C. cannabina*), sent to me last year from near Lancaster, is the smallest egg I possess—being considerably less than the gold crest's. I have seen several very small eggs of pheasant (*P. colchicus*) one I have is about the size of a robin's egg.

I have penned the above imperfect remarks in the hope that they may interest your correspondent S. Dewan, and others who take an interest in this matter, and I shall be glad if any one will give any instances that may come under his observation of the occurrence of "dwarfs" in any other species than those I name—or of any superstitions connected therewith, other than those already noticed.

R. STANDEN.

Goosnargh, Preston, Lancs.

MICRO-GEOLOGY.

By the kindness of W. H. Shrubsole, Esq., F.G.S., I have been favoured with the opportunity of seeing his most recent discovery, mineralised diatoms in the London clay, which has greatly interested me. The labours of that gentleman are too well known to require comment, even if such were becoming, while the fossilised remains of past generations in such numbers by him are before us as the result of his elaborate researches. The older geologists did much in their way with the organic remains of the Tertiary deposits, and not a little has appeared in the pages of SCIENCE-GOSSIP by Taylor and others, on various occasions, to direct attention and to facilitate the study of minuter and more easily destructible forms. It is possible that as investigation proceeds, other forms of long absent creations than those now recognised may yet be discovered, and in such a state of fossilisation as of which we have no previous experience, and that certain structural peculiarities and natural processes may thereby become better studied and understood. Mr. Shrubsole has explored a zone of clay of over one hundred miles in extent, therefore we may hope to have at an early future some further interesting and useful additions to our present knowledge of this important formation.

I am not aware of any instance in which the Diatomaceæ have been previously discovered in the state in which they are now found. Generally, those fossilised bodies so called, are presented to us in their primary siliceous condition, and more or less entire, and, as a rule, in respect of their state we distinguish but little difference between them and their more recent representatives of our own time. With those of the London clay, however, this is not so, for the inorganic constituents appear to have undergone an important chemical change, as is seen by analysis, and the original organism is represented by a most brilliant metalliferous deposit. There was a time when the nature of the cell was a subject of much dispute, and numerous were the speculations respecting it, but now, were there but a shadow of a doubt respecting it, such questions would be immediately set at rest, since the optical characters of the minutest details have become the more prominent and conspicuous in proportion to the deposition of metal upon it, while the depressions, as they are called, are represented as apertures, or foramina. The valves, consisting as they now do of pyritic iron and an infinitesimal quantity of organic matter, will, as I think, become a source of great attraction to the exhibitor. In brilliancy they are equal to the most striking of the ores, and their novelty must excite the curiosity and admiration of all lovers of the beautiful. They are well rendered by a condensed light from above, and by moderately low powers, but they may be studied with the ¼. They are, moreover, among the few subjects suited to the performance of the "Smith's Vertical Illuminator," under which, and the ½ inch, they are gorgeous. But to the student of micro-geology they will afford a still higher pleasure, and I have no doubt that ere long the London clay will have become a comparatively new and fertile field of research.

J. FEDARB, B.E.

HETEROMORPHIC ORCHIDS.

PERHAPS in no members of the vegetable kingdom is the remarkable phenomenon of heteromorphism more distinctly exhibited than in the two peculiar and interesting genera of Orchids, Catasetum and Cycnoches. Observers have from time to time recorded the appearance in some species (chiefly Catasetums) of certain strange departures from the typical structure of the floral organs accompanied by the normal flowers of the species and several intermediate forms all of which were in some instances borne upon the same inflorescence. The first who recorded one of these extraordinary occurrences was Sir R. Schomburgk, who contributed to the Linnean Society a paper describing an orchid he had found in Demerara which bore on one spike flowers of what had been supposed to be three distinct genera, viz., Catasetum, Monachanthus, and Myanthus. He further observed that although the Catasetum produced seeds freely, the Monachanthus was uniformly sterile. This account was published in the Linnean Society's Transactions (vol. xvii.) and attracted the attention of botanists and naturalists generally, but from its singularity was received by many somewhat incredulously. However, in November, 1836, a plant of *Myanthus cristatus* in the garden of the Duke of Devonshire at Chatsworth also produced flowers of Monachanthus and Catasetum similar to the plant described by Sir R. Schomburgk.

This specimen was figured in the Botanical Register (vol. xxiii.) and proved beyond all doubt the correctness of what had been previously written concerning the variability of the flowers. Dr. Lindley in commenting upon the plant mentions how he first assigned these forms to three genera, distinguishing Myanthus from Catasetum by the deeply fringed or crested labellum, and Monachanthus from both the others, by the absence of cirrhi or feelers from the column, and he further remarks in extenuation of this decision, "nor do I think that as a botanist I could be blamed for these errors, the genera being founded upon characters which no one could, *à priori*, have suspected could pass into each other in the manner that has now been seen." Many other similar specimens have since been noted, and the two pseudo-genera Monachanthus and Myanthus are now merged in Catasetum.

The other heteromorphic genus, Cycnoches, is similar in habit to Catasetum, its most marked characteristic being the long slender and gracefully arched column which suggested the name, Cycnoches signifying "swan-neck." Only two forms of flowers have been observed to occur on single plants of this genus, and these are usually borne upon two distinct racemes produced from opposite sides of the stem. In 1836 Dr. Lindley received from a gentleman in Birmingham, a specimen of a Cycnoches which differed from the species then known, *C. Loddigesii*, in having a column dilated and hooded at the apex and in being quite devoid of scent. This he considered a distinct species, and accordingly named it *C. cucullata*, but very shortly afterwards he observed in the garden of the Royal Horticultural Society a plant bearing two racemes, "on one were the fragrant flowers of *C. Loddigesii* and on the other the scentless flowers of *C. cucullata*."

Well indeed might the same author observe in the "Vegetable Kingdom," "Such cases shake to the foundation our ideas of the stability of genera and species and prepare the mind for more startling discoveries than could have been otherwise anticipated."

Fig. 98.—Flower of *Cycnoches Warscewiczii*.

Fig. 99.—Heteromorphic Flower of *Cycnoches Warscewiczii*.

Since that time about six or seven so-called species have been introduced from tropical America, in many of which a similar tendency to produce distinct forms of flowers on the same plant has been noticed, and it is thus extremely difficult to define the specific characters. *Cycnoches Warscewiczii* is one of the most recent introductions, and a specimen exhibited at one of the Royal Horticultural Society's meetings last year showed the dimorphic character extremely well. On one side of the plant was a long drooping raceme of numerous small, dull yellow flowers, with reflexed sepals and petals, a peculiar fringed labellum supported on a stalk, and a slender arching column.

Just above, upon the opposite side of the stem, was a short raceme of perhaps half-a-dozen flowers, considerably larger in size, of a greenish hue, and broad flat sepals and petals, a short thick column and a somewhat heart-shaped labellum. It appears probable that in this case the large flower is the seed-bearing form; for the other, although it produces pollinia, seems imperfect in the ovary, and thus the different structures have some bearing upon the phenomenon of fertilisation, an approximation to the monœcious state. It is a curious fact that while the three species *C. ventricosum*, *C. Loddigesii* and *heterochilon* have flowers similar to the large form of *C. Warscewiczii*—*C. pentadactylon*, *C. aureum*, *C. maculatum* and *C. Egertonianum*, bear flowers resembling the small form with a fringed stalked labellum.

LEWIS CASTLE.

A PECULIAR INFUSORIAN.

FROM the bottom of a glass in which gold fish are kept, I have obtained a large number of Infusoria of various forms, over twenty different creatures; among them some of the *Trachelocerca olor*. These beautiful creatures are thus described by Pritchard: "Spindle-shaped, neck very long and flexible, terminated by a dilated and ciliated mouth. Its surface is beautifully reticulated, creeps at the bottom of the vessel containing it, and twines itself gracefully about Conferva or the roots of Lemna, but swims awkwardly. It elongates and contracts its neck at pleasure, and is altogether an interesting object for the microscope, their greatest length 1-30"; it has been found encysted." Among the number of *T. olor* that I kept for some time in a cell, I have had the pleasure of witnessing their increase by longitudinal division. In the sketch I have endeavoured to show the process, which takes about thirty-five minutes to complete from the commencement of the division; Pritchard also mentions and figures a *T. olor* with a forked neck and two heads, and it is named Biceps, but he considers it to be not a distinct creature, but that it is evidently nothing more than "an animalcule in the act of longitudinal fission not far advanced," and as I have seen many of them in the act of fission, it would be easily mistaken for a forked neck, if the process was not watched throughout. They also at times increase by transverse fission dividing about midway, the posterior part containing the vesicle has the new head, neck, &c., formed, and the anterior part has a new tail formed with vesicle, &c. The act of fission by the latter mode is very rare, but by the former is very frequent, and appears to be the most usual manner of increase. I have seen the *Paramecium Aurelia* divide both transversely and longitudinally.

JAMES FULLAGAR.

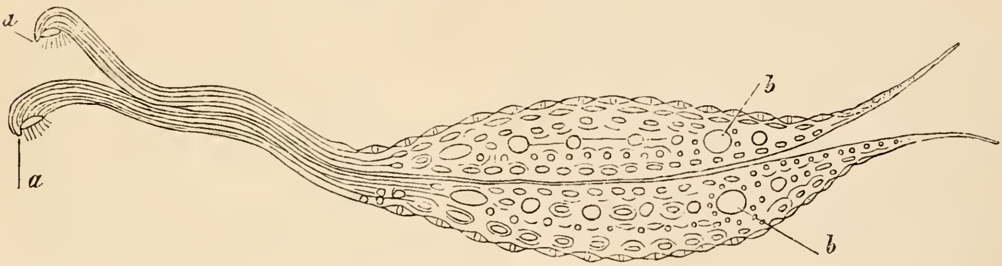

Fig. 100.—*Trachelocerca olor*; *a*, ciliated mouth; *b*, contractile vesicle.

NOTES ON *CORONELLA LÆVIS*.

AMONG the many readers of SCIENCE-GOSSIP there are no doubt some to whom a few notes on the habits of this rare snake will be of interest. As I have lived for some years at Bournemouth, in Hampshire, formerly its chief habitat, I have had many opportunities of observing the Coronella. Of its habit and manner of feeding, I am enabled to speak with more confidence, as, a year or two back, I had a live specimen in my possession for some time. Twelve years ago Bournemouth was but a very small village, surrounded by large expanses of moorland, intersected with marshy valleys, and was a famous hunting ground for either naturalists or entomologists. At this time Coronella was extraordinarily abundant. During the very hot summer of 1868 the snakes were to be seen literally by scores, and great numbers were killed. Since then, however, their numbers have gradually decreased, and most of the wild moor having disappeared before the advance of civilisation, they are not now met with in places where they formerly abounded.

The favourite haunt of Coronella is a dry, sandy, hillside, overgrown with short heath, and gorse, and coarse grass, and sloping down to a marshy valley, where water is at all times obtainable. There, on some bare patch of sand, the snake lies, loosely coiled, and basks in the sun; and there it can, when thirsty, get water without any great expenditure of energy. During the heat of the day it frequently comes down to some pool in the marsh to drink. Among the undergrowth it can also at any time find its prey, the common lizard, which abounds in such localities. Its mode of obtaining its food is one of the most interesting characteristics of the Coronella, and merits a somewhat minute description.

As soon as it sees its victim within easy reach, it slowly approaches, keeping its body concealed, but slightly raising its head above the heather and coarse grass. When it gets within striking distance, after remaining motionless for a few seconds, it darts suddenly, and with the quickness of thought, at the throat of the hapless lizard. If its aim is successful, the snake instantly grasps with its tail a stem of heather, or tuft of grass, and proceeds at once to the enjoyment of its meal. Its first step is to gradually shift its hold from the throat to the snout of the lizard, by slow and almost imperceptible degrees. When once it has the lizard's head fairly in its jaws,

Fig. 101.—Head of Smooth snake *(Coronella lævis)*.

the process of swallowing is rapid, and the strong protests of the victim are wholly unavailing, as the snake with its tail knotted round the grass is able to overcome all resistance. In this way it will, in five or ten minutes, entirely dispose of a lizard as large round as itself and two-thirds of its length. After its meal the snake is somewhat sluggish and disinclined to exert itself, but in about a fortnight it begins to recover its appetite, and, by the end of another week, it is again actively engaged in its search for food.

As the Coronella is by the uninitiated frequently mistaken for the common viper, to which, at first sight, it certainly bears some resemblance, it may be as well to point out how it may be distinguished. The chief cause of the confusion between the two snakes is no doubt the fact that the Coronella displays the particular markings that are popularly supposed to be specially characteristic of the viper; but, if we compare a specimen of each snake, the difference will be sufficiently apparent. While in the viper the markings are all remarkably clear and distinct, in the Coronella they are mostly blotched and undefined. The colour too of the latter is generally either a dull slaty grey, or a dusty brown, very different from the rich beauty of tint which adorns the viper. It should, moreover, be clearly understood that although the Coronella can, and if irritated will, at times bite hard enough to draw blood, it is not venomous and possesses no fangs properly so-called. Its teeth are mostly hardly larger than those of the lizard, and are barely perceptible without careful examination. But, situated at the extremities of the jaws, almost in the throat of the snake, are two long fang-like teeth, unconnected (as far as I can determine) with any poison glands. Presumably they are intended to aid the snake in holding its prey, and in defeating the vigorous efforts, that, during the swallowing process, the lizard makes to escape.

It is much to be regretted that naturalists have not given more attention to the Coronella and its ways, as it is a snake well worthy of careful study.

A. L. BALDRY.

LIST OF ASSISTING NATURALISTS.

[*Continued from p.* 154.]

KENT.

Dover. J. Fedarb, B.E., 10 Wood Street, Examiner, Privy Council, *Microscopy and its application to morbid Pathology*, &c.

MIDDLESEX.

London. Mr. Saville Kent, F.L.S., &c., Acton House, 87 St. Stephen's Avenue, Shepherd's Bush, W. *Infusoria.* These should be sent alive in phials similar to those supplied by Mr. Thomas Bolton, of 17 Ann Street, Birmingham.

MICROSCOPY.

NEW PRESERVATIVE FLUID.—In answer to the letter asking about the new preservative fluid mentioned in your journal, I may say that I have given it now three months' trial. The ingredient "methylic alcohol" is only the ordinary methylated spirit. For microscopically mounting most vegetable and animal preparations it seems to answer very well. But for objects such as polyzoa, containing any carbonate of lime it is quite unfit Where lime is present it speedily encrusts the object in a slimy coat that soon renders it all but invisible. It somewhat decolours vegetable and animal preparations, as, indeed, all mounting media do. It is very easy to use and not difficult to prepare. —*Alf. W. Stokes.*

PRESERVATION OF ORGANISMS.—M. Certes says that by treating water with a 1·5 per cent. solution of osmic acid, the acid will kill any organisms present without deforming them. They sink to the bottom of the vessel and can then be examined microscopically.

DULL OBJECTIVES.—The note on this subject in SCIENCE-GOSSIP for July, signed "G. F. George," should have had the signature "F. Jas. George."

FLOSCULARIA ORNATA.—I have just observed a peculiar but very interesting sight. I have read that the hairs on the lobes of the floscule have somewhat puzzled observers of this beautiful Rotifer. On a piece of weed which I obtained from a pond in this neighbourhood I had a beautiful specimen of the *Floscularia ornata*. I was intently watching her and her method of procuring her food; at times stamping my foot so as to enable me to see her beautiful setæ fall from the lobes; but, tired of this, I sat admiring the beautiful colours and their transparency, which I thought very singular, when a large brown mass came sailing along, and, as if blind to all danger, he held his course and went straight into the floscule's open mouth. The setæ at once closed up so as not to allow the prey to escape; and now commenced a determined struggle. The brown mass was too large to pass from the funnel into the vestibule, and the floscule kept swaying to and fro as if trying by this means to swallow her prey, and evidently bent on doing so, for the hairs formed a network by interlacing each other over the funnel. I made up my mind to watch and see the end of this "life and death struggle," at least for the animalcule, and the means of a "good meal" for Mrs. Floscule. I knew her to be hungry, for I had kept her on short allowance of water, as I wanted to find her should she leave her cell as others had done. Again another wriggle and tussle, but all to no purpose, and then the floscule kept perfectly still; the vestibule began to swell; the contractile rim gradually opened, the whole of the setæ on the lobes were turned inwards and thrust down the trochal disc on to the brown jelly-like mass piercing it like so many needles, thrusting it from the vestibule through the contractile rim into the mouth, which instantly became distended and the prey passed down into the stomach; the lobes were drawn upwards and again resumed their feather-like appearance. I could perceive quite plainly the animalcule pass from one stomach into another, and called Mr. Bean of Norwich to witness the termination of what I consider a peculiar phenomenon.—*T. B. Rosseter*, *Canterbury*.

Collecting-Bottle.—On page 136 of Science-Gossip for June, Mr. F. Row describes a collecting-bottle which he has just devised. I beg to say that

Fig. 102.—Wright's Collecting-bottle.

a collecting-bottle on precisely the same principle was brought out by myself and advertised in your Journal about ten or twelve years back, and has been sold by Messrs. Baker, Stewart, and other opticians. —*Edward Wright.*

Hackney Microscopical and Natural History Society.—At the last general meeting of this society, the president (H. Ramsden, M.A., F.L.S.) introduced a living specimen of the *Pyrophorus noctilucus* (Linn.), or fire-fly, of the order Coleoptera, fam. Elateridæ. It left Cuba on May 6, and arrived in England on May 30. The insect was feeding on its natural food, raw sugar-cane, and from its phosphorescent appearance fully deserves its common name of fire-fly. I doubt not that the appearance of a live specimen of this beautiful insect will interest many of our readers. I should like to know if it has been brought to this country alive before. Mr. Ramsden informed the members present that twenty-two were captured the evening before leaving Cuba, and two only reached England.—*Collis Willmott.*

Microscopical Drawings upon Glass.—No doubt it will interest others besides H. W. O. to know how these drawings are done; the great thing is to get the glass properly prepared. You can get it in this state at Mr. Holmes's, 149 Essex Road; it is done in the following manner:—first, well wash some emery, so as to get it very fine indeed, then with a piece of wash leather and sweet oil rub it carefully and evenly over the surface of a piece of patent plate glass until a dull surface is produced; then carefully free it from all traces of grease, and do the drawing with a HHH pencil; the fine point of the pencil soon wears down, but if the pencil be kept continually turned round it wears a fine point to itself. When the drawing is finished, the next thing is to colour; this must be done with aniline colours, such as Judson's dyes, but the colours prepared by E. Atkins, 200 Essex Road, I find work best; now when you have got it coloured and thoroughly dry, pour over it some Canada balsam diluted with benzine, and then place another glass (not a ground one) on the top; by the aid of the balsam the glass will become perfectly transparent. I have seen some very beautiful slides prepared in this manner. Any further information I shall be most happy to give.—*A. Smith.*

ZOOLOGY.

Living Toads in Stone.—On reading Mr. Eisdell's essay on the above subject in the May number of Science-Gossip, I was much interested with his résumé of the evidence of the existence of living toads in solid masses of rock, &c., because I have heard of several instances of these animals having been said to have been found alive in the heart of a block of coal, although I never came across a thoroughly authenticated case; for, as Dr. Buckland says, "the evidence is never perfect to show that the reptiles were entirely enclosed in a solid rock." The testimony may come from some person perfectly unwilling to deceive, but then, in most instances, he receives his information second or third hand. There never was to my knowledge a complete chain of evidence to place the record of such a discovery beyond a doubt. It is an easy matter for workmen in a quarry, and more particularly in a coalmine, when breaking up a block of either stone or coal and finding a toad turn up at the moment, innocently to believe that it came out of the rock, when most probably it was secreted somewhere near, and by the displacement of the stone came to their sight. The story of such discoveries I venture to think are on the face of them so much removed beyond the bounds of probability, if not possibility, as to render them unworthy of much belief, because in supposing such cases we are bound, without any alternative, to date the existence of the toad far back through the ages of the past, to the formation of the rock, and this fact alone is sufficient to warrant us in receiving all cases of such reputed discovery with the greatest caution. —Most of us have heard of "Flint Jack," but I do not think many readers of this Journal have met with any manufacturers of fossil toads, but I knew many years ago a working naturalist living in Leeds who used to prepare for "sale" toads stated to have been found in beds of coal, by baking them perfectly black and hard in an oven, and then taking square pieces of coal and after splitting them carefully he would cut a hollow in each portion to receive the "ancient reptile."—*Thomas G. Denny.*

British Association Meeting.—The meeting of the above association will be held this year at Swansea. The president elect is Professor Andrew Crombie Ramsay, LL.D., F.R.S., V.P.G.S., Director-General of the Geological Survey of the United Kingdom. The inaugural address will be delivered on Wednesday, August 25. In addition to the usual soirées, there will be discourses: on Friday evening by Professor W. Boyd Dawkins, F.R.S., on "Primeval Man;" and on Monday evening by Mr. Francis Galton, F.R.S., on "Mental Imagery." On Wednesday, September 1, the concluding General Meeting will be held at 2.30 P.M. On Saturday evening, August 28, Henry Seebohm, Esq., F.Z.S., will deliver a lecture to the operative classes on "The North-East Passage." The Presidents of the different sections are the following: Mathematical and Physical Science: President—Professor W. Grylls Adams, M.A., F.R.S., F.G.S., F.C.P.S.; Chemical Science: President—John Henry Gilbert, Ph.D., F.R.S., F.C.S; Geology: President—H. Clifton Sorby, LL.D., F.R.S., Pres. G.S.; Biology: President—A. C. L. G. Günther, M.A., M.D., Ph.D., F.R.S.; Geography: President—Lieut.-General Sir John Henry Lefroy, C.B., R.C.M.G., R.A., F.R.S., F.R.G.S.; Economic Science and Statistics: President—George Woodyatt Hastings, M.P.; Mechanical Science: President—James Abernethy, C.E. The local secretaries are W. Morgan, Esq., Ph.D., F.C.S., and Mr. James Strick. This is the fiftieth annual meeting of the association.

A Fresh-water Jelly-fish.—Professor Ray Lankester has given in a recent number of "Nature" an account of the discovery of a new jelly-fish, belonging to the order Trachomedusæ, living in the water-lily tank at Regent's Park. The organism he described as an adult Medusa of the family Petasidæ, and he thinks it comes nearest, among described genera, to Fritz Müller's imperfectly known Aglauropsis from the coast of Brazil. The most interesting fact in connection with it is that it occurs in great abundance in perfectly fresh water at a temperature of 90° Fahr. Mr. Sowerby, who first discovered the Medusa, has observed it feeding on the Daphnia, which abounds in the water with it. The diameter of the disk does not exceed one-third of an inch. Professor Lankester has given to it the name *Craspedacusta Sowerbii.* Since Professor Lankester published his account he found that Dr. Allman had also worked out the generic characteristics of the above Medusa, and assigned to it the name of *Limnocodium Victoria*, and Professor Lankester has generously withdrawn his own claim to priority and has accepted Dr. Allman's nomenclature, but he thinks Mr. Sowerby's name should be retained in connection with the species. The chief fact which remains, however, is the occurrence of a fresh-water jelly-fish.

"The Midland Naturalist."—The last number of the above journal contains, amongst other matter, a full account of the "Third Annual Meeting of the Midland Union of Natural History Societies," which gives the address of the president (Sir Herewald Wake, Bart.). Also articles on "Northamptonshire Birds," by Lord Lilford; "Pond Life: Where to find *Anuræa longispina*," by J. Levick; "British Lichens: How to Study them," by W. Phillips, F.L.S.; "Fossil Fish Remains from the Carboniferous Limestone of South Derbyshire," by E. Wilson, F.G.S.; and "Meteorology of the Midlands," by W. J. Harrison, F.G.S.

"The Popular Science Review."—The July number of this well-known magazine contains the following articles:—"Feather-stars, Recent and Fossil," by P. H. Carpenter, M.A.; "The Portland Building Stone," by the Rev. J. F. Blake, M.A., F.G.S.; "Climbing Plants," by Francis Darwin, F.L.S.; "On the Influence which a Molecular Movement due to Electricity may have exerted in certain Geological Phenomena, namely, the Metamorphism of Rocks and the Formation of Metalliferous Deposits;" "Sunspots and British Weather," by W. L. Dallas; "The Hardening and Tempering of Steel," &c.

Eggs of the Great Auk.—Two eggs of this extinct bird were recently sold by auction, by Mr. J. C. Stevens, and fetched one hundred pounds and one hundred and two guineas respectively. Lord Lilford was the purchaser. The eggs were discovered in an old private collection in Edinburgh.

"Manual of the Infusoria."—This much wanted and long expected work by Mr. W. Saville Kent, F.L.S., is, we understand, now thoroughly completed. We have been favoured with a sight of some of the plates, which are exquisite examples of engraving, and give us a capital idea of the transparency which characterises the structures of most Protozoa. The work will be issued in 10*s.* 6*d.* parts. The first part will be ready in October, and the others will follow in monthly succession. There is nothing before the public on this subject except Pritchard's "History of the Infusoria," published in 1841, and which now sells at much more than the original published price. Pritchard included desmids and diatoms among the Infusoria ! No other living naturalist is so capable of bringing out a work of this kind as Mr. Saville Kent, and there can be no doubt as to the value of the expected manual.

Agriculture in America.—The manner in which the highest intelligence is brought to bear upon everything in which our Yankee cousins engage must be one of the principal causes of their national success. We have received through Mr. W. C. Le Duc, Commissioner of Agriculture, his Report for 1877, published at the Government Printing Office, Washington. It is a bulky volume of nearly 600 pages, amply illustrated where illustrations are necessary, in which we have elaborate papers by the State Entomologist on the insects which interfere in any way with agricultural operations ; statistical papers on every agricultural subject ; botanical papers relating to various important plants, such as the olive, maize, and sorghum ; others on cattle improvement, diseases of domestic animals, &c. When our own agriculturists are as well supplied by our own government with similar valuable information, perhaps we shall not hear so much about American competition.

Arion ater.—Collectors of British Mollusca may be interested to hear of Maidenhead as a locality for the white variety of *Arion ater*. I have lately taken five specimens after rain, in ditches and on grass near Maidenhead. The slug is creamy white with dark grey tentacles and a yellow fringe round the entire length. I have also met with drab varieties of the same species of different shades, as well as the common black one. The neighbourhood of Maidenhead is gravelly. I should be very glad to know if any of your correspondents have seen this variety, and if so in what districts, with what soil and on what sort of vegetation.—*Lionel E. Adams.*

Bee Culture.—The very general failure of bees, scarcely any having survived the unfavourable season of last year, leads to the supposition that in England we are wanting in the knowledge of their treatment. Mr. Balchin, a florist of Cliftonville, had thirteen well stored hives in the spring of last year, but all of them died, he believed, from the extreme severity of the weather ; but on applying to Mr. Pettitt of the "Agricultural Institute" at Dover, he stated that the bees were not killed by the frost, but that it was last summer that killed them, and not the winter. There might have been food provided for them, but as bees cannot take in food at a lower temperature than 56°, the cold was too intense to remove it, and they died of starvation. He tells me he has preserved about seventy hives, by feeding them up well in September or not later than October, which keeps up their temperature, as they store up their food in their cells. With plenty of food inside the hives they never suffer from cold. He also says they should never be fed during winter, for if they have plenty of food inside they can bear any amount of cold that we have in this country ; that a well-stored hive is always warm inside, even in the coldest weather, and that the only protection bees require during the severe frost in England is to keep them dry, and if they are well fed up in September, they will never suffer from the cold. In the "Times" of the first of July, it is stated that in Paris a person keeps from eight to nine hundred hives, and yet the winter temperature in Paris is usually lower than in England. Mr. Pettitt says bees should be placed where they get no afternoon sun.—*T. B. W., Brighton.*

BOTANY.

Automatic movements of a Fern.—Dr. Asa Gray, in the "Coutler's Gazette" says :—Mr. E. J. Loomis of the Nautical Almanac Office, Washington, recently showed me a phenomenon which I suppose has never before been noticed, and which is commended to the attention of botanists. A tuft of *Asplenium trichomanes* gathered last autumn in the mountains of Virginia is growing in his house in a glass dish. About two months ago he noticed that one of the fronds—a rather short and erect one, which is now showing fructification—made quick movements alternately back and forth in the plane of the frond, through from 20 deg. to 40 deg. whenever the vessel was brought from its shaded situation into sunlight or bright daylight. The movement was more extensive and rapid when the frond was younger. When I saw it on the 23rd of January its compass was within 15 deg. and was about as rapid as that of the leaflets of *Desmodium gyrans*. It was more rapid than the second hand of a watch, but with occasional stops in the course of each half vibration.

This was in full daylight, next a window, but not in sunshine. No movement had been observed in the other fronds which were all sterile and reclining, with the exception of a single one which was just unfolding, in which Mr. Loomis thinks he has detected incipient motion of the same kind. This little fern is very common and it is easy to obtain it and set it growing. The matter is worthy of further investigation. Have any of our readers observed the phenomenon herein stated?—*J. Kenyon.*

A SUGGESTION.—It has occurred to me that a valuable addition might be made to the literature of British Botany were a compact manual to be published under the joint authorship of several of our recognised leading botanists (of whom six would probably form a sufficient number), combining the authority such a conclave would command, with the collected results both of special work in the field and at the desk, of the principal writers of the time. Such a work (not too costly) would be of great value to the student, from its comprising a more corrected grasp of specific differences in our plants, based on well-considered individual opinion. Some genera need such joint authority greatly: the Rubi, for instance: and the pardonable elaboration of special investigation of any one section of the subject would thus receive due condensation and record. Such a National Manual of British Botany might well be corrected and re-edited every six or ten years, and so set forth on its title-page or preface; proper recognition being given to existing authorities that would probably be laid under contribution for such a purpose. The director for the time being of our National Botanical Gardens would seem to be the right person to preside as chairman for what, I venture to think, would prove, to the student of the botany of these islands, a most valuable work.—*Horace Pearce, F.L.S., Stourbridge.*

ORGANS OF MOSSES.—"Inquisitive" asks for information on some of the organs of mosses. (1.) The use of the calyptra after being torn away from the vaginula, is protective to the young and tender sporogonium: all field botanists must have noted this in the Calypteraceæ, Polytrichaceæ, &c., for when the young sporogonium is hardly distinguishable from the seta, it is effectually protected by the calyptra. (2.) The use of the paraphyses is to keep the antheridia and archegonia moist, in order that their functions may be performed. Bridel says: "Cum vero omnia dissepimentis transversalibus, quæ basim versus spatio minori inter se distant intercipiantur et liquore quodam limpidissimo plena videantur, et simul atque antheræ officio masculo defunctæ fuerint emarcescant et corrumpantur, nihil obstat quo minus illa corpuscula pro nectariis specici peculiaris habeantur, sine utriculis a providente natura ad eum finem dispositis, ut liquore quo turgent genitalia quibus denso agmine circumstant perpetuo madefacta a noxia siccitate defendantur, illaque humiditatis gradu semper fruantur sine quo pollinis explosio nullatenus succedere potest. Eandem ob causam feminea genitalia talibus filamentis succosis stipata inveniuntur, sine quorum auxilio desiccata atque corrugata nec pollinem fœcundatum admittere nec admissorum granulorum rupturam promovere valerent." Paraphyses are not found in the flowers of all mosses, some of those inhabiting water and very moist places having few or none, while those that are found in dry places very rarely want them. Paraphyses occur less frequently in female than in male and bisexual flowers. (3.) The use of the apophysis I will leave to be fully explained by an abler pen, but I think it is protective, as it is developed to the greatest degree (being sometimes larger than the capsule) in the Splachnaceæ, these mosses being generally found on decaying animal matter, which usually abounds with insects. (4.) "Inquisitive" almost answers this question himself in his first query. The vaginula is the base of the archegonium from which the calyptra was torn away when the sporangium was young. (5.) The antherozoids are conveyed by their power of swimming (when mature) over the moist surface of the plants, fertilisation taking place in moist weather. In many mosses the antherozoids have not far to go, as in the bisexual ones. Some dioicous mosses are rarely found in fruit, the male and female plants often occurring in distinct patches.—*Wm. West, Bradford.*

ORGANS OF MOSSES.—As another "Inquisitive" I am trying to understand the mosses' structure, and would offer the following in a spirit of inquiry:—(1.) The "calyptra" or hood is a parent growth of the moss, as a protective covering of the new plant (sporogonium); when the latter is more advanced, the hood is thrown off by wind or rain; and in some cases the operculum of the new plant is an inner covering which detaches when the spores are ripe and ready to disperse. (2.) The "paraphyses" are probably imperfect or undeveloped archegonia, a kind of calyx of altered leaves. (3.) What is an apophysis? (4.) The "vaginula" is the base of the archegonium, from which the calyptra has been separated by the upward growth of the new plant which pushes through it and lives upon the parent juices, but without organic connection.—*No. 2 Inquisitive.*

WILD FLOWERS AND THEIR NAMES.—I shall be obliged for a little information as to the best method of discovering the names of flowers which one may meet with and be unable to recognise. It appears to me there are three methods, viz.: 1. To determine (1) by stem and variation of leaf to which division of Cotyledons the plant belongs; then (2) refer it by examination of petals and stamens and their disposition to its class, Thalamifloræ, Calycifloræ, or other; (3) determine its natural order in this class by some such diagnosis as that given for each order by Bentley; and (4) take the individual characteristics to determine the species. For example, let a mallow be the unknown plant. (1) It is found to be Dicotyledon; (2) Thalamifloræ; (3) the leaves, calyx, petals, stamens, anthers, filaments, carpels, and seeds, are found to answer to the diagnosis of Malvaceæ; and (4) the individual of the various tribes is settled. By this reductio ad unum the persevering searcher hopes he has discovered and named the plant aright. 2. Bentley has at the end of each class an "artificial analysis of the orders in each sub-class," by which perhaps the natural order of a plant may be discovered, although, as it seems to me, in some cases a tyro would find it somewhat complicated, difficult, and uncertain. Taking the mallow again as an example, one would have to determine amongst all the possibilities of botanical adjustment that (*a*) the flowers were polyandrous; (*b*) the leaves with stipules; (*c*) carpels combined into solid pistil with more than one placenta; (*d*) placentas in the axis; (*e*) calyx with valvate æstivation; (*f*) stamens monadelphous; (*g*) anthers one-celled; and therefore the plant belongs to the order Malvaceæ. 3. To take in one's hand some reliable local guide, e.g., De Crespigny's "London Flora," for, say, Box-hill and neighbourhood, and endeavour to assign the name from the list of plants stated to grow in the locality. This is of course unscientific, and perhaps one could not be quite certain of the result. Perhaps Bentham's "Handbook of the British Flora," mentioned on page 184 of vol. xv. of SCIENCE-GOSSIP, would afford further assistance in this method, but Bentham's is a somewhat expensive work. I should be glad of assistance or of reference to any work which may be likely to help myself and others desirous of similar information.—*F. H. Hn.*

PRIMULA VERIS IN SCOTLAND.—Mr. Swinten's remarks on the above will surprise those Scotch botanists who have more than a local knowledge. *P. veris* is not "rare" in Scotland, being generally distributed over the country, though it may be termed local like many other plants; so that it is not the fact that "it is only found near Edinburgh." It is unfortunate that Mr. Swinten has misread Sir J. Hooker, and that he is unaware that the distribution of our plants has been worked out to a large extent since the publication of the "British Flora" in 1831. I should not like to say that it is as common as in England, but it certainly is very far from being "rare."—*A. Craig-Christy, Edinburgh.*

PHYSARUM TUSSILAGINIS, *B. and B.*—I desire to call the attention of the students of micro-fungi to the above parasite, which is, I believe, only found upon the Butter Bur (*Petasites vulgare*). I found it nearly a dozen years ago, and, not knowing it, forwarded specimens to Mr. Cook, who after some time named it as above. Since the time referred to, I have found the same fungus nearly every spring in some parts of Cheshire, but never in any other county. Mr. Cook reported that the plant was new in Britain. I hope students will look for it in other parts of the country, for as yet I am not aware of any one finding the plant except myself. I shall be glad to send small specimens to inquiring students; I regret to say small, but I have never found the plant in large quantity.—*T. Brittain, 47 Derby Street, Moss Side, Manchester.*

GEOLOGY.

DIATOMS IN THE LONDON CLAY.—To enable me to determine the exact extent of the diatomaceous band in the London clay, I am anxious to obtain information of any wells in progress, or in contemplation, anywhere in the London basin, west and north of London. With the help of some of your readers I have no doubt that I shall shortly be able to show that the zone referred to is coextensive with the London clay. The details I wish for are: (1) Locality of well; (2) If begun, the depth attained. I shall also be glad to hear of any railway cuttings now being made in the same area. To every informant I shall have much pleasure in sending a packet of these mineralised diatoms, which I find from the letters that reach me are attracting much attention throughout Europe and America.—*W. H. Shrubsole.*

NEW SCOTCH CARBONIFEROUS CORALS.—We have received a copy of a paper entitled "Contributions to our Knowledge of the Rugose Corals, from the Carboniferous Limestone of Scotland," by James Thomson, F.G.S., read before the Philosophical Society of Glasgow. The pamphlet is embellished with most exquisite illustrations, showing the cellular structure in its minutest details, and the entire work bears evidence to the fact that Mr. Thomson is still, what he always has been, a most indefatigable worker.

TOPOGRAPHICAL GEOLOGY. — The "Scottish Naturalist" for July contains the conclusion of the Rev. Dr. Milroy's interesting and valuable article on the above subject, previously noticed in SCIENCE-GOSSIP for June. Briefly summed up, the conclusions reached are the following: In the higher levels little or no change has been made in the physical features, which are essentially the same to-day as they were when they received their Celtic descriptive names. In the lower level some changes have occurred since that time—a change affecting the surface merely; waters have decreased, the courses of streams have been prolonged, bog, morass, shallow lake, and river-channel have become dry and firm land. Such are the changes which the old names of places indicate.

ANCIENT SEA BEACHES.—At the meeting of the Geological Society, a paper "On the Occurrence of Marine Shells of existing Species at different heights above the present level of the Sea," was read by J. Gwyn Jeffreys, LL.D., F.R.S. This paper resulted from the author's examination of the Mollusca procured during the expeditions of H.M.SS. "Lightning" and "Porcupine" in the North Atlantic. He stated that he found several species of shells living only at depths of not less than between 9000 and 10,000 feet, which species occurred in a fossil state in Calabria and Sicily at heights of more than 2000 feet, such depths and heights together exceeding the height of Mount Etna above the present level of the Mediterranean. He then gave an account of the Post-Tertiary deposits in Europe, Asia, and North America, to show their various heights, and especially of the raised beach on Moel Tryfaen in Caernarvonshire, which was from 1170 to 1350 feet high. Some of the shells in that deposit were boreal and did not now live in the adjacent sea. The author stated that no shells of a peculiarly northern character had been noticed in the west or south of England. He then questioned the permanence and even the antiquity of the present oceanic basins, from a consideration not only of the fauna which now inhabits the greatest depth, but also of the extent of oscillation which had prevailed everywhere since the Tertiary period. A complete list of the Moel-Tryfaen fossils was given to the number of sixty, besides three distinct varieties, of which number eleven were arctic or northern and the rest live in Caernarvon Bay. All of these fossils were more or less fragmentary.

THE GEOLOGY OF IDAHO AND WYOMING.—Through the kindness of Dr. Hayden, chief geologist, we have received the Report of the Survey of the Territories for 1877, in which the above places are included. It is a large volume, crowded with evidences of good work, and well illustrated with numerous plates, in many of which we get, very happily and graphically combined, the leading features of an extensive landscape, and the outcrop of the different rocks underlying it. The illustrations of new species of fossils are beautifully executed. Among the contributors of the present volume are Professor Hayden, Professor Endlick, Dr. C. A. White, Mr. O. St. John, Dr. A. C. Peale, &c. The generous manner with which the United States Government send out these acceptable volumes contrasts painfully in our mind with the miserable niggardliness of our own Stationery Office. Great Britain cannot afford it!

FOSSIL INSECTS.—In his report of the "Geological Survey of the Territories of Idaho and Wyoming," just published, Dr. Hayden says: "There is every reason to believe the Tertiary strata of the rocky mountain region are richer in remains of fossil insects than any other country in the world, and that within a few months the material at hand for the elaboration of the work on fossil insects which Mr. Scudder has in preparation for the survey, will be much larger than was ever before subject to the investigation of a single naturalist."

FOSSIL MAMMALIA.—In the valley of the Maun there is a deposit of surface gravel from which I have obtained a number of teeth and bones, the latter, except in two instances, in rolled fragments. I suppose the gravel to have originally formed part of the bed of the river whose stream once filled the whole of the narrow valley, but is now confined to a small channel near its centre. The gravel is used for road mending; it was by turning over the pebbles of one of the roadside heaps some two or three years ago, that I found the first fragment of bone, and a few days after, by careful search, two teeth; since then I have obtained from the workmen a number of specimens. I believe I have among others, *Bos primigenius* and *Equus plicidens*, but in the country, far away from any museum, it is not easy to identify species; a friend who took the teeth for me to the British Museum did not find the custodians of our national treasures so communicative as might have reasonably been expected. I shall be pleased to send the teeth and bones and present specimens to any reader of SCIENCE-GOSSIP well up in identifying teeth of the various species of Bos, Cervus, &c.—*W. Gain, Tuxford, Notts.*

NOTES AND QUERIES.

THE ELEPHANT BEETLE.—Can any reader of SCIENCE-GOSSIP give me any information concerning the above-mentioned beetle, *genus* Scarabæus? I have heard of two specimens, both of which were seen in Scotland.—*E. F. Sargeant.*

BOTANISTS' PORTABLE COLLECTING PRESS.—With respect to J. R. M.'s query about the above press, I can say from personal experience that it is of very great service, enabling the specimen to be at once pressed, thus saving much time, particularly with mosses which perish so quickly. I can cordially recommend it to every one interested in Botany. —*M. Ridley.*

PLACES FOR EXCURSIONS.—Could you inform me of any places, easily accessible from Winchester, in the direction of Surrey, out of Hampshire, whither a society could go for a day's excursion? It would be well if all the various branches of natural history and geology could be met with, but, failing that, a good botanical and entomological spot would be necessary. It must not be more than two and a quarter hours or so by rail.—*Wm. Coll.*

EARLY FLOWERS.—Seeing a notice in a late number of early flowers this spring, it may not be uninteresting to some of your readers that I found two specimens of the cowslip in full flower between Hursley and Winchester on March 14.—*Wm. Coll.*

FISH IN AQUARIA.—With regard to keeping fish in aquaria, I think your correspondent would not find much difficulty with minnows. I have a very small aquarium, consisting only of a glass propagator turned upside down, and set on a wooden stand; but I have kept minnows in it for the allotted length of their lives, viz., three years. It is necessary to be careful about two things. (1.) The balance of life. Fishes breathe oxygen, and expel carbonic acid; plants absorb oxygen as animals do, but they also absorb carbonic acid, and from the carbonic acid they remove the pure carbon, converting it into vegetable tissue, which gives out free oxygen. So that plants exhale more oxygen than they absorb, which makes the deficiency required for the fishes. If the balance of animal and vegetable life be properly attended to, the plants and fishes will be healthy, and the water so clear that it need never be changed. The fish must not be over-crowded; one small fish to a gallon of water is a safe average. (2.) The feeding of fishes. I feed my fishes with worms cut in small pieces, which they eat greedily and thrive upon. When worms are scarce I use oatmeal, but it is not so successful. I have heard that raw meat answers the same purpose. Care must be taken that no more food is put into the aquarium than the fish will consume, as it soon putrifies and poisons the water. The fish need only be fed twice a week. I have tried to keep minnows, eels, and dace; the minnows and eels were successful, but the dace being a delicate fish soon died. Of course the eels were very small.—*C. E. Michelson.*

MARINE AQUARIUM.—Those who have or are about to construct a marine aquarium, will be glad to hear that the Great Eastern Railway Company will supply pure sea water from Lowestoft in three gallon cans at sixpence per three gallons, free to any station on their line. Orders can be sent to Liverpool Street station or any station-master on the line.—*John H. Webb.*

WEATHER FOLK-LORE.—The fact that May has been dry, and June wet this year, affords no ground for the presumption that the weather during the ensuing months will be seasonable. If easterly and north-easterly winds prevail throughout the month of May, on their giving place to the south-westerly winds of June, there are generally heavy showers. On the average of many years however, the rainfall during the two months is very nearly equal. As a rule, little dependence need be placed upon old facts about the weather. Some of them are mere rhyming descriptions of natural prognostics, as

"Evening red and morning grey,
Are certain signs of a fair day."

"Mackerel scales and grey mares' tails,
Make lofty ships to carry low sails."

But those especially which base their predictions upon the state of the weather on certain days, weeks, or months, are little to be relied on.—*J. A. B. Oliver.*

CARNATION GRASS.—F. H. Arnold in the present number of SCIENCE-GOSSIP asks what species of Carex is called "Carnation Grass." If he refers to "Treasury of Botany," under head of "Grass" he will find Carnation grass is *Carex glauca*; and others, "*Carex glauca*, Scop., glaucous heath carex" (*C. recurva*, Huds. S. M. E. B.).—*T. B. W., Brighton.*

CARNATION GRASS.—I have to thank several correspondents for information as to this term. One kindly tells me that *Carex panicea*, "the pink-leaved grass, in the older works on Botany, is known by the name of carnation grass in West Sussex." Another suggests that the plant in question is either *C. panicea* or *C. glauca*, abounding often in the ova of the Distoma which occasions the fluke in sheep. The latter, which is one of the most common of our sedges in marshy ground, is perhaps the more probable, and Smith speaks of its leaves truly as "much resembling the foliage of pinks and carnations."—*F. H. A.*

CONFERVOID GROWTH IN AQUARIA.—H. will doubtless find some assistance by reading M. W. Alford Lloyd's paper on "Gold-fish," printed in the "Animal World" for April, 1880.—*W. W. King.*

HAWTHORN BLOOM.—In the part of Cumberland in which I reside—the central part of the county, there is this year, which is very unusually the case, an entire absence of the bloom of the hawthorn. In this neighbourhood the hedges are composed almost entirely of hawthorn; and generally you may trace them with the eye for long distances, running along the sides of the roads or across the fields, looking as white as if covered with a sheet. This season, it is not only that the blossoms are sparse, but there is an entire absence of them. Has any reader of SCIENCE-GOSSIP observed this in any places? Has it been occasioned by the young shoots not having been sufficiently ripened during the ungenial season of last year, or is it the effect of the long-continued low temperature of the present spring? "Many haws, many snows," says the proverb; and if so, then, per contra, we shall not see a single flake during the coming winter.—*R. W.*

THE PRESERVATION OF CRUSTACEA.—I should like to add the following note on the above subject: It is most important that all specimens should be well washed in fresh water before being left to dry, as the salt often forms a white crust upon them, spoiling their appearance.—*L. E. Adams.*

COLOURS OF GALLS.—I should much like to know from whence are derived the beautiful colours of the cherry-gall and oak-apple. That the rose bedeguar should be adorned with scarlet and green is, I suppose, a fact easily accounted for, inasmuch as these colours, had they not been diverted from their proper course, would have been displayed in the petals and leaves. But that many of the galls which infest the oak, whose leaves are simple green and flowers colourless, should be so brilliantly coloured, is to me a curious puzzle. —*A. M. P.*

PLOVER'S EGG.—I have added to my collection this last month, an egg of the common plover or lapwing (*Vanellus cristatus*), the ground colour of which is white, sparingly dotted with small spots of black. Brown in any shade is entirely absent. The egg was quite fresh when blown. Have any of your oologist readers met with similar varieties?—*C. D. Wolstenholme.*

MOTHS.—Can any of your correspondents inform me what moth it is, the female of which answers to this description? "Upper wings pale yellowish-brown, with chains of brick-red spots; length from tip to tip 2 inches and about 3 lines. Lower wings very pale brown, clearly veined; antennæ plain; about $\frac{1}{8}$ inch in length." I caught it depositing white globular eggs on a nasturtium. I have looked in several museums and many entomological works, but I find no reference to it.—*H. C. Brooke.*

Blue Pimpernel.—Will some correspondent kindly tell me in what localities the blue pimpernel is to be met with.—*A. M. P.*

Woodcocks Nesting in Cumberland.—A few years ago the nest of a woodcock was a great rarity in Cumberland, now it is of frequent occurrence. Last year a pair of these birds had a nest in my parish; this year the number is doubled; and two nests are also said to have been found in the woods at Edenhall, belonging to Sir P. Musgrave. In mild evenings some of the old birds, males I presume, may frequently be seen disporting themselves in the manner described by Kingsley, and for which he was accused by your correspondent T. A. B. in the March number of Science-Gossip as making a gross blunder, and mistaking the fern-owl for a woodcock. Kingsley, however, is quite right. The term "hawking" may have been misapplied, as the bird is certainly not capturing prey; but there is no doubt that woodcocks do thus disport themselves, flying to and fro, tumbling about as some describe the action. It seems to be a habit connected with the breeding season. Your readers may have seen the snipe at that season ascend high in the air, making a piping noise of two notes, and descending with a loud boom. The woodcock does not rise much above the tops of the adjoining trees, its note is very different from that of the snipe. Some naturalists call this note a gurgling or chuckling sound. An observant neighbour of mine, who has had frequent opportunities both of seeing and hearing the bird, assures me that this note very much resembles that of a swallow. I have not heard it myself.—*R. W. Westward.*

Woodcocks versus Goat-suckers.—Your correspondent W. C., p. 118, is quite correct: woodcocks do playfully fly about on a calm evening at about the same hour when the goat-sucker becomes visible. For a long time I imagined they were the latter bird only, and stoutly maintained this in argument with a gamekeeper, who declared woodcocks were to be found in our neighbourhood: at length I proved his words correct, exactly as described by Canon Kingsley. I have repeatedly proved there is no time so favourable for the study of Ornithology as the evenings of spring and early summer; country-life is then at its best, and, as the Canon often remarked, full of joy and delight. The cuckoo was two days behind its usual time this year. I am also glad to announce more young thrushes than I have ever known before in Cheshire.—*R.*

White Leveret.—A purely white leveret has been recently taken in a wood near York, and is now in the hands of Mr. J. Young of this city for preservation. Such a specimen I should imagine is of very rare occurrence.—*C. D. Wolstenholme.*

Male Birds Building Nests (?)—Could any readers of this paper inform me if it is a common occurrence for the crimson-beaked weaver bird to build a nest without a mate in an aviary? The bird is a cock.—*C. C. Walker.*

Metropolitan Societies, &c., their Meetings.—Mr. Dannatt (Hon. Sec., Greenwich Microscopical Society) in your May number calls attention to "the fact that in the course of the winter months, we were sometimes invited to exhibit at three or four soirées in about as many weeks and then hear of no more throughout the season," and as a remedy he suggests that the arrangements, &c., of the Metropolitan Microscopical and Natural History Societies should be annually printed in your magazine, so that each society might see the fixtures of the others. For my own part, I consider that the interchange of annual reports is quite sufficient to this end without taking up the valuable space of your paper on programmes of arrangements. It may be argued that the dates of soirées do not appear in the majority of annual reports, but for the very reason that they do not appear therein they could not appear in Science-Gossip, viz., because they were not fixed at so early a date as the Annual General Meeting. By far the better plan would be to print a list of the Microscopical and Natural History Societies in the metropolis, say in your January number (as Mr. Dannatt suggests), with the names and addresses of their respective secretaries, so that each might correspond with the other and have the earliest information of forthcoming events; this would also be a means of bringing each society more into contact with the other. Every one must agree that soirées do come all together as a rule, and it seems possible that it results from a want of knowledge between the societies of each other's doings.—*Fred. Stewart, Hon. Sec., New Cross Microscopical and Natural History Society.*

Noise made by Water Snails.—In a recent number of Science-Gossip (page 118) is a note by Mrs. S. Brentford, on the above subject. If the "drip" there described is what is referred to by C. J. P., Weymouth, it is I think probably caused by *L. stagnalis*, for they are in the habit of floating on the surface with the shell downwards, and when in that position may be observed taking in air; this generally produces a small air bubble, the bursting of which causes the "drip" mentioned by Mrs. S., and is the only sound I have ever heard from any of the Mollusca in my tanks.—*Chas. Foran, Eastbourne.*

Vipers swallowing their Young.—In reply to the suggestion in your April number, I write the following particulars, as I can positively assert that the young vipers take refuge within their parents. More than forty years ago, I was walking with my brother, and our way lay through a hedge-row, on approaching which he remarked he had once or twice seen a viper in the path, and suggested we should provide ourselves with sticks. We had not proceeded far when we came upon a pair of vipers, probably male and female, and we distinctly saw a young one go into the mouth of an old one, and one small one still remained on the ground. The old vipers were so incapable of quick retreat from their great size, that we killed them without difficulty. As we had often heard the story of the peculiar manner by which vipers protected their young, we determined to prove the fact, and having taken them to an open space we opened them, and there came out about twenty little black wriggling creatures about the size of large earthworms. Within a few days, I have had an opportunity of asking my brother if he remembered the circumstance; he said he had a perfect recollection of it, and that he had frequently related it, and he reminded me that when we killed the old vipers one of them had a little one hanging out of its mouth. The old reptiles sacrificed their lives in the effort to preserve their young; they would have had ample time for escape, but the delay in waiting for so many young ones to get down their throats proved fatal.—*R. H.*

Wood Pigeons and Rooks.—Much has been said and written regarding the destructiveness of both wood pigeons and rooks. An association was formed in Fife a few years ago for the purpose of diminishing the number of wood pigeons, if not of entirely extirpating them. For a time the efforts of the members of the association were instrumental in killing many birds, and destroying eggs, premiums for such work being given. But still the "coo o' the cushat" is heard at every step in our woodlands, and their number is not much reduced, even under the influence of the last wet summer and cold winter. A farmer informs me that he shot a number of wood pigeons and rooks lately, and in the crop of one of the former he found 378 grains of barley, besides small stones, and a quantity of vegetable matter, and in that of the latter an enormous number of grubs and the larvæ of insects. Not one word can be spoken in favour of wood pigeons, which are destructive in devouring cereal grains, turnip seeds, turnip tops and bulbs, young clover plants, &c., but the rook—the often badly used rook—has much claim on our sympathies. He preserves our crops by devouring such pests as feed upon them, and certainly he ought to be allowed a trifling reward for his good services by our bearing with him a little when he compels us to pay tithes in the shape of potatoes and corn at certain seasons.—*A. F.*

Rook or Raven.—During the severe weather of last February, I found upon a snow drift what I took to be a fine specimen of the common rook (*Corvus frugilegus*), apparently recently killed by hunger and cold. It was not above twenty yards from a large rookery. On taking it to a bird preserver to be stuffed, he immediately pronounced it to be a raven (*C. Corax*). As I wish to be quite certain, I should be much obliged if any of your readers could furnish me with the distinguishing characteristics of the two birds. The stuffed specimen measures twenty inches from the tip of the tail to the beak. The beak itself is 2½ inches long. The plumage is a beautiful glossy blue-black colour.—*J. A. Wheldon.*

Instinct or Reason?—At the menagerie in the public gardens here, is a young orang-outang; it was born three months ago in Calcutta, and until yesterday morning it certainly never climbed into a tree. It had not been in the tree a quarter of an hour before it began to construct, and has completed, a nest for itself, a sort of platform of broken branches laid one upon another. On this platform it sits, and seems perfectly happy.—*Arthur Hough, Bombay.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

To Anonymous Querists.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

Asplenium Sinelii.—Unfortunately the specimen of this fern intended for illustration was mislaid; we purpose giving a woodcut shortly, with other explanatory matter.

Dr. Green.—The leaf of the cabbage is very interesting, vide, page 22, "Vegetable Teratology." It is formed by the cohesion of margin, and is found in many species. There are several lime-trees with leaves thus cohering in the cemetery of a Cistercian monastery near Seidlitz, on which it is stated certain monks were once hanged, hence the legend has arisen that the peculiar form of the leaf was given in order to perpetuate the memory of the martyred monks; however, we have never before seen the cabbage leaf thus pitcher-shaped.

Salix.—The specimens are 1, *Avena pubescens*; 2, *Fumaria officinalis* (L.); 3, *Salix lanceolata* (Sm.?) The latter is doubtful, but judging from the leaves, there is but little doubt about the species.

F. A. D. (Winchester).—1, *Carex sylvatica*; 2, *Luzula congesta* (Sm.); 3, *Carex Œderi*. We did not find any specimen of *C. binervis*, as suggested in your letter; would you kindly send on another example?

M. K. (Edinburgh).—Thanks for the abnormal pelargonium you sent us some little while ago, with leaves arising from the umbels; a very similar instance is given in Masters's "Vegetable Teratology," and is very frequent in large gardens, especially with the bicoloured group.

J. K. (London).—We believe it to be *C. tetrandrum*, although it is difficult to tell with certainty in its present form.

T. H. Buffham.—Your specimens of shells are as follows: No. 1, *Littorina rudis*; No. 2, young of *Littorina littorea*; No. 3, *Trochus cinerarius*.

R. Egerton.—To obtain full information as to cleaning shells, &c., see chapter in "Collecting and Preserving Natural History Objects," by Professor R. Tate, on "Mollusca." Price 3*s*. 6*d*.

G. W. Bell.—Get Dr. De Crespigny's "New London Flora," price 5*s*. London: D. Bogue.

J. K.—There is no doubt that one of your specimens is *Ulva bulbosa*; we sent the other to one of the most celebrated algologists, who declined to pass an opinion about its being *Chætophora elegans*.

H. C. Chadwick.—We have sent your drawing and letter to one of our best microscopists, who replies as follows: "The foram. (?) I think may be an imperfect or abnormal form of a Nodosaria, but I do not remember seeing it figured or described in any work to which I have access."

W. Duckworth.—The galls you sent us are the barnacle galls (*Cynips corticalis*), so called on account of their resemblance to the senile barnacles of our coasts.

Rev. S. Brennan.—The insect whose name you inquired about arrived in such a "smashed-up" condition that it was impossible to recognise anything, except that it might be an insect.

F. W. Challis.—White sparrows are by no means uncommon, but owing to their conspicuousness they are soon shot down.

C. E. Waddington.—Your fish parasite is *Argulus foliaceus*. See Taylor's "Half-hours in the Green Lanes," page 15, for portrait of the same.

E. F. B.—We are sorry to hear that our Exchange Column has been taken advantage of. If this is repeated we will publish the name and address of the defaulter.

W. Locock.—The malformation in your plantain is due to prolification of the inflorescence. See Masters's "Teratology," page 111, *et seq.* It is not uncommon.

W. Jacobs.—You may procure abundance of Pliocene (Red Crag) fossils at Walton-on-Naze. London clay fossils (Nautilus, &c.), are found at Clacton.

A. D. P. (Sunderland).—The insects appear to be a species of spring-tail (Podura), but they were too dried up and shrivelled to make out.

T. G. Lane.—We found nothing but a flocculency due to the precipitation of organic matter.

H. H.—Dr. M. C. Cooke's "Ponds and Ditches" (recently published at 2*s*. 6*d*.), would answer your purpose as to your first query; and Dr. Duncan's "Transformations of Insects" would serve for your second query. Price of latter, 18*s*.

T. B. Linley.—The late J. Clifton Ward's "Geology of the Northern Part of the Lake District," price 9*s*. London: Edward Stanford, from whom also maps of the districts may be obtained.

EXCHANGES.

Botanical Exchange Club.—Members of the above club are requested to send their parcels for exchange to No. 3 St. Martin's Place, Trafalgar Square, London, W.C., not later than the end of October.

Wanted, a clean complete copy of Lambard's "Perambulation of Kent;" micro slides or cash in exchange.—Geo. Clinch, Hayes, Kent.

Wanted, "Vestiges of the Natural History of Creation," "Ramsay's Ancient Glaciers of Wales." Apply to Harry Muller, Rawdon, near Leeds.

Wanted, an old razor (for section cutting); must be of the very finest possible quality of steel. Offer a rubber stamp, value 5*s*. or 6*s*. in exchange. Write before sending.—Walter White, Litcham, Swaffham.

Eggs of golden crested regulus, lesser redpole, red grouse, curlew, guillemot and razorbill for others.—R. Baxter, Prince of Wales Terrace, Glasgow.

Eggs of stock-dove, ring-dove, nightjar, kestrel, sparrowhawk, wild duck, flycatchers, wagtails, warblers, ring-ousel, field-fare, redwing and others, for eggs of other good birds.—R. Darling, Eyke Rectory, near Woodbridge, Suffolk.

Plant hairs, 12, 24, or 36 varieties, many very beautiful and rare, in exchange for microscopic slides.—M. Medhurst, 2A Dell Street, Hall Road, Liverpool.

"*Calamagrostis stricta*," for other rare plants or grasses, such as *C. epigeios* and Nos. 1519, 1513, 1550, 1551, 1552, 1553, 1554, 1555, 1566, 1507, 1479, 1480, 1482, 1483, 1484, 1485, 1487, 1496, 1497, 1499, 1501, 1504, 1505.—London Catalogue for 1877.

WANTED, vol. xi. of a 4to. Herbarium, or "Hortus Siccus," bound in parchment, formerly the property of Mr. Edward Wilson (who appears to have been on familiar terms with Professor Henslow in 1829); exchange or cash. Information respecting Mr. Wilson will be acceptable.—John N. Dufty, Grammar School, Tuxford.

WANTED, good specimens of local objects of Natural History in every department (animal, vegetable, mineral, and fossil), in exchange for other specimens, microscopic slides, scientific apparatus, books, or cash.—William Cash, 38 Elmfield Terrace, Halifax, Yorkshire.

WANTED, British Algæ in return for dried flowering plants.—Rev. F. H. Arnold, Emsworth.

WILL send four good slides of fossil fish remains, for two slides of tongue of drone fly, and two slides of the tongue of house fly, or blow fly.—John Simm, West Cramlington, Northumberland.

EIGHTY species of Scottish mosses, well-mounted, with scientific name, locality, &c.; for antiquities or recent scientific books.—A. M., 4 Brook Street, Stoke-upon-Trent.

WANTED, side-blown eggs of golden plover, curlew, sandpiper, ferns, sedge warbler, garden warbler, merlin hobby; will give micro-pathological slides of cancer, polypus, &c. (Human.)—H. B. Runnalls, St. Judge, Bodmin, Cornwall.

WILL exchange good mounted microscopic objects for $\frac{1}{4}$ or $\frac{1}{8}$ inch objective; will also give liberal exchange of mounted objects for unmounted microscopic material. Fragments of gorgonia, sponges, &c.—W. White, 7 Warden Place, York Street, Nottingham.

WANTED, SCIENCE-GOSSIP for 1872, 1873, and 1875; exchange in books, slides, or fossils. SCIENCE-GOSSIP unbound for 1879 offered in exchange for ground-edged slips.—E. Edwards, 8 St. John's Cottages, Penge, S.E.

WILL exchange copper and silver coins, and rubbings of monumental brasses, for well-mounted slides of diatoms, foraminifera, or any other objects of interest.—J. Boggust, jun., 1 Rock Cottages, Alton, Hants.

GOOD specimens of *Limnæa Burnetti*, from Loch Skene (Dumfries); *Vertigo alpestris*, from Pattersdale (Westmoreland), offered for *Vertigo minutissima*, *V. pusilla* and *V. angustior*, *Testacella haliotoidea*, *Geomalacus maculosus*, or *Vertigo substriata*.—W. Sutton, Upper Claremont, Newcastle-on-Tyne.

SIDE-BLOWN eggs of lesser black-backed gull, black-headed gull, sedge warbler, redshank, little grebe, moorhen, common tern, and others, in exchange for other single-holed specimens not in collection.—C. F. Bell, 11 James Terrace, Tait Street, Carlisle.

MEMBERS wanted to join a "Botanical Evercirculator."—J. Wooller, 10 Farm Road, Hove, Brighton.

MOUNTED or unmounted slides of *Uredo segetum*, *Uredo caricis*, also *Lolium temulentum*; will exchange mounted slides of the alkaloids, also slides to illustrate the adulteration of foods.—A. Smith, the Laboratory, Essex Road, Islington.

WANTED, a good clean copy of Berkeley's "British Mosses," and any other work on Bryology; state date when published, with lowest cash price.—J. R. Murdock, 40 Leighton Lane, Leeds.

GOOD side-blown eggs of the following birds (in exchange for other eggs, or for lepidoptera, desiderata numerous); sandwich, common and Arctic terns, cormorant, eider-duck, and lesser black-backed gull.—John J. Walker, 21 Holly Avenue, Newcastle-upon-Tyne.

A COLLECTION of upwards of 200 different species of British lepidoptera (many rare), 130 different British birds' eggs (many rare), and a few Natural History books; open to offers, list sent.—A. Smith, 8 South Mount, Aberdeen.

WANTED, Lindsay's "Popular History of British Lichens," or Cooke's "Myxomycetes of Great Britain," for either herbarium of 100 species of British mosses or herbarium of 120 uncommon species of British flowering plants.—X., 14 Sherborne Road, Bradford.

ONE dozen *Drosera rotundifolia* in good condition for observations, carefully packed, post free for one mounted slide (preferably Acaræ).—J. H. Wilson, 6 West Park, Harrogate.

VOLUMES 1 to 5 Hardwicke's SCIENCE-GOSSIP, and "British Hepaticæ," both complete; offers solicited.—Charles Aubrey Day, 95 Navarino Road, Dalston, E.

WANTED, with fruit *Pottia crinita*, *Hookeria lesterrens*, *Didymodon flexifolius*, *Glyphomitrium Daviesii*, *Daltonia splachnoides*, *Hypnum micans*, and *Hypnum demissum*, also any foreign species of Orobanche and Chara; exchange rare fern fronds, &c.—Miss Ridley, Moy Laggan Lodge, Kingussie, N.B.

Unio tumidus var. ovalis offered for foreign shells, for Dudley corals, or for fossil fern leaves contained in nodules; many other rare British shells in duplicate offered, also Rhaetic fossils.—Miss Fanny Kele, Elmgrove Road (Fairlight), Cotham, Bristol.

WANTED to purchase, a small wooden press, suitable for pressing plants for the herbarium.—R. B. Lindsay, 1 St. Ann's Terrace, Stamford Hill, N.

WANTED, Babington, Hooker, or Bentham's "Flora," of recent issue, Gabriel and Haughton's "Theoretical Mechanics," Smith's "Latin Principia," Part II., G. L. Bennett's "Second Latin Writer," and Todhunter's "Spherical Trigonometry." Cash.—Webb, 13 Padeham Road, Burnley.

WANTED, pretty mosses for ornamental purposes. *Crista castorensis*, *filicinum*, *tamariscinum*, *splendens*, &c.; good exchange or cash.—J. Baker, Speakland Cottages, Edge Hill, Liverpool.

FOR "Field Naturalist's Handbook" (Wood), a splendidly mounted slide of Indian wood moralee, if the book is in good condition.—W. Ernest Milner, 47 Park Road, Haverstock Hill, N.W.

SPICULES Fijian gorgonia, plates of *Primnoa australis*, Santonine (all fine polarising), and spicules *J. latronis*, offered for well-mounted parasites, or other insect preparations, or for picked diatoms. Pleurosigmas especially wanted. Stage-forceps for exchange.—E. Clover, Springfield, Sudbury, Suffolk.

SUPERIOR binocular microscope with quantity of apparatus, and $\frac{1}{4}$, $\frac{1}{12}$, $\frac{1}{16}$ objectives, by Powell and Lealand. Exchange astronomical telescope, £30 to value.—S., 364 Kennington Road, S.E.

SUPERIOR mahogany cabinet suitable for moth, butterflies, &c., 13 drawers, 8×5, cost £3 10s.; exchange injected objects.—S., 364, Kennington Road, S.E.

SUPERIOR anatomical and pathological sections, stained and ready for mounting, in exchange for mounted slides, insects preferred.—H. Vial, Crediton, Devon.

I HAVE a few specimens of *Anemone Pulsatilla*, which I shall be happy to distribute among persons wanting the species. Send name and address, and return postage to J. W. Carr, 28 Emery Street, Cambridge.

WANTED, a good telescope; will give in exchange SCIENCE-GOSSIP, from September, 1873, to present month, unbound, capital condition.—G. S., Elm Grove, Ealing, W.

COUCH'S "British Fishes," 1st edition, 4 vols. perfect, for good egg cabinet.—E. E. Evans, Brinscombe, Gloucestershire.

FOR *Orchis incarnata*, write F. S. Cook, Icklesham, Rye, Sussex.

FOSTER'S "Text-Book of Physiology" (quite new), for Balfour's "Comparative Embryology," vol. i., or Rolleston's "Forms of Animal Life."—Arthur Marshall, 35 Connaught Square, London, W.

FRESH collected examples of *Melanippe hastata*, Russula (and eggs of Russula), Paphia, and Adippe, offered in exchange for British birds' eggs; send list of duplicates.—G. Garrett, Harland House, Wherstead Road, Ipswich.

BOOKS, ETC., RECEIVED.

"Geography, Physical, Historical, and Descriptive." By Keith Johnston. London: Edward Stanford.

"Freshwater Rhizopods of North America." By Dr. Leidy. Washington, United States Government.

"The British Moss-Flora." By R. Braithwaite, M.D., F.L.S., &c. Family II., "Buxbaumiaceæ," and Family III., "Georgiaceæ."

"Le Monde de la Science," &c. July.

"Scottish Naturalist." July.

"Midland Naturalist." July.

"Journal of Conchology."

Thos. D. Russell's "Natural History Circular."

Brook's "Popular Botany."

Report of the "Chichester and West Sussex Natural History and Microscopical Society."

"British Dogs." Parts XII. "Bazaar" Office, 170 Strand.

"Fancy Pigeons." Parts III. By J. C. Lyell. Ditto.

"The Practical Fisherman." Part VII. Ditto.

"Transactions of the Watford Natural History Society and Hertfordshire Field Club." June.

"American Naturalist." July.

"The American Journal of Microscopy." June.

"Good Health." June.

"American Entomologist." June.

Bulletin of the "Essex Institute."

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—R. W. C.—A. P.—W. G.—W. W.—H. M.—E. W.—J. K.—S. A. B.—G. C.—R. D.—W. R. B.—E. E.—Dr. J. F.—F. L.—T. H. B.—J. A.—H. J. W.—A. J. T.—W. L.—F. J. G.—F. H. H.—H. P.—W. W.—H. V. B.—W. P.—H. W.—R. E.—G. W. B.—F. H. A.—W. D.—F. H.—W. C.—E. C.—A. C. A. B.—H. E. W.—W. H. S.—M. E. O. J.—J. F.—A. M. McA.—H. B. R.—J. T.—C. E. N.—S. D.—J. H. W.—C. A. D.—J. E. K.—M. N.—J. N. D.—F. W. C.—J. H. W.—W. W.—R. H.—T. J. L.—M. M.—J. D. W.—W. M. W.—J. R. M.—E. M.—A. S.—J. W.—W. J. C.—J. A. B. O.—W. W.—R. B. L.—C. F. Y.—E. C.—T. B. L.—E. E.—P. K.—S. E. P.—H. H.—L. E. A.—W. G. T.—J. B.—W. D. S.—G. W. C.—W. J.—W. W. K.—E. F. B.—R. W.—W. H.—J. B.—T. B. W.—J. D. H.—W. H.—P. S.—H. V.—W. H.—J. W. C.—G. W.—G. S.—T. G.—E. B. P.—E. E. E.—F. S. C.—J. S.—&c.

FOREST NOTES IN SAFFRAGAM, CEYLON.

To lovers of nature, Ceylon presents a fine field of inquiry in more than one branch, for well known as the island is, still but few have had sufficient interest in it to devote their attention to matters of a scientific character, connected with the island. This is a matter for regret, for it cannot be said that any part of Ceylon is out of the reach of the naturalist, for the country abounds in roads, and possesses no tribes likely to resist the efforts of any who wish to collect specimens for public, or private, collections. Ceylon has also a museum of its own, which could easily be made the centre of scientific investigation, did the country possess a few more endowed with a desire to study the rich fields of nature, open to all. There is, however, a further stimulus wanting, and that is a magazine or journal, in the pages of which many valuable essays might be produced, thus placing on record the observations of its correspondents, instead of leaving their labours to be wasted and forgotten.

Much as is known of Ceylon, still we cannot so much as boast of a geological survey of the island. Geologists have at times visited the country, but have made no systematic exploration; and so far as the public are interested, they have kept to themselves everything out of the common that they may have discovered. Of the botany of Ceylon, we are considerably unenlightened, and I know of no handbook on the subject, except a work by Dr. Thwaites ("Enumeratio Plantarum Ceylanicæ"), which though valuable, is insufficient in detail.

The fauna of the country has been treated by various writers, but still we have no connected work embracing it as a whole, unless in the scanty pages of Dr. Kelaart's "Prodromus Faunæ Ceylanicæ,"—a work published in 1852, and now, I believe, out of print. From time to time, various works have appeared on Ceylon ornithology, and perhaps in this particular branch the country has been well treated, by such well-known and erudite writers as Layard, Blyth, Holdsworth, and Legge, the latter having produced a most valuable work, the result of careful and indefatigable labour, on this most beautiful subject. Still, however, there is room for more, as there are many subjects about which but little is as yet known. But few of the coffee planters care to devote their spare time to nature, while perhaps, if they had an opportunity of recording their remarks in some magazine devoted to nature, and published in the country, many a buried observation might be brought to light.

In this paper, I shall only venture to bring forward a few of my notes, so as not to press upon your valuable space too heavily, while I trust my remarks may attract the attention of those who are more competent to write than I am; and I hope that by "breaking the ice," so to speak, that the pages of SCIENCE-GOSSIP may receive contributions from more able hands than my own, and on subjects that will be greedily perused by those far away in merry, but scientific, England.

As will be seen by the heading of this paper, I treat, or wish to treat, merely on "Forest Notes," and such notes as could be gathered in half an hour's stroll, and those confined to the district of Saffragam, or more correctly Sabaragámùa, to use the native name. The district, or country as it might be called in England, better known as Sabaragámùa north, is one that has come under the eye of a geologist, Dr. Gygax by name, who considered that it presented a striking likeness to the volcanic locality of the Azores. Much of the country has been "*chenaed*," or cultivated and abandoned, by natives, who are still scattered about throughout the district, owning here and there a field of paddy (rice), or occasionally a "shuck" coffee garden, which possesses divers articles of Singalese domestic economy, such as the cocoa-nut palm, the "Jaggery" or "Kitool" palm, from which is extracted a spirituous liquor known as "*Thedja*" or "Thellidja," or Toddy, and also "Jaggery," or native sugar (Sing. *Hakooroo*), the Arica-nut palm, and perhaps an occasional "Tallipot" (*Corypha umbraculifera*, Linn.) palm, all of which are allowed to grow as nature dictates, there being little or no attention paid to them when once above the ground. On rice, however, the Singalese bestow vast pains, as their fields are made of level terraces, one above another, cut out across the hills or valleys in which they are situated. The beauty of a large "paddy" field when young is almost past description, and can scarcely be forgotten by any who admire the picturesque and wild beauty of the East.

The forests teem with wonders of both the animal as well as the vegetable kingdoms, though to the unpractised eye there is a seeming monotony that is oppressive. However, there is much of the "Mahomet and the mountain" system, even in the wildest parts of the country, for unless the naturalist is prepared to go and search for Nature's wonders himself, he will never find them knocking at his door, and requesting inspection.

The first thing that would strike a naturalist on entering a Ceylon forest, would be the variety of vegetable forms and animal sounds that everywhere crowd upon his eye and ear, yet, strange as it may seem, there are but few scented flowers or singing birds.

Occasionally we come upon a stately banyan (*Ficus Indica*) whose gigantic arms are upheld by roots that have fallen from them, like huge crutches placed to support these emblems of age and strength; while among the smaller shoots and branches, creep and hop numbers of small birds, particularly barbets (*Megalaima flavifrons* and *Xantholæma rubricapilla*) and lorikeets (*Loriculus Indicus*). Now and again we may see the bright red woodpecker alight for a moment upon the mighty tree, but unless he finds something worthy of his attention, he shapes his course in the direction of more fertile shades. Now our attention may be drawn towards a bird, whose activity and power of searching for food, in almost any conceivable attitude, is only equalled by his rodent rival, the brown squirrel; I allude to the little blue nut-hatch, or *Dendrophila frontalis*, that is widely distributed over the hill country. These little birds are readily distinguished by their general colour of blue over the upper parts, and dusky brown below. The eyes are golden; bill coral red; and the feet, armed with very long and slender toes and claws, are coloured a horny brown. They may be found either in pairs, or in small flocks of eight and ten, when their lively and graceful motions cannot fail to attract attention and admiration. Our notice may next be claimed by the loud and disagreeable chattering of a species of thrush, known also by the name of the "swin brothers" or "dung-thrush," of which there are three varieties, but those under notice are, as a general rule, forest birds. The second species is very common about the outskirts of Colombo, and is, in fact, numerous over most parts of the low country.

The forest bird is much darker in plumage, and assumes a reddish tinge, while the "town bird" is ashy, and paler in all points. They are, however, both gregarious in their habits, and their diet seems to consist of fruits and insects, as well as worms, that they find under fallen leaves in damp localities.

Tree-ferns of great height and extreme beauty are to be found in damp and swampy places, where the sluggish waters supply their roots with the necessary moisture. Here and there may be found one taller than the rest, but all seem to partake of an equal grace, and wave their long fronds in the calm, soft breeze that plays among them. Should we choose to press further, we may chance to come upon a "joungle cock" (the *Gallus Stanleyi* of Gray), but unless the sportsman has a quick eye and an equal sympathy with his finger and gun-trigger, he will rarely claim a full-grown joungle fowl as the reward of his labours. Spur-fowl, or spur-partridge (*Galloperdix bicalcarata*), are also numerous, but shy, and it is only with great difficulty and patience that they can be obtained. A rough, grunt-like bark may draw our eyes in the direction of a solitary "Wanderoo" monkey (*Presbytes ursinus*), whose silvery beard may look as if its owner had seen the "threescore and ten" allotted to man; but his activity is unabated, and his vast leaps from tree to tree proclaim him to be a creature of no small power of limb. The small "red monkey" (*Macacus sinicus*, Linn.), or "Rilawar," so often seen in confinement, is to be met with in the Saffragam forests, but they are not very numerous in the higher parts of the district.

Let us now bend our way in the direction of some broad stream or "oya," and we shall probably find more to interest us. Here we may find trees bound together by the powerful "Weywal" canes that grow to some hundreds of feet in length, crowned by graceful clumps of feathery leaves, upon which are most powerful thorns—regular "infernal machines" of the vegetable kingdom. Further on, we may find a huge "Puswell" vine, large as a man's thigh, and growing in the most fantastic forms that nature alone delights in. Below, the wild ginger and numerous balsams drink in all the moisture that is spared to them, while in their bosoms there nestles the lovely orchid known as the "Wanna rahja," or king of the forest, known to botanists as the *Anæctochilus setaceus*. This beautiful orchid is by no means rare, though to those who do not know where it abounds they appear hard to obtain. While pausing over this woodland gem, a harsh, rasping note calls the naturalist to turn in the direction from which the sound proceeds. Suddenly a portly blue bird, with a red bill and rusty-red head, and long blue tail margined with white, flies across the open glade, and rests on some branch from whence he surveys his position, and is possibly succeeded by three or four more of his own species. After making a few crow-like hops from branch to branch, and giving vent to a variety of strange sounds, our visitor—the Ceylon blue jay (*Cissa ornata*)—retires with his companions to some more favourable locality, where his movements may not be so narrowly observed. He is no sooner away, than a low, goat-like call indicates the presence of a hornbill (*Tockus gingalensis*), whose deep, undulating flight need only be seen once to be remembered. As we move away down the stream, a flash of blue over a deep, dark pool, denotes the movement of the little blue kingfisher, who speeds away at the sight or sound of man.

In the water below are many crabs, some of large and others of small size; but there appears to be but little variety among them as to colour. Another look discloses a variety of life in, upon, and above the flowing waters: added to crabs, there are a few fresh-water crayfish, and a few members of the finny world, but nearly all small creatures, and scarcely worth fishing for if intended for food, except in large rivers, where some fair specimens may be obtained. On the water, beetles of various shapes and colours swim about in ever-changing evolutions, while a good-sized water-spider gives a change to the scene. Over all this may be found the powerful web of some spider, on whose body there seems to glisten

"Full many a gem of purest ray serene."

O'er our heads float many a brightly-coloured butterfly or beetle, while the darkest spots flash with the airy dances of the delicate dragon-flies as they flit past.

But let us close our day's ramble, for we find so many faces crowding upon one page of nature that we want a chapter to describe each, and this could not be done in a brief and rough sketch like that which I have endeavoured to draw, but which I trust may arouse the interest of naturalists who can do so much justice to a still open field.

F. L.

THE PARASITE OF THE WATER-BEETLE.

ONE hot day, at the end of August, last year, I noticed in a stream a large water-beetle (*Dytiscus marginalis*) being helplessly carried down by the current. Apparently it was dead. Not so, however; I secured it, and noticed how very weakly it seemed! And no wonder, for between the elytra and abdomen there were several large pear-shaped bodies, of a blood-red colour, firmly attached by the small end, which was hooked. I killed the insect (a male) for dissection, and detaching these objects, placed them in water. After some days their colour changed, and soon they took a greyish hue, when I knew they contained germs of vitality. I was aware that *Dytiscus marginalis* was often infested with a parasitic mite, but I had not met with an account of the creature. In a few weeks, large, curious-looking mites made their appearance, and I kept one alive in a glass of water for some months. It was round, of a blackish colour, with blotches of red; eight legs, and of course antennæ, protected by a hard covering. It was the liveliest little creature of its kind I had seen, and would spin through the water with a peculiar rapid motion. Occasionally it would remain suspended in the water for some time, then dart to one side and move in a circle, then perpendicularly, again diagonally, until all seemed combined to make up a most puzzling and untraceable series of motions. Sometimes, when thus engaged—and it used thus to be occupied for considerable periods without ceasing—it would suddenly gather its legs together, and sinking to the bottom, remain motionless as death. Presently one leg and then another would move, until gradually it had resumed as lively as ever its merry gyrations. When I had two, they were accustomed to fight most desperately.

The above observations are from my note-book, and may interest some readers. I have since, however, found that the parasite is *Achlysia dytisca*, mentioned in Cuvier's "Animal Kingdom," p. 471. The following is the passage (editorial):—

"From the very valuable discoveries lately made by M. Dugès, it appears that these water-mites [Hydrachnellæ] undergo metamorphoses, accompanied by a complete change of form, the larvæ having a very large head and six legs, whilst the pupæ are inactive, attaching themselves, by a single pair of legs, to the bodies of other aquatic insects, and consisting, as it were, simply of an oval bag with a narrow neck, the insect in this state having been formed, by M. V. Audouin, into the genus Achlysia, and specifically named *A. dytisci*, from taking up its residence beneath the elytra of the water-beetle (*Dytiscus marginalis*). They also attach themselves to the slender filaments composing the tails of the water-scorpions (*Nepa* and *Ranatra*)."

C. F. Y.

TEN DAYS IN THE NEW FOREST.

IN company with my two brothers and friend, I started for the Forest on the 14th July, last summer. The rain fell fast, and continued to do so more or less during the whole of our stay, consequently we did not meet with that success which we might otherwise have had, had the weather been more propitious; nevertheless, we captured a few decent insects and thoroughly enjoyed our visit.

Amongst the butterflies seen and taken, I may mention Ægon extremely abundant, Aglaia, Adippe, and Paphia equally so, and one of the beautiful dark variety—Valezina Sibylla—was this season very common, but most of them were by this time "past." One of the little boys of James Gulliver, of Brockenhurst, had the good fortune to secure a grand black variety of this insect, the white bands on all the wings being nearly obliterated. I must say it was well earned, as the youngster is a most indefatigable collector, possessing a genuine and ardent love for the study. Galathea was in prime beauty, some of my specimens being quite yellow. Auroraria and

Fig. 103.—Marbled White Butterfly. Upper side.

Fig. 104.—Marbled White Butterfly *(Melanagria Galathea).* Under side.

Fig. 105.—White Admiral *(Limenitis Sibylla).* Under side.

Meliloti turned up in good numbers. Quadra was just making its appearance as we left. Near the old Rifle Butts, on a common where the *Calluna vulgaris* grows profusely, we beat out of the heather a nice lot of Plumaria; but not one female amongst them: it is extraordinary how scarce it is. Obscurata was found frequenting an old sand-pit; it was hardly worth the trouble and annoyance caused in taking it; the wind being very high that morning, our eyes, noses, and mouths were filled with the blinding sand. The black form of this moth was much commoner than the light. In some marshy ground adjoining, *Drosera rotundifolia* luxuriated, with here and there large patches of the golden Asphodel, and the long plumes of *Eriophorum polystachyum*, with its cottony tufts waving in the breeze. The Myrica Gale sent forth a sweet odour when touched or trodden on. The pretty little *Anagallis tenella* quite filled up the

Fig. 106.—White Admiral *(Limenitis Sibylla).* Upper side.

Fig. 107.—Black variety of White Admiral. Upper side.

Fig. 108.—Black variety of White Admiral. Under side.

Fig 109.—Small Black Arches Moth *(Nola strigula).*

Fig. 110.—*Hyria Auroraria.*

pools by the roadside. Of course we did not neglect to "sugar," and thus obtained some fine *Oo*—a moth, we were told, which had not been taken there for three or four years. I was much amused at the remark of one of the working-men collectors, who said it was "getting fashionable again;" as in 1873 it was considered a "duffer," being so exceedingly common that dozens of specimens were sold for twopence or threepence each, since which time its price in the entomological market has been much increased. Turca, Nebulòsa, Blanda, Caliginosa, Pyramidea, and others of the "ignobile vulgus," were frequent visitors. One night we were thrown into a state of excitement; we were "sugaring" in Holland's Wood, and had just completed our operations when loud bellowings were heard, and one of the men from the village, who was sugaring in the same place, ran up in haste with the intelligence that we must look out for our safety, as we had intruded on the privacy of a bull and his cows, and that as soon as the bull had

Fig. 111.—*Lithosia quadra.* Male.

Fig. 112.—*Selidosema plumaria.* Male.

Fig. 113.—*Selidosema plumaria.* Female.

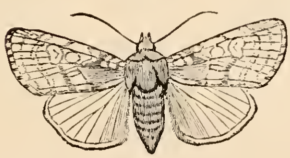

Fig. 114.—*Dicycla Oo.*

worked himself into the requisite amount of rage he would be sure to resent it; adding the pleasing information that only a week or two previously a policeman had been nearly killed by one, and that he and his father were "tree'd" for more than an hour. A council of war is accordingly held, and it is determined that the best thing to be done is to "take the bull by the horns," and *en masse* charge the rascal before he has time for an onslaught. Away therefore we go, with shouts so loud and shrill as to make the woods and nodding groves rebellow to the road, and we soon had the satisfaction of driving pigs, cows, bull, and all the "feræ naturæ," far into the Forest. Judge though of our horror and disgust when after all the bravery and heroism displayed, the bull turns out next morning to be a harmless steer! Possibly our kind informant had a desire to clear the woods of other animals than bulls!

I must not omit to mention that the somewhat rare little *Nola strigula* came to sugar freely.

And here I may just allude—one being in my possession—to the three Cicadas recently taken in the Forest, one by my friend Mr. Auld, who distinctly heard it stridulate; the other two by Mr. James Gulliver. All three of them are females, and in each instance their capture was effected from the loud noise they were making. This is conclusive evidence as to the power of stridulation on the part of the females of *Cicada Montana*.

"Et cantu querulæ rumpent arbusta cicadæ."

Chichester. JOSEPH ANDERSON, JUN.

OUR COMMON BRITISH FOSSILS, AND WHERE TO FIND THEM.

By J. E. TAYLOR, Ph.D., F.G.S., &c.

No. XII.

SPEAKING of British fossil corals—perhaps it would be impossible to direct the student to richer fossiliferous deposits than the lower carboniferous strata of Scotland. Mr. James Thomson, F.G.S., who has worked these deposits for corals

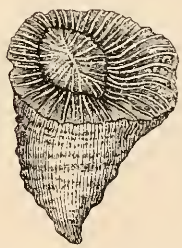

Fig. 115.—Fossil Coral (*Dibunophyllum*).

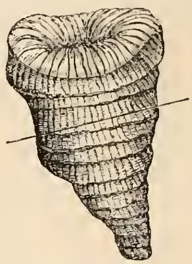

Fig. 116.—*Zaphrentis.*

more assiduously than any other geologist, is of opinion that their abundance in Scotland is due to the strata of the latter having been deposited in shallow water, whilst the English carboniferous or mountain limestone was laid down in deep water. But the great thickness of the limestone in Derbyshire (about five thousand feet) indicates a depression of the sea-floor all the time the beds were forming; for it would have had its mineral characters altered if

Fig 117.—Transverse section of *Zaphrentis.*

it had simply filled up an ocean basin to that depth. As we have already seen, a gradually lowered sea-bed has been proved by Darwin to be necessary to continuous coral growth.

Of all the carboniferous corals the genus *Zaphrentis* is one of the most widely distributed and generally abundant. It is usually found in a very perfect condition, and may often be seen in the walls in limestone countries, so weathered that it stands out in high relief. This coral is not only abundant wherever the carboniferous limestone occurs in Great Britain, but it is also distributed through the strata

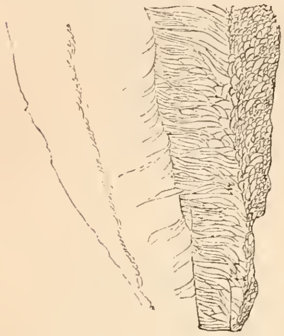

Fig 118.—Vertical section of Fossil Coral (*Koninckophyllum*).

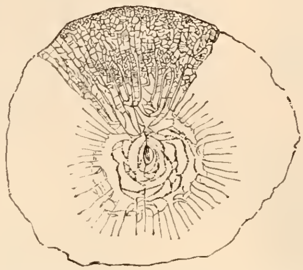

Fig. 119.—Transverse section of Fossil Coral (*Koninckophyllum*) in part showing cellular structure.

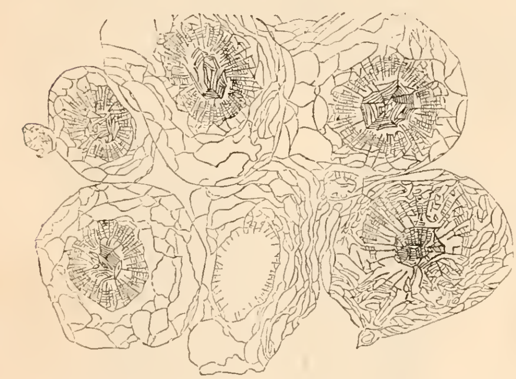

Fig 120.—Transverse section of *Lonsdalia rugosa*.

from the bottom to the top, although the smallest specimens are usually found in the upper beds, and the largest in the lower. The fact that it is plentifully found where *shale* bands occur shows that it affected shallow water, for shale is a muddy deposit.

The genus *Dibunophyllum* (Thomson) differs from Zaphrentis in the structure of its calycle or cup. This coral, as well as such other genera as *Rhodophyllum*, *Koninckophyllum*, *Aspidophyllum*, *Clisiophyllum*, *Histiophyllum*, *Cyclophyllum*, is found most abundantly in the lower strata of the Scottish carboniferous limestone system. Beith, in Ayrshire, and Dunbar, Haddingtonshire, are capital collecting grounds for all the above-mentioned fossil corals, and perhaps we may add that they are in a better state of preservation at Beith than anywhere else in the United Kingdom. *Aspidophyllum* occurs in abundance in the limestone of County Down, Ireland; and in the picturesque, terrace-like outcrops of the carboniferous limestone strata at Blackhead, County Clare, both this and several other genera of corals are plentiful. Speaking of Blackhead, induces us strongly to recommend it to the young naturalist, for its rare and beautiful plants and ferns, as well as for its numerous and varied assemblage of fossils, among which the masses of sponge spicula and Radiolarians are not the least interesting.

Lonsdalia (which obtained its name after the early geologist) is another abundant carboniferous coral. It is very common in the neighbourhood of Mold, and may be extracted from the walls by the roadside in wonderful perfection. The uppermost beds of the fine escarpment of limestone seen at Llangollen, in North Wales, also contain it in large quantities. There are many species of *Lonsdalia*, of which *rugosa* and *floriformis* are perhaps the most beautiful as well as the most abundant. Both show structure in the clearest manner, and thin sections of them, either transverse or horizontal, form exquisite low-power objects for the microscope. The following are among the British localities where different species of *Lonsdalia* may be obtained: Ecclefechan, Dumfriesshire, Boghead, Lesmahago, Clifton (near Bristol), almost every part of Derbyshire where the carboniferous limestone crops up, but particularly near Castleton, and in the Welsh localities above mentioned. At Boghead this fossil coral may be found in very large masses, all in a capital state of preservation.

A SKETCH OF THE GEOLOGY OF SWANSEA AND THE NEIGHBOURHOOD.

By Horace B. Woodward, F.G.S., of the Geological Survey of England and Wales.

[*Continued from page* 174.]

Triassic.

KEUPER. — The Dolomitic Conglomerate, formed chiefly of pebbles and boulders of Carboniferous Limestone in a magnesian matrix, appears in the neighbourhood of Kenfig and Newton Nottage. Between Gwar Coch and Dan y graig, near the latter village, it abuts against the Carboniferous Limestone without creeping up the combs, which generally appear to have been hollowed out after the Keuper period, and probably in much later times. Where it rests on the Coal-measures it contains occasional pebbles of sandstone. Here and there lime-kilns mark the places where the pebbles of the conglomerate have been burnt for lime.

Near Llantrissant and Llanhary are iron mines. Here horizontal beds of conglomerate and iron sandstone, resting upon the upturned edges of the Carboniferous Limestone, are worked for hæmatite. This also occurs in pockets of the limestone. At St. Hilary are old lead-workings, where the ore was formerly obtained from the conglomerate. At Hendre, north-east of Coyty, nearly forty feet of the conglomerate may be seen. Close by, at Byeston, it is interstratified with marl, and the same may be seen in a railway-cutting near Llanharan.

Red marls occur at Pyle, and in some places beds of magnesian limestone and sandstone occur; all these varieties form an interchangeable group, which evidently belongs to the Keuper division of the Trias.

Rhætic.—The Rhætic or Penarth beds extend as far westward as Pyle, where they have been described by Mr. Bristow. Here they comprise limestones, shales, and marls. At Gelligaredig they consist of brown sands, resting on the green and grey marls of the Keuper. In the outlier at Coed Mwstr, white lias limestones are developed, associated with greenish clay and conglomerate. At Stormy Down the white lias has been noticed, and beneath occur sandstones and marls with *Anatina præcursor*, *Avicula contorta*, and fish-remains. The white sandstones that are worked, near Bridgend, for building and grinding-stones, are regarded by Mr. Bristow as of Rhætic age.

Liassic.

Lower Lias.—The Lower Lias of Glamorganshire is well shown in the cliff sections between Sutton and Dunraven, with a thickness of about forty feet. At Sutton the beds constitute a white and tufaceous freestone, which has been largely quarried, and was used in the construction of Neath Abbey and Swansea Castle. Eastwards the beds become darker and contain fragments of chert derived from the Carboniferous Limestone. In places the beds become very conglomeratic, and De la Beche remarked on the difficulty of separating the Dolomitic from the Lias conglomerate. They contain *Gryphæa incurva*, *Ostrea liassica*, *Pecten pollux*, *Lima gigantea*, and large ammonites.

At Merthyr-mawr, Bonvilston, and other places, the Lias assumes a crystalline texture, so like the Carboniferous Limestone that it is difficult to separate them. The beds at Sutton were at one time claimed as Rhætic by Mr. E. B. Tawney,* but they have been shown by Mr. H. W. Bristow and Mr. C. Moore to belong to the Lias, with which they were originally classed by De la Beche.*

Post-Pliocene.

Glacial Drift.—But little attention has been paid to the deposits of Drift scattered over the southern parts of Wales, and I am not aware of any description of glacial beds in the immediate neighbourhood of Swansea, beyond that of some patches of boulder-clay found by Professor Prestwich on Cefn-y-bryn and in Rhos Sili Bay, in Gower.†

From Llandaff, by Cowbridge to Bridgend, and north-west of Pyle, the rocks are much obscured by boulder-clay, of irregular thickness. Often the soil gives indication of drift, when a quarry close by shows no trace of it. Thus in the railway-cuttings between Ystrad Owen and Cowbridge, Drift alone is seen in some places, and in others the Lias comes up to the surface. This Drift is a clay with boulders of grey sandstone, quartzose conglomerate, cherty sandstone, and quartzite; derived from the Old Red Sandstone, Millstone Grit, and perhaps Coal-measures. All these are local rocks; the Carboniferous Limestone is very rarely represented in the Drift.

Towards Welch St. Donats and Pendoylan the ground, hill and valley, is covered with Drift; sometimes this is sandy and contains subangular blocks of red sandstone and cherty rock, and sometimes the ground is very boggy. The Drift here corresponds in character with that seen in the neighbourhood of Tiverton in Devonshire. Mr. Bristow informed me that he and Professor Ramsay found Coal-measure sandstones with glacial striæ in the boulder-clay near Cardiff.‡

Caverns.—The Carboniferous Limestone of Gower is well known to contain a number of caves, fissures, and holes—some inland, most of them on the coast—nearly all of which have yielded bones of animals long since extinct in this country. The Goat's Hole at Paviland was explored by Buckland in 1823, and he then obtained specimens of the woolly rhinoceros, hyæna, cave-bear, and mammoth. Many years later several caves were systematically explored by Lieut.-Col. Wood and Dr. Falconer. In addition to the forms before mentioned, they obtained *Rhinoceros hemitœchus*, *Elephas antiquus*, Hippopotamus, and, in one fissure, called Bosco's Den, about one thousand antlers of a variety of the reindeer.§ At Long Hole flint implements were found in association with the two species of rhinoceros just mentioned. In the Isle of Caldy is a cavern with numerous fine stalactites and stalagmites.

* Quart. Journ. Geol. Soc. vol. xxii. p. 69.

* Bristow, *Ibid.* vol. xxiii. p. 169; Moore, *Ibid.* p. 511.
† Quart. Journ. Geol. Soc. vol. xvi.
‡ Geol. Mag. vol. ix. p. 574.
§ Quart. Journ. Geol. Soc. vol. xvi. p. 491.

Submerged Forest and *Raised Beaches.*—In 1859 Mr. M. Moggridge described a submerged forest which was exposed in the excavation of the Swansea Docks. Beneath a deposit of made ground, sand, and loose gravel (varying from 6 to 20 feet in thickness), he recorded three beds of peat containing leaves, trees, &c., which alternated with blue marine clay to a depth of over 18 feet. The clay contained *Scrobicularia piperata*. In the peat he noticed remains of oak, beech, birch, alder, hazel, and crab-tree; and he observed that in very many cases roots, still attached to plants in the peat, descended into the clay beneath.

Mr. Moggridge noticed also the occurrence of a raised beach to the west of the Mumbles;* while Professor Prestwich has recorded one that was to be seen for a mile along Mewslade Bay, westward of Paviland.†

These changes of level bear out what is indicated by the Gower Caves, when what is now the Bristol Channel was probably an open plain "supporting herds of reindeer, horses, and bisons, many elephants and rhinoceroses, and now and then being traversed by a stray hippopotamus, which would afford abundant prey to the lions, bears, and hyænas inhabiting all the accessible caves, as well as to their great enemy and destroyer man." ‡

Dr. Falconer considered that the Gower Caves were filled with the mammalian remains after the deposition of the boulder-clay before mentioned.

Recent Deposits.—Since this period, submergence has allowed the sea to enroach over much of the area it now occupies, while it has eaten its way through the softer rocks into the bays of Caermarthen, Oxwich, and Swansea, that are hollowed out of the Coal-measures. As the sea encroaches, so flats occupied by sand mark its progress.

On this coast the south-west winds are particularly felt: the bent trees at Dunraven, and many other places becoming conspicuous indications of it. The wind, however, has made great efforts to restore to the land some part of the material it has lost, to which the numerous burrows of Blown sand testify.

At Candleston Castle great hills of sand rise up against the Carboniferous Limestone, forming Newton Burrows which stretch away to Porth Cawl. Likewise at Kenfig, Margam, and Aberafon, at Crymlyn, Penard, Penmaen, Oxwich and Hill End, at Llangenydd and Whiteford, are these hills of Blown sand to be found.

Alluvial flats border the Tawe, the Neath, and the Llwchwr; and tracks of marsh and moor occur at Aberafon, Margam, Llanrhidian, and Oxwich.

Eastwards, alluvial tracts spread out here and there like lakes, as at Pen Coed, Penlline Moor, and Morfa Ystrad Owen. West of Llantrissant, Gwaun Ynysplwm might even be taken for an old glacier-dammed pool, for it is almost hemmed in on the south by a bank of drift-gravel which the railway cuts through.

* Quart. Journ. Geol. Soc. vol. xii. p. 169.
† *Ibid.* vol. xvi.
‡ See Dawkins, "Cave Hunting," p. 290.

Having thus indicated the leading features in the geology of the country around Swansea, mention may be made in conclusion of some of the larger questions concerning the classification of the rocks which are now undergoing consideration.

The proximity of the South Wales coal-basin to the disputed rocks of the Devonian area has naturally led to several attempts at correlating the beds in the two districts. It is now known, through the labours of Professor A. Geikie, that the Old Red Sandstone of Scotland consists of two great divisions, a lower one passing down conformably into the Silurian shales, and an upper one graduating into the lower Carboniferous rocks above, with a complete discordance between these two divisions. The same arrangement has been described by Mr. Kinahan and Professor Hull, in the south-west of Ireland, where the Dingle or Glengariff grits, which in lithological characters seem to belong to the Old Red Sandstone, pass downwards into the Silurian rocks, and are overlaid discordantly by beds of true Old Red Sandstone.

Not enough is known of the precise relations of the two divisions of the Old Red Sandstone in the counties of Brecknock, Hereford and Monmouth. They have usually been considered as conformable, and the entire series in the neighbourhood of Cardiff has recently been stated to be a continuous deposit, from the conformable Silurian at its base to the conformable Carboniferous at its summit.* There is therefore no positive evidence of a break between the Old Red Conglomerate and the "Cornstone series;" the former of which Professor Hull regards as the equivalent of the Pickwell Down Sandstone of Devonshire; the latter, he regards as representing the so-called Middle Devonian, and the Lower Devonian beds above the Foreland Group.†

In proceeding westwards from Llandeilo, it has been pointed out by De la Beche that the Old Red Sandstone begins to overlap the Silurian rocks and to rest directly upon the older strata. Still further the Old Red Sandstone is overlapped by the Carboniferous Limestone, which again near Haverfordwest is overlapped by the Coal-measures, the latter thus resting in that neighbourhood on the Cambrian rocks.‡ Owing to this overlap of the Old Red Sandstone, the passage-beds are hidden, but Professor Hull thinks that "the purple and reddish sandstones, shales, and conglomerates of the Ridge of the Trichrag, under-

* W. J. Sollas, Quart. Journ. Geol. Soc. vol. xxxv. p. 494.
† Geol. Mag. Decade II. vol. vi. p. 192, and Quart. Journ. Geol. Soc. vol. xxxvi. p. 269.
‡ Mem. Geol. Survey, vol. i. p. 24.

lying the so-called 'Old Red Sandstone' near Llandovery, are the representatives or the Foreland beds on the one hand, and of the Glengariff beds on the other." Regarding thus the Lynton Sandstone (Foreland group) as Silurian, Professor Hull classifies the overlying Lynton Slates and the "Middle Devonian" as Devonian proper (equivalent as before-mentioned to the Cornstone group); the Pickwell Down Sandstone being regarded, together with the upper division of the Old Red Sandstone, as Old Red Sandstone proper. The overlying Baggy, Marwood, and Pilton beds are regarded as Lower Carboniferous, including the representative of the Lower Limestone shale.

The unconformity in Ireland between the Dingle beds and the Old Red Sandstone is thus accounted for by the absence of the Devonian beds.

The following table shows the general classification proposed by Professor Hull:—

continued with little interruption since the period when the Carboniferous rocks were first uplifted. The waste of the rocks is shown in the Dolomitic Conglomerate and in the Lias, as well as in the blown sands and alluvial muds of the present day.

The valleys receiving many of them their first outlines in faults or fissures, and irregularities of the surface, have been carved out by the agency of freshwater, by streams and rivers, and by waterfalls of which several well-known examples are to be seen in the Vale of Neath; and this action of freshwater was no doubt modified and accelerated during the vicissitudes of the Glacial period.

One advantage of the deep valleys is the beautiful scenery they afford to ramblers in search of the picturesque;* another advantage lies in the fact that the coal crops out along their sides, and can often be worked by adits and galleries driven

	Devonshire.	*South Wales and Herefordshire, &c.*
CARBONIFEROUS	Baggy, Marwood and Pilton beds.	Carboniferous Limestone and Shale.
OLD RED SANDSTONE	Pickwell Down Sandstones.	Old Red Conglomerate.
DEVONIAN	Mortehoe beds Ilfracombe beds Hangman beds Lynton Slates	Cornstone group.
SILURIAN	Lynton Sandstone (Foreland group).	Ludlow rocks and Passage beds.

There is much that seems plausible in this re-arrangement, and especially in the introduction of Silurian beds into Devonshire.

Professor Dewalque has hinted that the Cornstone beds may be marine, and Professor Hull is disposed to regard the group as the *estuarine* equivalent of the Devonian beds, a correlation which in the present state of our knowledge can only be taken as suggestive. Referring to the palæontological differences, he observes that the discoloration of the waters by peroxide of iron in the Devonian estuary of the South Wales and Herefordshire district, prevented the incursion of those mollusks, corals, and crinoids that flourished farther south.

That the area was a subsiding one during a long period of time is proved by the successive overlapping of the beds up to the Coal-measures. It is generally considered that these latter were connected with the Forest of Dean, and with the coal-field of Bristol and Somerset; and there seems little doubt that the culm-measures of Devonshire were also connected with them. The subsequent upheaval of the area was attended by many undulations, whose synclinal folds gave rise to the coal-basins. In South Wales, the beds generally have a higher dip on the southern than on the northern side of the coal-basin, while numerous faults, having a north and south direction, affect the Coal-measures near Swansea, testifying to the disturbances that have taken place.

The great denudations of the area have been depicted by Professor Ramsay,* and they have been

* Mem. Geol. Survey, vol. i. p. 297.

into the hills, instead of by shafts sunk from their summits.

Little has been said about the natural scenery of each past period; that, however, may be left to those who conduct the geological excursions of the British Association, and who amid the rocks themselves may well undertake the poetic interpretation of Nature.

THE HISTORY OF THE PLANE-TREE.

A TREE is an object which has at all periods been held in a certain degree of admiration by mankind, from its grandeur, its beauty, and its use. In the Scriptures there is an abundant reference to all objects of nature, and its allusions to trees are peculiarly rich. The Persians, Greeks, and Romans were particularly attached to trees: some of their greatest men were proud to acknowledge that they had made plantations with their own hands, and fine specimens, whether planted by nature or art, were held sacred or specially protected.

The extraordinary beauty of the Oriental plane (*Platanus orientalis*) with its massive trunk, wide-spreading branches, and large handsome foliage, almost tropical in appearance, giving a delightful shade and coolness to the space beneath, has made it in all ages an object of marked attention. This tree is celebrated in the earliest record of Grecian history;

* See papers by Dr. Bevan, "Geologist," vol. i. pp. 49, 124; vol. iii. p. 90; and Geol. Mag. vol. ii. p. 158.

Homer frequently mentions "the shady plane." It was dedicated by the Greeks to the beautiful Helen, and it is said that the bridal wreath which she wore on the occasion of her marriage with Menelaus was partly composed of the catkins of this tree.

Theocritus, a poet who flourished 282 B.C., represents the virgins of Sparta introducing the plane in the Epithalamium or marriage song of their princesses, thus—

"Reverence me, for I am the tree of Helen."

One Persian monarch, Xerxes, when invading Greece with his prodigious army, appears to have lost his reason at the sight of one of these magnificent trees he found in Phrygia. He compelled his army to encamp in the neighbourhood, whilst he adorned the tree with all the jewels belonging to himself, his concubines, and the principal men of his court, until the branches were loaded with gems, necklaces, bracelets, and ornaments of every kind. He called it his mistress and his goddess, and it was some days before he could be prevailed on to leave the tree of which he was so enamoured, and even then he caused a figure of it to be stamped on a gold medal which he constantly wore about him. Herodotus relates that he encircled this favourite tree with a collar of gold, and confided the charge of it to one of the ten thousand. It is said that the delay occasioned by this foolish freak was one of the causes of his defeat.

The Greeks named this tree Platysample, in allusion to its spreading branches and shady foliage. In Athens the plane was planted near all the public schools; the shady walks round the Gymnasia and public buildings, the grove of Academus in which Plato delivered his celebrated discourses, were formed of this tree. Socrates swore by the plane instead of by the gods, and this offended Melitus, one of the philosopher's principal accusers, who declared it was a great crime to swear by so beautiful a tree.

The Romans named this tree Platanus from the Greeks, and they appear to have held it in equal veneration with their more Eastern neighbours. They planted the public and academic walks of their imperial city with it. When first introduced into Rome it was cultivated, with much industry and great cost, by their orators and statesmen; we are told that Cicero and Hortensius would exchange now and then a turn at the Bar, that they might step to their handsome villas and irrigate the roots of these favourite trees, not with water but with wine.

Pliny informs us that the plane-tree was first brought over the Torrian Sea, into the island of Diomede, where it was planted to ornament the tomb of that hero. This same author records the particulars of several remarkable plane-trees, and tells us of one in Lycia that had a cave or hollow in the trunk which measured eighty-one feet in circumference. The summit of this tree, notwithstanding the internal decay of the trunk, is said to have been sufficiently umbrageous to have borne quite a little forest of branches aloft. In this singular tree Licinius Mucianus, when consul, used to give dinner and supper parties, and he sometimes preferred sleeping in the hollow, perhaps on account of the wine he had imbibed on such occasions, and was unable to walk home.

The Emperor Caligula found an extraordinary plane-tree, near Velitræ, in the cavity of which he gave a supper party to fifteen of his debauched courtiers, leaving ample room for his train of attendants to wait on the company. The emperor called it the "Feast of the Nest," because it had been given in a tree. Pliny states that when this tree was first introduced into the country of the Morini, a maritime people of Gaul, the inhabitants paid a tribute to the Romans for permission to enjoy its shade.

The Oriental plane appears to have been introduced into England about the middle of the sixteenth century, and is first mentioned by Dr. Turner, the father of English botany, who, in his Herbal, published under the title of "Names of Herbs," 1541, says: "I have seen two very young trees in England, which were called there Playn-trees, whose leaves in all poyntes were lyke unto the leaves of the Italian Playn-tree, and it is doubtless that these two trees were either brought out of Italy or some farr countre where unto the frieres, monks, and chanons went a pilgrimage."

Gerard, who published his Herbal in 1596, does not mention having seen the Oriental plane growing in England, but tells us "his servant, William Marshall, whom he sent into the Mediterranean Sea as surgeon unto the *Hercules*, of London, found divers trees hereof growing in Lèpanto, hard by the seaside, at the entrance into the town, a port of Morea, being part of Greece; and from thence brought one of these rough buttons, being the fruit thereof." Parkinson, in his "Theatrum Botanica," published 1640, tells us that the plane-tree is a native of Asia, but it is very rare in the Christian world. Evelyn, who did much for the improvement of horticulture in the reigns of the Stuarts, by his writings and the introduction of exotic trees into this country, mentions, in his discourse on "Forest Trees," published 1664, that the great Lord Chancellor Bacon was the first who planted a noble parcel of Oriental plane-trees at his seat at Verulam (St. Albans, Herts), some of which continue unto this day. Goodwood Park also contains some of the finest specimens of this tree in England, and, perhaps, in Europe, excepting those in the vicinity of Constantinople. The Oriental plane, known as the Chinar, has been cultivated in Persia from the earliest periods; long avenues of it are to be found in the gardens, under which the Persians perform their religious duties. Sir William Ouseley mentions that on these trees the devotees sacrifice their old clothes by hanging them to the branches, and that the trunks of the favourite Chinar trees are commonly found studded with rusty nails and tatters, the clothes sacrificed being left nailed to the tree till they drop to pieces of themselves. The Oriental plane is thought to be a great purifier of the air, and also, it is said, defends cities and other places, where it is grown, from the plague. Evelyn says, "A worthy knight, who staid at Ispahan when that city was infected with a raging pestilence, told him that since they have planted a greater number of these noble trees about it the plague had not come nigh their dwellings." The plane is hardly less beloved by the Turks in modern days; it is a usual practice with them to plant one at the birth of a son; and they appear to enjoy no greater luxury than that of reclining under the umbrageous branches of these majestic trees, smoking their tobacco in a perfect state of indifference to all sublunary things. No part of Europe can boast of such gigantic plane-trees as those that are to be found in the neighbourhood of the Sublime Porte. Close to the Bosphorus stands what is called the plane-tree of Buyutidéré, known also as the plane-tree of Godfrey of Bouillon, who is said to have rested under its shade when leading his army to Jerusalem in 1097. It has the appearance of a single tree, but on close inspection is found to consist of nine closely joined together. The circumference of the united trunks is over 133 feet. The height of the group is 195 feet, and the circumference of the spread of the branches is 364 feet. Part of the trunk has been hollowed out by fire, and eight or ten persons can be sheltered in the cavity.

Lady Craven, in her letters, speaks of some plane-trees she saw in the Turkish dominions, of such magnitude that the largest trees we have in England placed near them would appear only like broomsticks.

The Hebrew word Armon, translated Chestnut in the Scriptures, as one of the trees from which Jacob took rods, in which he pulled white strakes to set them before Laban's flocks when they came to drink (Gen. xxx. 37), is supposed to refer to the Oriental plane. In Eccles. xxiv. 14, wisdom is compared to a plane-tree by the waters. In Ezek. xxxi. 8, the Armon is spoken of as one of the glories of Assyria (see Smith, "Dictionary of the Bible").

The American plane-tree (*Platanus occidentalis*) was introduced into this country, in 1636, by John Tradescant. It grows naturally within the same latitudes of the Western world that *Platanus orientalis* flourishes in the East. This species is far more common than its Eastern relative, and is to be found especially in some of the close courts, the parks, and squares of London, where the smoky atmosphere appears to agree with it better than any other tree.

Within the precise boundaries of the City, according to the "Gardener's Magazine" for 1877, there are about 1200 established thriving trees, excluding all such under-shrubs as privets, lilacs, &c., and comprising at least thirty species and varieties; out of this number there are 520 planes—some remarkable for their size and stature, for example, the plane at the corner of Wood Street, Cheapside, in which not many years since a small colony of rooks made their abode in its branches, and for some six or seven years after they quitted it, their nests remained, and were annually patched and occupied by the City sparrows.

In many other spots the plane is to be seen enlivening with its refreshing greenery the wilderness of brick, mortar, and asphalte. There are some splendid specimens of the Western plane to be seen in Mecklenburgh and Russell Squares. The young trees on the Thames Embankment are all of the American species, and, being of rapid growth, are well suited for the purpose for which they were planted. The Western plane, in magnitude and general appearance, bears so close a resemblance to the Oriental that many persons confound them together, but they are easily distinguished from each other. The leaves of the American plane are larger and less deeply lobed, their petioles or footstalks being of a red colour; those of the Oriental, green. The fruit, or rough ball-shaped catkin which we see gracefully suspended from the branches, not unlike chain-shot, in the winter months, is much larger and rather smoother than those of the Eastern plane. The flowers of both species are contained in the small globular catkin we see hanging from the branches just as the tree is coming into leaf, but are so minute as to require a glass to distinguish them.

The seeds ripen late in the autumn, and are not unlike those of the lettuce, surrounded with a kind of down, by which they are transported to a considerable distance by the wind. The young shoots and leaves are also covered with down, which becomes detached from them in the course of the summer. In some parts of the United States, where the tree is very abundant, the inhabitants, according to Michaux, regard this down with dread, as they think it has a tendency to produce irritation of the lungs, and finally consumption. In the States it is known as the cotton-tree from this down, and also button-wood from the shape of its catkins. The growth of the foliage of these trees is different from others. Most trees when the leaves have reached maturity fall off on their own accord, without being at all pushed off by new ones, which are yet in embryo, and do not occupy the place of the old leaves, but are only formed contiguous to them, except in the plane, the new leaf of which is found precisely under the base of the footstalk of the old leaf. Loudon tells us that the head of the plane-tree, during summer, often abounds in what painters call flickering lights; the consequence of the branches separating themselves into what may be called horizontal undulating strata, or, as it is called in artistical phraseology, tufting, easily put in motion by the wind, and through openings in which the rays of the sun penetrate and strike on the foliage below. A peculiarity of these trees is the property of throwing off their bark in scales, thus naturally cleansing themselves from moss and other parasitical encumbrances. This cause of falling off of the bark Dr. Lindley states to be the rigidity of its tissue, on account of which it is incapable of stretching, as the wood beneath it increases in diameter.

The wood of the Oriental plane is used for cabinet-work, and is said to make beautiful furniture on account of the smoothness of its grain and its susceptibility of receiving a high polish. The wood of the Western plane becomes a dull red colour in seasoning; is used in carpentry, but is not much esteemed. These trees are to be highly recommended before all others for ornamental planting in public walks and city gardens and squares. Limes grow shabby and lose their leaves before autumn comes; elms at that season look brown and rusty; but the plane keeps its lively verdure to the last.

H. G. GLASSPOOLE.

NOTES ON THE AMŒBAS.

IN the same cell and water in which I saw the self-division of *Trachelocerca olor*, there were a great number of Amœbas, and, for more than a month, their movements were so slow that I sometimes thought them dead; nevertheless, at intervals I could perceive some of the granular matter in them to move very slowly. On March 3, however, they were all suddenly moving very fast, and the granular matter within them, with the vesicles, were plainly seen to move, and they travelled on at a quick rate. A number of the *Coleps hirtus* were also present, and I have seen the latter place themselves in front of the moving Amœba, directly in the path that the Amœba were travelling. The Coleps appeared to tear the gelatinous envelope of the Amœba, and

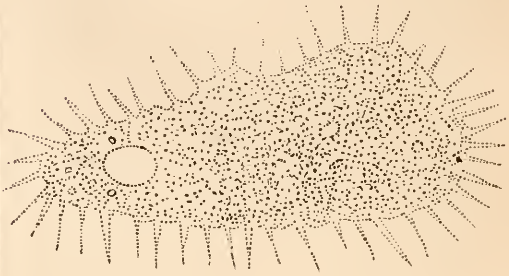

Fig. 125.—Amœba assuming prickly shape.

extract the granules moving in that direction. I have also seen them pass into the body of the *C. hirtus*. After feeding for a time it would leave the Amœba, which would proceed on its journey forward without apparently sustaining any damage from the attack of *C. hirtus*. As this animal is a very fast and quick-moving creature, it did not appear possible that the Amœba could retain it as prey, yet I had seen several instances where it was found in the interior of the Amœba as food, but this I thought at the time must have taken place after the death of the *C. hirtus*. On March 7, I saw that a large Amœba

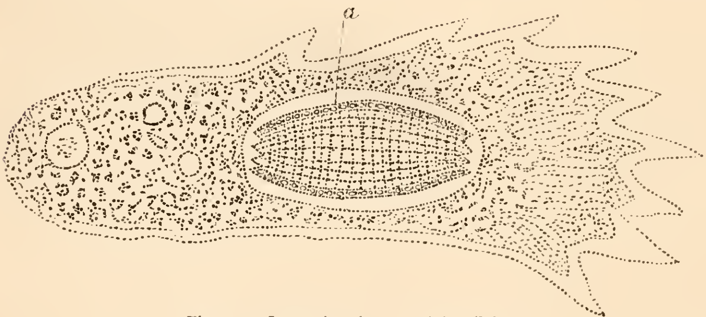

Fig. 121.—Large Amœba, containing Coleps.

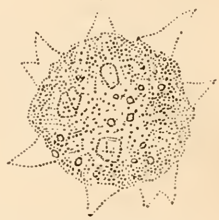

Fig. 123.—Amœba assuming a globular form.

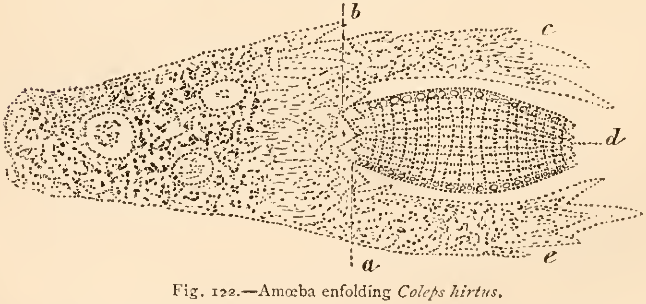

Fig. 122.—Amœba enfolding *Coleps hirtus*.

Fig. 124.—Globular-shaped Amœba.

had taken into its body a living one. It was entirely surrounded by the Amœba (fig. 121, *a*), and was struggling to escape by rapidly revolving on its long axis, as it could not move either backwards or forwards. In a few minutes it suddenly ceased to move or exist, and evidently became the food of the Amœba, and was dissolved or digested; the oval shape and outline of it remained visible for some time carried about in the Amœba. The dark colour of the *C. hirtus* was soon gone, evidently assimilated by the Amœba, and was rendered as translucent as the Amœba itself. Since then I have observed the *C. hirtus* evidently feeding on the Amœba, and they really appear to be aware that it is dangerous to remain too long feeding at the expense of the Amœba. For several times I have seen the latter, while *C. hirtus* was busy feeding on the centre or front (fig. 122, *b*), send forth on each side two powerful processes (*c*, fig. 122) and encircle the *C. hirtus* in its folds. Sometimes the *C. hirtus* has remained in the position at fig. 122, *d*, until there was but just sufficient room to escape by withdrawing backwards. But woe to the intruder if once the processes closed around it; and this I have witnessed, which proved to me the

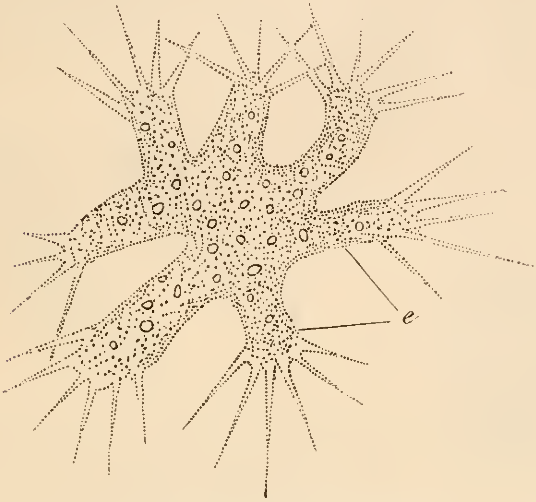

Fig. 126.—Amœba with compound pseudopodia.

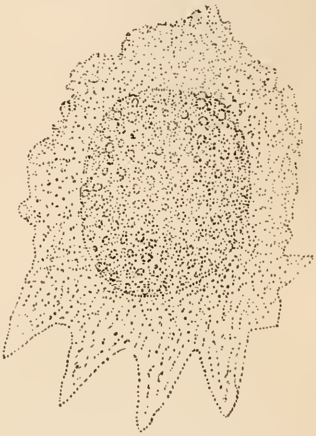

Fig. 128.—Amœba putting forth pseudopodia.

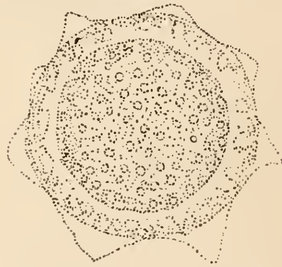

Fig. 129. — Amœba putting forth pseudopodia after remaining stationary.

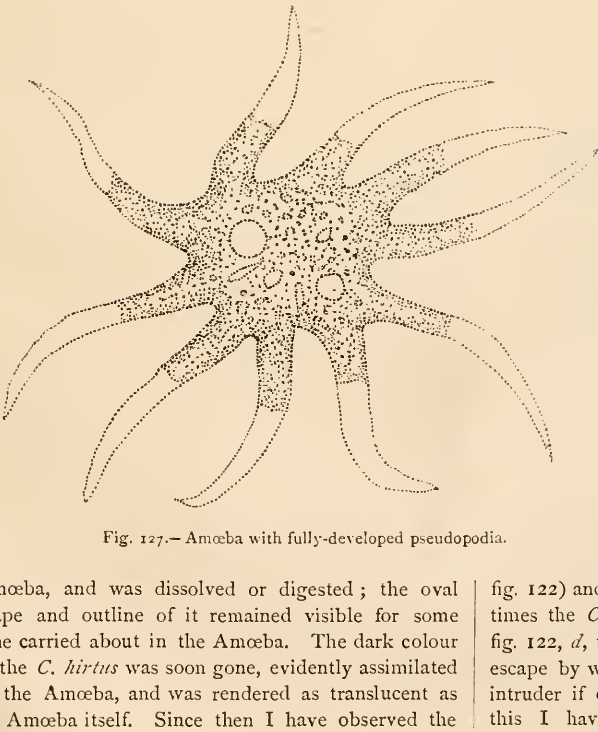

Fig. 127.— Amœba with fully-developed pseudopodia.

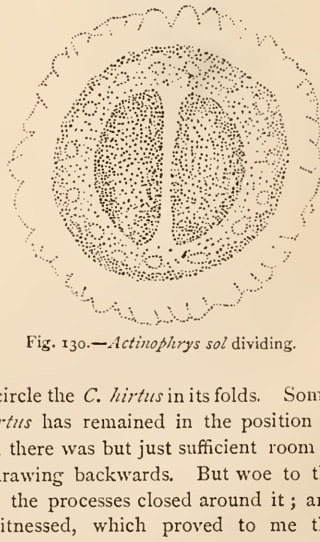

Fig. 130.—*Actinophrys sol* dividing.

manner of capturing the living *C. hirtus* by the slow-moving Amœba.

The Amœbas are ever moving and changing their forms, so that at no time are there two alike, nor indeed does any one of them retain the same figure for any length of time. Yet there is a similarity of form running through the whole of them—a sort of characteristic family likeness; and they are very beautiful, when sometimes a dozen of them are to be seen in the field of the microscope at one time, all moving in different directions, putting forth their

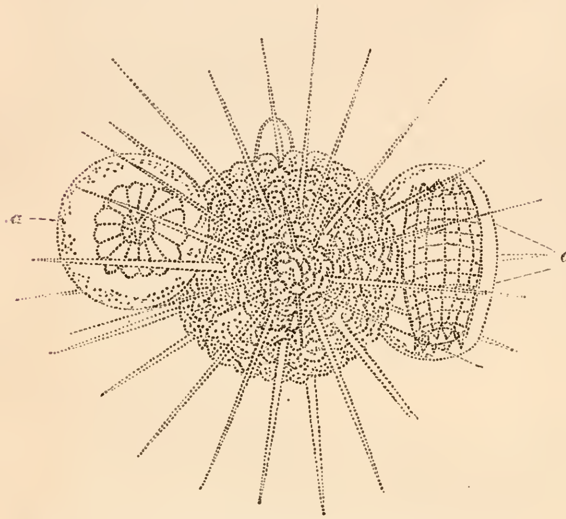

Fig. 131.—Actinophrys-shaped Amœba, entangling *Coleps*, &c.

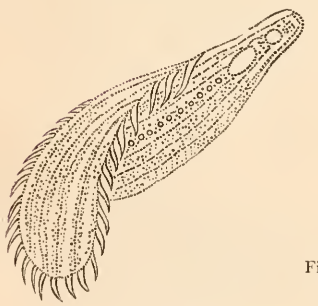

Fig. 132.—Infusorian.

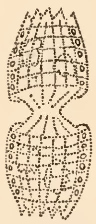

Fig. 133.—Self-division of *Coleps hirtus*.

ever-changing pseudopodia, and the continual flow onwards of their granular contents.

Several *Actinophrys sol* soon made their appearance in the same cell. I counted over thirty of them. As they increased in number the Amœba decreased; and I have reason to think that they are produced from the Amœba, as several of the Amœbas have been seen to withdraw their pseudopodia and become globular in form, as shown in fig. 123, and finally disappear altogether, as at fig. 124. In this state they remain for some time, after which the tentacles or spines of the *A. sol* are put forth, as at fig. 131. In this form the *A. sol* becomes a far more formidable enemy to the *C. hirtus* than the Amœba, and, indeed, to every other animalcule in the cell, for if the *C. hirtus* comes in contact with the spines of the *A. sol*, it is entangled in them and cannot escape, but are gradually drawn to the surface of the Actinophrys when it is not wholly absorbed into the body, but a transparent gelatinous envelope is thrown round the victim (fig. 131, *a*), by which it is held while the process of assimilating the contents of the body

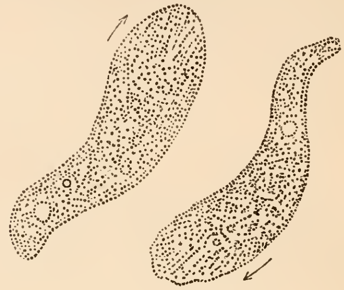

Fig. 134.—*Amœba Limax*.

goes on. This is a peculiar feature in the *A. sol*, which of themselves are very small in comparison to what I have seen, both of *A. sol* and *A. Eichhornii*. The latter are large, and are enabled to take into their body infusorians of good size, but these small ones only bring their prey to the surfaces of their body by the agency of their spines. I have seen three of the *C. hirtus*, each in separate envelopes, round one *A. sol* (as the two in fig. 131, *a*). At times three or four *A. sols* may be seen in conjugation; and in this state as many as nine *C. hirtus* may be seen held as food by the spines. After awhile the *A. sols* again separate and withdraw their spines, and each of them divide into two kidney-shape bodies (as at fig. 130). From this form I could not trace them farther, so as to ascertain more changes in their life history.

Among the various shaped Amœbas was the *A. Limax* (fig. 134). They are much smaller than the other forms; their granules are few, but large, and they always travel in one direction (as indicated by the arrows). A number of Amœbæ (of the shape at fig. 127) were in the cell at the same time. Some of them have many more pseudopodias than are represented in the sketch, and are much less in size, but they were extended in length to more than twice the diameter of the body, and were gracefully bent in all directions. These were very beautiful objects. Some of the Amœbas, after withdrawing their pseudopodia and remaining stationary for some time, and the centre becoming very granulated (as at fig. 129), would again put forth their pseudopodia, and travel on, carrying the granulated mass with them (as at fig. 128). Some few of them have taken the form shown at fig. 126. The larger processes at E, in the course of an hour were seen to withdraw, and then the creature assumed the form at fig. 125 with the spines thickly set, and did not take on the globular form of *A. sol*, but continued to move on slowly in the direction of the arrow. There were also a number of infusoria, of the kind represented at fig. 132, the names of which I do not know. Fig. 133 shows the curious manner of self-division of the *C. hirtus.* They divide exactly in the middle, and as the two halves gradually recede from each other they take on the perfect form, occupying about thirty-five minutes to complete the division.

These are some of the many objects obtained from my fish globe, with which I have been much interested; and I thought that they would not be altogether void of interest to your readers.

James Fullagar.

SCIENCE IN THE PROVINCES.

THE annual volumes of "Proceedings," "Transactions," &c., which many of our leading provincial scientific societies now issue, must draw off a large supply of papers from the metropolitan societies. Nor is the matter contained in such publications of an inferior kind to many of the papers read before the Linnean and Geological Societies at the present day, whilst if we compare the twenty-year-old volumes of the latter with the best of these papers we at once see what an advance has been made by natural science.

The Literary and Philosophical Society of Liverpool is one of the oldest and best in the kingdom, and in their last issued volume, besides other contributions and abstracts of proceedings at the meetings, we have the following papers:—"A Fresh-water Sponge from Bahia," by T. Higgins, F.L.S.; a lengthy and ably-written paper on "Developmentalists and Evolutionists; or the Use of Dogma in Science," by the Rev. H. H. Higgins; "Scientific Materialism from a non-scientific point of view," by J. A. Picton, F.S.A; "The Salt-lakes, Deserts, and Salt Districts of Asia," by Thomas Ward; "Tides in the Irish Sea and in the River Mersey," by J. N. Shoolbred, B.A., C.E., &c. The annual volume of the Cumberland Association for the Advancement of Literature and Science is now a very welcome book, which has unquestionably been so soon raised to its present position by the genius and energy of its lamented secretary, the Rev. J. Clifton-Ward, F.G.S., whose loss cannot be too deeply deplored. We are glad to notice that the vacant secretaryship has been filled by Mr. J. D. Kendall, F.G.S., an able geologist and mineralogist. The "Transactions," of the Cumberland Association is now before us, and contain (besides purely literary papers) essays on "Our Summer Visitors," by J. Duckworth; "The Entomology of the District," by George Dawson—a most enthusiastic and careful entomologist—and a "List of Birds in the Carlisle and Keswick Museums," by George Dawson and the Rev. J. Clifton-Ward. The last issue (vol. ii. part v.) of the "Transactions" of the Norfolk and Norwich Naturalists' Society contains the following papers:—"The Gannet City," by J. H. Gurney, F.L.S.; "Norfolk Decoys," by Thomas Southwell, F.L.S.; "A Memoir of Samuel Woodward," by his grandson, H. B. Woodward, F.G.S. (already noticed by us); "Fauna and Flora of Norfolk, Part ix. Hymenoptera (Chrysididæ and Aculeata)," by J. R. Bridgeman; and a very able Address by the President, F. W. Harmer, F.G.S., reviewing the latest discoveries in Tertiary palæontology, and their bearings upon the doctrine of Evolution.

The "Proceedings" of the Liverpool Naturalists' Field Club for 1879-80, is not of so ambitious a character as the publications just noticed. It is devoted chiefly to accounts of the various excursions made during the summer months which are very pithily condensed, and frequently serve as very effective guides to the natural history of favourite localities. The president is the Rev. H. H. Higgins, M.A., indefatigable in his advocacy of science in Liverpool), and his address, given in full, consists of Biographical Sketches in Zoology, from its origin to its union with Botany in the Science of Zoology. There is also a capital report of a lecture (illustrated) by the same naturalist on "Floral Defences." The Twenty-second Report (1879) of the East Kent Natural History Society gives some very well executed abstracts of the papers read at the monthly meetings. Among the contributors of papers we find the names of Professor Gulliver, F.R.S., James Fullagar, G. Dowker, F.G.S., G. S. Saunders, Col. Horsley, W. H. Hammond, &c., whereby we are let into the secret of the high standing occupied by this society. We commend to the notice of geologists the lengthy and interesting paper giving an "Outline and Index to the Geology of East Kent," by Capt. McDakin. The "Proceedings" of the Nottingham Literary and Philosophical Society for 1879-80 contains some very able papers (besides the President's address on "What is Science?"), among which we specially notice that on "Sandstones," by J. H. Jennings; and another on "The Structure of Molecules," by J. J. Harris Teall, M.A. The South London Microscopical and Natural History Club has just published their Ninth Annual Report, containing, besides the address of the President (W. T. Suffolk, F.R.M.S.), valuable papers by H. and J. Groves on the Phanerogamia, Filicules, and Characeæ of the South London District; lists of Lepidoptera of the same, by W. West and J. S. Ponsford; as well as brief abstracts of papers read before the club.

MICROSCOPY.

A simple method of illuminating Opaque Objects under High Powers.—In the "Journal of the Royal Microscopical Society," for June, Mr. James Smith describes an easy method of illuminating opaque objects under the higher powers of the microscope. The microscope is placed in position for observation with the light in front (or at the side, as may be most convenient), about three inches off the flame, which should be somewhat lower than the stage, and turned edgewise to the microscope. The bull's-eye condenser is then placed between the stage and the lamp, with the plane side uppermost, the convex surface being a little higher than the stage. The light strikes the plane surface of the condenser, and is again reflected at a very oblique angle upon the object on the stage, a sharp and brilliant wedge of light being cast upon the slide. The position of the lamp and condenser requires some careful adjustment to produce the best effect, when it will be found to answer all practical purposes for ordinary use. There is, however, a slight haziness (such at least is my experience) caused by the cover-glass. Probably the effect would be better on uncovered objects. The method, however, is so simple and inexpensive that it is well worth being noticed. I have seen pollen-grains and butterflies' scales viewed as opaque objects under a $\frac{1}{5}$th and $\frac{1}{8}$th as I have never been able to see them with any other method of illumination.—*R. H. Nisbett Browne.*

The Fresh-water Rhizopods of North America.—Thanks to the kindness of the United States Government, we have received a copy of this elaborate and beautiful work, by Dr. Leidy. It is one of the series of volumes published by the U.S. Geological Survey. The book opens with a short introduction, in which Dr. Leidy states (in order to give confidence to students) that expensive instruments are not required for such investigations as those herein described; on the contrary, the instrument he has in use is called the "Economic Microscope" (sold by Mr. Beck), and has $\frac{1}{4}$-inch and 1-inch objectives. The introduction is followed by some general remarks on the Rhizopods, including comments on their classification; where they may be found; their collection and examination; and a short review of the Orders into which they are divided. Dr. Leidy then proceeds to the systematic description of the various genera, &c., and appended to this is a list of the Fresh-water Rhizopods, indicating the many forms which occur together in certain localities. A catalogue is also given of the chief works and communications relating to the Fresh-water Rhizopods, with lists of the forms described, and a partial and probable reference of these to corresponding forms described in the body of the present work. The whole is followed by a series of forty-eight brilliantly executed plates, lithographed from the author's sketches; the greater portion are coloured, and all are drawn to scale. Perhaps it will not detract from the interest of the work if we mention the fact that these elaborate researches, extending over a period of many years, have brought no pecuniary recompense to their able conductor.

The Birmingham Microscopists and Naturalists' Union.—This society has been formed to supply a want which has been felt amongst many students of microscopy and natural history, who are desirous of securing the benefits of mutual help and co-operation at the minimum cost; and to place the society within the reach of all, the subscription has been fixed at 5*s.* per annum. The officers of the new society wish it to be understood that it is not formed in any spirit of antagonism or rivalry to the older and more advanced society, the Birmingham Natural History and Microscopical Society; but it is intended to help more elementary students who are not members of the older society. The president is Mr. J. W. Oliver.

San Monica Earth.—At a recent meeting of the San Francisco Microscopical Society, the President announced, to the great satisfaction of the members of the society, that more of the celebrated "Santa Monica earth," or some similar to it, had been discovered. The deposit is about seventy miles from the spot where the original piece was first discovered by Mr. T. P. Woodward two years ago. Professor H. L. Smith, of Geneva, N. Y., reports in regard to this deposit, that he has tried the "new find," and finds it so rich and so nearly like the "Santa Monica," that he desires a quantity, so as to be able to supply the demand. Mr. Norris and ex-President Hyde have also made a careful examination of the material, and the former presented a mounted slide which showed forms of great beauty and fully as rich as the original of two years ago. Scientists all over the world, it is to be hoped, can now be supplied with this very interesting material, for which they have been so anxious.

Yellow Fever and the Microscope.—Dr. Sternburg, who has been devoting his attention for some time to the natural history of the Yellow Fever, at New Orleans, has announced that "there is no gross and conspicuous germ or organism, either in the blood of yellow fever patients, or in the air of infected localities, which by its peculiar appearance or abundant presence might arrest the attention of a microscopist, and cause suspicion that it is the veritable germ of yellow fever." This statement is of importance in view of the announcement lately made by Klebs and Tomason that they had discovered what they believed to be the germ of malarial fever in the neighbourhood of Rome.

ZOOLOGY.

THE LATE WILLIAM ALFORD LLOYD.—We regret to announce the death of Mr. W. A. Lloyd, formerly of the Crystal Palace Aquarium, whose valuable advice has been sought in connection with aquaria by persons in all parts of the scientific world. Mr. Lloyd was a regular correspondent of SCIENCE-GOSSIP, and kept up this connection till the last. The last article of his, entitled "Frozen-over Fish-ponds," appeared in the December number, 1879. Mr. Lloyd was a remarkably earnest and upright man, and more than once in his life forewent advantages when the latter in any way compromised his scientific views.

ISLE OF MAN NATURAL HISTORY SOCIETY.—This society, which is now an established fact, made its first excursion on Monday, May 24th. The locality chosen was the quaint old town of Peel, renowned for its castle and the relics of a once famous abbey, the scene in Sir Walter Scott's novel of "Peveril of the Peak." The castle was the first place visited, and, as might be expected, the Henbane (*Hyoscyamus niger*) was found growing near the walls. The only fern noticed was *Asplenium marinum*, which was growing at a considerable height on the ruins. After leaving the castle a fine specimen of the common Guillemot (*Uria troile*), which had been caught on a fish-hook in the harbour, was brought to the party for examination. Owing to the mildness of the climate the Camomile (*Anthemis nobilis*), an autumnal flowering plant, was discovered in bloom. An extempore museum was inspected, formed by various private collectors in the neighbourhood. A short meeting of the society was next convened, at which the president, Edwin Birchall, Esq., F.L.S., read an interesting paper on *Algæria philanthiformis*, an insect almost peculiar to the Isle of Man. The excursion was a complete success, and a vote of thanks was given to Mr. P. Kermode, who undertook the arrangements.

THE COCOON OF CIONUS SCROPHULARIÆ.—The cocoon of this beetle, one of the Curculionidæ, seems to me so peculiar in the manner of its formation as to deserve a special description. No extraneous materials enter into its composition, and it does not appear to be produced by any spinneret, oral or anal. The only mention of it I have been able to meet with is in the 1st vol. of Westwood's "Modern Classification of Insects," where it is stated, at p. 343: "Schäffer has figured the transformations of the *C. scrophulariæ* (*Abhandl.* vol. iii. pl. 9) . . . . The cocoon is formed with open meshes, like that of the Hyperæ." This description altogether disagrees with the cocoon of *C. scrophulariæ* as I find it abundantly here. The larva belongs to the limaciform type, very much resembling a small slug, and crawls over the leaves of *S. nodosa*, on which it feeds, by means of the sticky mucus which its body secretes. When about to pupate, the larva contracts itself, drawing in the head and tail and arching up the back, to a grape-shaped spheroid resting on a small oval base. One soon observes a whitish "bloom" over the head and fore-parts, which on closer inspection is seen to be a jelly-like substance, somewhat resembling boiled starch, and appears to envelop the head and anterior segments, especially around the base of attachment, and to be breaking out in patches along the dorsum. The larva is busy with its head buried in it, moulding, chewing, insalivating (?), and working this starch-like matter into a mould over itself. Whitish and soft at first, this substance hardens and stiffens eventually into the cocoon, which is parchment-like in colour and consistence. At first there are holes with everted edges sparsely scattered over the equatorial region for about two-thirds of the length of the cocoon, like the rough side of a nutmeg-grater, which, however, are soon plastered up from the inside, and the whole cocoon becomes a perfectly closed investment. If now the cocoon be detached from the leaf, it will be found to have an oval hole on one side at the place where it was fastened ; and if this be done before the larva has become quiescent, it immediately sets about repairing the deficiency. Through the opening I have seen it plucking off, with its mandibles, little round pellets of the whitish starch-like matter which seemed to be excreted somewhere near the anus. These it sticks on to the edge of the opening, and draws out and moulds with its mouth into a membrane which soon dries up and becomes of the texture and colour of the rest of the cocoon, from which the imago subsequently escapes by a circular opening which it cuts in one of its ends.—*J. A. Osborne, M.D., Milford, Letterkenny.*

VARIETIES OF L. SIBYLLA AND A. PAPHIA IN THE NEW FOREST.—While stopping at Brockenhurst I captured, on July 5th, a black variety of *L. sibylla* in good condition, and on the 17th I caught a male specimen of *A. paphia* settled on a thistle-head in one of the rides, which on examination I found had a small white patch on each of the fore-wings, which is repeated, but not so distinctly, in the hind-wings. I believe this variety is of uncommon occurrence.—*A. J. R.*

HONEY AND NO BEES.—I see on page 118 of SCIENCE-GOSSIP, for May, that A. A. and the bee-keepers could not account for the fact that no bees were found in the hive, but they had left plenty of honey. It appears that, although they had kept bees a great many years, they had not found out that such is frequently the case with first swarms, which are always accompanied by old queens, and that such is of common occurrence, when the old queen has reached the age of three years (the duration of her natural life) and her majesty has departed without raising a successor. In reference to the communication of I. F. R., on page 166, July number, I am like many others—I do not read the "Times," but I have not heard of deserted hives this year; and I cannot think it possible that a hive could have been found during last April with "honey and no bees." I have kept bees more than forty years, and never but once experienced a summer so bad for bees as last year; and that was about the year 1859, when about nine-tenths of the bees in the country perished from actual starvation during the following autumn and winter, from their being unable to collect honey for their winter's food in consequence of the unfavourable weather during the summer of that year; and I much question, when the population of a hive have gradually dwindled away, whether "the last few" could find refuge in a neighbouring colony. We know a loaded bee is generally well received by any hive of bees; but I never knew a case of a starved-out stock finding refuge in a neighbouring colony. I have stated above, that the duration of the life of the queen is about three years; this refers only to English queens. I have kept a Ligurian queen in the same hive for five years; and, as a rule, I have found the Ligurian queens longer-lived, more prolific, and more hardy.—*Apis Ligustica, Apicultural Institute, Dover.*

WEBLESS-FOOTED DUCK.—When in the country, a short time ago, I saw what I took to be a curious phenomenon, namely, a duck whose feet were entirely webless. It had been born so; the feet were otherwise perfectly natural. Is this not very peculiar?—*A. M.*

THE MIDLAND UNION OF NATURAL HISTORY SOCIETIES.—The Council of the above Union have instituted an annual prize for the paper indicating most original research which may be read before any of the societies included in the union. The prize is to be a gold or bronze medal to be called the "Darwin Medal." Dr. Darwin has signified to the council his sense of the honour thus done to him in connecting his name with a scheme for the encouragement of original research.

BOTANY.

ARRENATHERUM BULBOSUM (Lind.).—This plant, mentioned in your last issue, I find about here in clayey soil, with a bulbous rootstock, reminding one of the bulb of *Allium oleraceum*. As far as I recollect, I have not observed this bulbous form on limestone.—*W. West, Bradford.*

"THE BRITISH MOSS FLORA."—Part ii. of this valuable work treats of the families Buxbaumiaceæ and Georgiaceæ. It is fully up to the high merits of the first part, and Dr. Braithwaite evidently intends to make this book worthy of his reputation.

HERTFORDSHIRE FLORA.—In looking through a "Flora Hertfordiensis," thirty years old, I noted down the following species, then considered native in Herts, but not now considered native in any part of Britain:—

1. Delphinium consolida (extinct).
2. Turritis glabra } Waifs of
3. Silene Armoria } cultivation.
4. Papaver somniferum }
5. Medicago sativa }
6. Fragaria elatior }
7. Matricaria Parthenium } Not indigenous.
8. Filago gallica }
9. Borago officinalis }
10. Populus nigra (alien).
11. Scrophularia vernalis (extinct).

—*S. Dillen, Fore Street, Hertford.*

A REVIEW OF THE BRITISH CHARACÆ.—Under the above heading an article, by Henry and James Grove, has been reprinted from the "Journal of Botany" for 1880. The pamphlet is intended to supply a want, long felt by collectors, of an authentic reference book of the British Characæ, and in accordance with that purpose, it is abundantly and beautifully illustrated, the illustration showing the distinctive characteristics of the various species, &c.

OCCURRENCE OF MEADOW SAXIFRAGE.—In this neighbourhood for some years past, I have found the occurrence of *Saxifraga granulata* (Meadow Saxifrage) remarkably local, confined to a few spots within a radius of three or four miles, but abundant where growing, and in three places found upon a sloping sandy bank. This restriction may be partly due to the seeds of this delicately beautiful plant being comparatively heavy, and consequently not so readily carried far by the wind, and also to the peculiar roots, growing so near the surface, requiring a certain condition of sandy soil for favourable development.—*Horace Pearce, F.L.S., Stourbridge.*

DEVELOPED PRIMULAS.—Mr. Swinton writes in your issue of last month,—"They are rarely found intermixed," referring (as I understand him) to either two or three of our wild Primulas. I have never seen the local *P. elatior*, Jacq., growing, but *P. vulgaris b. caulescens* is tolerably plentiful here in Yorkshire, and I have often seen it, but only where *P. officinalis* and *P. vulgaris* grew *intermixed.* This variety is not mentioned by Mr. Swinton. In speaking of *P. elatior*, it should be stated whether Withering's or Jacquin's *elatior* is intended. The majority of "beginners in botany" call this hybrid (? *b. caulescens*) the oxlip, and label it *P. elatior*, Jacq. I have seen large quantities of *P. farinosa* growing, but never came across it with a sessile umbel. I should like to know if this form is often seen; it must have been seen, as Hooker writes, "Scape stout, 2–8 in., rarely 0." Watson mentions, in "Compendium Cybele

Britannica," that in Sutherland there has been found "a variety of *P. scotica* differing from the usual form by having the umbel sessile, so that the elongated pedicles appear to be one-flowered peduncles, as in the common Primrose. Thus far the two forms are in analogy with *veris* and *vulgaris*; but there is no corresponding change of character in calyx or corolla.—*W. West, Bradford.*

THE STUDY OF FLOWERS.—Messrs. W. & R. Chambers (London & Edinburgh) have just published a well-got-up sixpenny *brochure* bearing the above title, and written by Dr. Andrew Wilson. This little work is in reality a series of practical exercises in elementary botany and gives simple but very pleasant lessons about a buttercup, wallflower, primrose, apple, deadnettle, tulip, daffodil, iris, pea, daisy, &c. We cordially recommend the work to all those engaged in teaching elementary botany.

GEOLOGY.

"MISSING LINKS" BETWEEN THE REPTILIA AND THE LOWEST MAMMALIA.—At a recent meeting of the Geological Society, Professor Owen, F.R.S., referred to certain Triassic reptiles from South Africa, already described by him, as showing certain resemblances to implacental Mammals. Another still more interesting indication of such resemblances is furnished by some remains from Graaff Reinet received from Mr. E. J. Dunn. These consist of some thoracic vertebræ with portions of ribs, a sternal bone, a scapula, and a right humerus, found imbedded in one mass of rock, and of a femur and phalanges, and a pelvis in another mass. Professor Owen described these bones in detail. The vertebræ were said to agree most nearly with those of Dicynodon and Oudenodon. The supposed sternal bone is of a rounded hexagonal form, and is regarded by the author as the anterior bone of the sternum proper, which is usually unossified in recent lizards, but well ossified in Ornithorhynchus. In the scapula also the author pointed out resemblances to that bone in Ornithorhynchus. The humerus in its general proportions, and especially in the great development of its ridges, was also shown to resemble the same bone in the Monotremes. The ungual phalanges were described as broad and obtuse, probably constructed to bear claws adapted for digging, as in Echidna; the femur also resembles that of the last-named animal. Professor Owen remarked upon these approximations to the Monotrematous Mammalia, in allusion to which he proposed the name of *Platypodosaurus robustus* for this animal, the humerus of which was $10\frac{1}{2}$ inches long and nearly 6 inches broad at the distal end. He also alluded to the interesting problems opened up by the study of these South African reptiles in connection with their possible relationships to the low implacental Mammalia of New Guinea, Australia, and Tasmania. Professor Seeley, after having had the opportunity of inspecting the specimens, by the courtesy of Professor Owen, had arrived at the same conclusions with the author as to the distinctness of this form. He was not able to follow the author in dividing the reptiles of South Africa into Dinosauria, Anomodontia, and Theriodontia, and asked Professor Owen to state how these groups differ in vertebral characters, that we might judge of the affinities of the fossil. All seemed to him to show remarkable mammalian resemblances, as had been pointed out by the author; but he doubted whether this implied the evolution of Mammalian orders from the South African reptiles, as Professor Owen had suggested. He alluded to the remarkable modification of the humerus found in the mole, as throwing light on the singular modifications of form which may result from burrowing habits, and suggested that as the Ornithorhynchus also burrows, and its resemblances to the fossil do not extend to the more important parts of the skeleton, the correspondence was more likely to show merely that the humeral bones were used in similar ways in the fossil reptile.

JADE CELTS.—At the meeting of the Archæological Association of Ireland, held in Belfast in the month of July, a highly polished and elaborately wrought celt of Eastern jade, found in Co. Antrim, was exhibited by Canon MacIlwaine, who read a paper on it, and others of like material. Since the close of the proceedings a very similar celt has come to light, which was discovered in the Co. Derry. A coloured engraving of both will appear in the forthcoming journal of the society. The engravings are from the establishment of Messrs. F. Ward and Co. The genuineness of both these interesting antiquarian objects appears to be capable of direct proof, which will give to them, as "Irish finds," a great amount of interest among our archæologists.

STRATIGRAPHICAL POSITION OF THE VARIOUS FORMATIONS.—The anniversary address of Mr. Kinahan, M.R.I.A., as president of the Royal Dublin Society, has been republished in the form of a small pamphlet. The author deals principally with the stratigraphical position of the various formations in Ireland, and points out the erroneous ideas which may arise concerning the thickness of strata by computing their vertical extent from the aggregate of their component parts formed in different places.

GEOLOGISING IN INDIA.—The following extract from a letter of Mr. R. Lydekker, M.A., F.G.S., the well-known Palæontologist to the Indian Geological Survey, will give a good idea of the difficulties under which science has to be pursued in the Himalayas:

SKARDO, BALTISTUN.
May 25th, 1880.

Since my last letter, I have only made ten marches, but they have been stiff ones. We had a very hard and difficult pass to cross between Astor and the valley of the Indus, at Rondù; very deep in snow and bitterly cold, being over 15,000 feet elevation From the top of the pass, where we were in mid-winter, we came in two days down to the Indus at Rondù, where we found everything like midsummer —the mulberries being ripe—and such mulberries! From Rondù we came up the valley of the Indus, to this place (Skardo), by one of the worst roads I have ever seen. One day we were at the level of the Indus with terrific heat, among the mighty precipices which border the river, and the next day swarming up a cliff to the level of the snow to avoid an impassable gorge. In places, we had to crawl along the face of a scarped precipice, with only a ledge not more than a few inches wide to stand on, or on a shaky platform made of a few sticks of timber fastened into defts on the face of the rock. This place is an open sandy plain, several miles in width, where the Shyok-Shigar and Indus rivers unite—here and there dotted with villages, full of mulberry, apricot, and apple, which form excellent camping grounds. I am off to-morrow, for a trip of seven or eight marches, up the Indus valley, to join on my work with that of last year in Ladák; thence I shall return to this place, and shall then take another trip northward, to the enormous glaciers of the Mustag mountains, which may take me about three weeks.

The Epping Forest and County of Essex Naturalists' Field-Club made an excursion to the well-known post-glacial pits at Ilford, on Saturday, July 24. These pits are famous for the number of elephant and other remains discovered there from time to time, and the members of the club, on the above occasion, had the good luck to exhume a well-preserved jaw of *Bos primigenius*. Sir Antonio Brady and Mr. H. Walker, F.G.S., delivered addresses on the zoology and geology of the district.

The late Professor Broca.—We are sorry to have to record the death of Dr. Paul Broca, the celebrated anthropologist, at the comparatively early age of fifty-six years. Dr. Broca was as well known for his surgical and anatomical researches as for his anthropological contributions. His last work was the formation of the École d'Anthropologie in Paris, with museum, library, professors, &c.

NOTES AND QUERIES.

Cats.—It is certainly not universally true that cats will not eat mice after they have been killed (p. 142). An instance occurred in which a black kitten ate up a mouse she had just captured and slain. This is not the only case of the kind which has come under my notice. The "Cleveland Leader" narrates a curious anecdote about cats and sparrows. "The other day a number of gentlemen were sitting in the detectives' room in the City Hall, when an English sparrow flew near the window, peeped in and darted away again. Captain Holzworth, who saw the little fellow, said that whenever he saw a sparrow it reminded him of a little scene which occurred in his yard one cold day last winter. The sparrows, it seems, ascertained the fact that there was a knot-hole in the gable of his house, and took advantage of their knowledge by taking possession of the hole and a portion of his attic, where they passed the winter as snug as bugs in a rug. The captain's wife has a warm spot in her heart for birds. So when the ground was covered with snow, and the little fellows ran a risk of starving to death, Mrs. H—— would sweep away the snow and spread upon the ground a fine repast of crumbs. The sparrows soon learned to depend upon her, and told their friends what a fine landlady they had. In consequence hundreds of them congregated daily about the captain's house and partook of his charity. Close to the spot where the birds were usually fed was a pile of bricks, and upon this pile the captain's cherished mouser used to station herself for the purpose of watching for prey. As soon as the birds would get comfortably settled about the crumbs the cat would pounce upon them and invariably get a tender sparrow for dinner. Finally the birds became accustomed to the cat's mode of procedure and would be on the watch whenever they were feeding. They were so alert that the cat would hardly get ready for a spring before they were up in the air and out of danger. One day they were eating as usual, and the cat as usual watching them. Like a bolt of lightning the mouser jumped into their midst, but they were too quick for her, and escaped unhurt. Miss Tabby, not discouraged, mounted the pile of bricks again and awaited their return. The sparrows, after flying about for some time, finally settled upon the fence at the foot of the lot, where they held a long and interesting confab. After chattering away for several minutes they cautiously returned to their crumbs and resumed their eating, keeping all the while a sharp look-out for the enemy. After the cat had become satisfied that they were too much interested in satisfying their appetite to think of her, she made another spring. The birds were up in an instant, and instead of flying away as usual they formed themselves into a hollow square and charged upon the foe. Some got upon the cat's back and scratched and pecked with all their might; others flew right into her face, while the balance made it interesting in the rear. The cat was so surprised at first that she stood unable to move. The birds became more and more infuriated and fought such a savage battle that they drove the foe down the garden path on a full gallop and under the barn. They returned to their feast and were left to themselves the balance of the winter, the cat making herself scarce when they put in an appearance. This, if not true, is *ben trovato*.—*Jane Axom*."

Can a Parrot reason?—With reference to the query in your last number, "Can a parrot reason?" your correspondent seems to have overlooked the great probability that the words, "It's a bad job. Puir body, puir body!" were used—perhaps repeated several times—by the man after he had murdered the woman, or by any one who may have entered the room after the commission of the crime. If this, as is not unlikely, were the case, the parrot might have easily caught up the phrase.—*Harry V. Barnett.*

Cirl Bunting.—Does the Cirl Bunting breed as far north as Aberdeen, or not? All the books on birds I have seen say it does not breed in Scotland at all. —*E. F. B.*

Longevity of Cats.—I believe Mr. Timbs estimates the average life of a cat at fifteen years. I have a female cat nineteen years old, and this spring gave birth, after an interval of about five years, and brought forth two kittens. Is it not a very unusual circumstance? Perhaps some of your readers will kindly discuss the question.—*Willing, Kent.*

Flight of Swifts.—About seven o'clock on the evening of the 1st of June of this year, whilst standing near Pentire Point on the north coast of Cornwall, I noticed that there were an unusual number of swifts flying about, and on watching them more attentively I found that there were several hundreds of them spread out in the shape of a square, coming from the west and directing their course due east. Until reaching the land they were flying very high, but then they flew much lower, some only a few yards from the ground, and some came so close to me that I might have almost knocked them down had I had a stick. They did not appear to be at all fatigued, and were flying in a straight course, not stopping to catch flies, &c., of which there were a great number in the air, as might be seen from the busily engaged swallows. The above may be of interest to some of your readers, who might be able to tell me from whence they came.—*H. B. Runnals.*

The practical Use of the Microscope.—It has been my impression for some time that the microscope might be used for more practical purposes than is usually the case, as for instance in the study of wool, its nature, quality, &c. As a learner, I wish to make this subject my study, but am in a difficulty as to the proper manipulation of the instrument, how to detect the differences between the best and the worst kinds of wool, and betwixt vegetable productions and the real article itself after each has been acted upon by the different processes of manufacture. Perhaps some of your numerous correspondents may be able to throw a little light upon the above, for which I shall be exceedingly obliged, and to you also, Sir, if you will kindly insert the above, in such condensed form as you think fit, in your valuable periodical.—*J. T. G.*

"Carnation Grass."—In reply to Mr. F. H. Arnold's query as to which carex is indicated by this name (page 147) I would say that in Shropshire it is *Carex glauca.* While on the subject of plant names I may say that while botanising recently on Whinall Moss (Salop) with a friend, we came upon an original character in the person of an old man cutting turf for use as fuel, who called the two species of cotton grass that grow most abundantly on the moss, viz., *Eriophorum vaginatum* and *E. polystachum*, by the name of "Davy white-yeads" (i.e. heads), a name I had not before heard used. "We callen um Davy white-yeads."—*W. Phillips.*

Rookeries and the Tipula Grub.—Some of your agricultural readers may be interested in the following information on this subject, an account of which was lately issued by the Royal Agricultural Society, and is apparently going the round of the press in the country. About ten days ago a rook from amongst a flock which were feeding in a meadow here, was shot for the purpose of ascertaining what they were so busily looking after. In its mouth, or pelican-like pouch, in which they carry food to the sitting hens and to their young ones, were found twenty-one Tipula grubs which no doubt were intended for young which had escaped rook-shooting. I find rooks in an hour, on an average, visit their young in nests about four times; and if we take that as a fair specimen, eighty-four of these grubs are destroyed per hour, for each nest. Many fields of corn are very "patchy," on account of these grub pests; one piece of wheat near here is probably more than half taken; in some places not a blade of wheat is to be seen for yards, and I find the ground is full of these grubs which can be seen on stirring the surface. This plague is in a great measure owing to the scarcity of birds, especially of fieldfares and redwings, during the past winter. The starlings are having a rare feast, and may be seen carrying these pests of grubs in the point of their beaks in all directions to their young.—*E. Edwards.*

A Colony of Frogs.—Some weeks ago I was out beetle-hunting, and on pulling up the turf at the foot of a wall, there was brought to light a sort of colony of young frogs, which much excited my curiosity. In the centre of the group there was a solitary toad of the same size as the frogs, all of which were small. They dispersed too suddenly to permit of my ascertaining their precise number, but there must have been a dozen or twenty. Is this circumstance merely accidental owing to the situation being peculiarly favourable to their well-being and discovered and appropriated by each: or is it the habit of the animal to congregate in this manner?—*C. F. Y.*

Climbing Powers of the Toad.—From Helen Watney's description (page 165) one might be led to suppose that the toad climbed up steps, &c., by means of an adhesive power, having its origin in the rough surface. My experience leads me to consider that this is not the case, for I have been able to keep restless toads fast prisoners, by simply placing them in a fairly deep flower-pot. But I have often seen toads climb up steps and out of shallow pots, by standing upright upon their hind-legs, hooking the hands, or even one only, over the top ledge, and then walking up the wall, or side of the pot, as it were with their feet. I should say that with a little practice a toad might by these means climb a wall, the projecting edges of the bricks affording holding ground for the hands.—*Edward B. Parfitt.*

Emmets or large Ants.—Why are they always found in companies, going contrary ways? I have watched them here (Bournemouth) with great interest, and am surprised at the weights they carry. I have seen two convey a pieee of stick, as we should a basket of washing, and when the load is heavier, it is shared by two or three more. Any information would be gratefully received.—*A. B.*

Woodpeckers' Eggs.—Having added to my collection of eggs, green woodpeckers' eggs, blotted with brown or yellowish brown, I shall be obliged if any of your readers would inform me if this be of rare occurrence.—*Geo. Wheldon.*

Queer Nesting-place.—I have just returned from a country house where I have seen a bull-finch's nest in the queerest position that I am sure bull-finch ever built in. The "Bullys" are great pets of the lady of the house, and fly about her room, frequently alighting on her shoulder to receive seeds from finger-tip and lips. Over the door of this room, on the inside, is fastened a buck's skull with the antlers attached, and it is within this skull that the "Bullys" have elected to build their nest, perfectly undisturbed by the frequent opening and shutting of the door beneath. In this strange receptacle for her coming brood, the hen bird sits assiduously, encouraged in her maternal duties by her mate on the neighbouring antlers.—*W. Hambrough.*

GLOW-WORMS.—Do they emit heat as well as light? Can they increase or diminish their light at pleasure? I have kept some for a month, and their light becomes nightly less brilliant; they also produce a slight stinging or burning sensation when crawling over the hand.—*A. B.*

SPIDER-KILLING WASPS.—The following is an interesting extract from a lady's letter, dated Pieter Maritzburg:—"In a corner of my bedroom window a bit of architecture has been going on which has much interested us all. A pair of slender wasps, with golden bodies and purple wings, came and built, bit by bit, most industriously and fast, seven tunnels of clay; the male insect worked, he fetched the moist pellets of clay from a distant puddle outside the garden. These he worked with mouth and paws into shape most beautifully. When the first tunnel was complete the female went in and laid her eggs at the bottom. Then together they flew away, and came back with a spider, half killed (that is, stung to a deadened state, but so that it would keep and not putrefy), and poor spider was tucked into the tunnel. The pair worked on hunting for spiders all day and popping them in, and night surprised them too soon; so the male fetched a pellet of clay and made a perfect door, closing up the hole from all intruders, and they disappeared. In the morning, quite early, I opened the shutter without which they could not get at their work, and very soon they arrived. They cut and tugged at the still damp door, till it came away clear and left the open arch, and several more unfortunate spiders were added to the larder of the future grub, laid in embryo at the end of the tunnel. Then it was closed with fresh clay, and made doubly secure by an extra thickness of daubing. And immediately, without waiting to rest, another tunnel was built side by side with the first. For days, I think quite a fortnight, we watched their steady work, until seven of these wonderful tombs—or should I say habitations?—were filled and closed. After the insects had quite finished and gone altogether, leaving the whole daubed together and cemented into one large lump of various shades of clay, I cut it out of the window, and have got it in a basket covered with net, so that we may see the exit of the young creatures that are to eat through all those spiders and break their way into the world some day. I opened one tunnel lengthwise that we might see and count the spiders—there were fifteen in it! Fat-bodied little garden spiders of various sorts; one was too big to push in, so they had cut its legs off at the roots! We waited just a little too long before digging an opening into that wasp's mud castle. What we found was this: a long transparent brown case, and within it a wasp perfectly formed, but colourless. Not a trace of the fifteen spiders! And these must have been eaten by the little grub which came out of the egg—probably the egg was laid in the fat body of a spider; and when the spiders were all eaten we can only suppose the grub went through a change and came into the wasp, but how that beautiful case was formed over it I cannot imagine. You could see the creature inside perfectly as if it were made of glass, and the whole thing exactly fitted the tunnel of clay. After a few more days, another tunnel was opened, not by us, but by the perfected wasp itself. A round hole at the end was cut as if with a sharp instrument, and out walked the pretty creature, slowly and sleepily. Then it walked up on the top of the clay mound and spread its wings in the sun, and looked out at the world quite ready to take its place at once on the business of life. We uncovered the net from the basket and let it fly; and next season I shall look out for another such erection, and open the tunnel earlier, so as to see the grub when half through its larder of cold meat. We saw another and much larger sort of wasp the other day running along with a very large fat caterpillar which it had deadened; it held it by the head in its mandibles and the body trailed along under the whole length of the wasp and out behind, and the caterpillar was so fat that the wasp had to stride along on tip-toe to carry it at all. At last it stopped—left the body a moment, and began like a terrier to scratch at a hole: the loose earth fell away at once, and was evidently only banked up to hide the hole from intruders. The wasp ran in and disappeared; presently out he came again, backwards, with some earth which had fallen in; and he did this several times, throwing out all the earth which had tumbled in. Then he ran and inspected the body of the caterpillar, ran all round it gleefully, and dragged it nearer to his hole. Then we laughed to see the clever fellow, sailor-like, turn himself round and pop down the companion, tail first; and then peeping out, he reached out his head and arms, and seizing the caterpillar, pulled it down after him, into what seemed a long gallery, leading a great distance. No doubt an egg was laid in the body of the caterpillar for the future grub's sustenance."

SOME COMMON WADING-BIRDS (p. 152).—Dr. Keegan in his interesting paper on the heron speaks rather disparagingly of cooked sea anemones, but Mr. P. H. Gosse in his "Aquarium" says that the common sea anemone, *A. mesembryanthemum*, when boiled for ten minutes, is excellent eating.—*W. W. King.*

LOUIS D'OR.—Can any one kindly tell me the scientific name of the Humming-bird known in the French West India Islands (and possibly also in French South America) as the "Louis d'Or"? Or can any one refer me to any description of the bird so called?—*X.*

BIRDS' EGGS.—Many of the eggs of our smaller birds which have a pinkish tint, owing to the colour of the yolk showing through the partially transparent shell, on being blown become perfectly white (on the unspotted part) and almost unrecognisable by one who is well acquainted with them in the nest. I thought the eggs would be much better as cabinet specimens if the colour were restored, and this I have succeeded in doing. I use Crawshaw's scarlet dye, one grain to the fluid ounce of spirits of wine; this is quite strong enough, and for some eggs, as those of the long-tailed tit, two-thirds of this strength would be sufficient. After having treated the eggs with the corrosive sublimate solution, and allowed them to thoroughly dry, say next day, I wash out the shell quickly with the coloured solution, introduced by a small glass syringe with the point drawn out as fine as possible by means of a blowpipe flame, and remove it as thoroughly and as quickly as possible after the whole of the membrane has been wetted by it. Probably many other of the aniline preparations would be found quite as suitable. The whole of the dye does not dissolve in the spirit; the colour is very quickly extracted.—*W. G. Tuxford.*

ANTS KILLING SNAKES.—Your correspondent, Y. V. S., will find a very interesting account of ants in the Rev. J. G. Wood's admirable little work, "Strange Dwellings;" also on reference to "Maunders' Treasury of Natural History," under the name of Ants and Driver Ants. For the benefit of the readers of SCIENCE-GOSSIP who are not able to refer to the above works, but whose interest in the subject may be as lively as that of Y. V. S., I will quote a few lines, with your permission, in answer to the query, "Do ants really kill snakes?" The common European ant does not appear to be so ferocious a creature as many that are found abroad. I have never heard or read any account of the little creature so often met with in our gardens and houses attacking and killing anything more than the weaker insects. When they meet with an insect which they are singly incapable of mastering, they communicate with others, and presently several of them will join in the attack, which generally ends in a victory for the ants, unless the assailed is able to move off and get clear of the enemy. The Driver Ant, a species of Hymenopterous insect belonging to the family of ants, is perhaps the most terrible of all. Its name is Anomma arceus, and is found on the west coast of Africa. Dr. Savage, an American missionary on the west coast of Africa, gives a very interesting account of the Driver Ant in a paper published in the "Transactions" of the Entomological Society for 1847. He says, "I know of no insect more ferocious and determined upon victory. They fiercely attack anything that comes in their way; 'conquer or die' is their motto. . . . The dread of them is upon every living thing. It may be literally said that they are against everything and everything against them. . . . They will soon kill the largest animal, if confined. They attack lizards, guanas, snakes, &c., with complete success. . . . They have been known to destroy the *Python natalensis*, our largest serpent. When gorged with prey it lies powerless for days; then, monster as it is, it easily becomes their victim." The Rev. J. G. Wood says, "The large iguana lizards fall victimst o the Driver Ant, and so do all reptiles, not excluding snakes. It seems from the personal observations of Dr. Savage, that the ant commences its attack on the snake by biting its eyes, and so blinding the poor reptile, which only flounders and writhes helplessly on one spot, instead of gliding away to a distance. . . . Fire will frighten almost any creature, but it has no terrors for the Driver Ant, which will dash at a glowing coal, fix its jaws in the burning mass, and straightway shrivel up in the heat." Darwin, in his "Voyage of a Naturalist," records having witnessed one day, at Bahia, a swarm of small ants on the move. "Lizards, spiders, cockroaches, and other insects were flying in all directions, and the efforts which the poor little creatures made to extricate themselves from such a death were wonderful."—*Walter T. Cooper.*

Fowls at Aden.—It may not be generally known that the cocks at Aden commence to crow about 10 P.M., which they manage to keep up the whole night, much to the annoyance of new-comers to that station. The fowls of Aden are of a very small size and the cock has a peculiar shrill crow of its own unlike any other crow that I have ever heard.—*J. H.*

Weaver Birds and their Nests.—Permit me, in reply to your correspondent C. C. Walker, to say that all the male weaver birds build nests, apparently for their own amusement; these structures are called "toy" nests, as distinguished from the nests built by the females for the purpose of rearing their young broods; the toy nests are built whether females be present or not. I have a "Christmas-tree" quite covered by the work of two red-billed weavers. About three years ago I showed at the Crystal Palace a large toy nest built by a male oriole or giant weaver; it was constructed of grass, and was a wonderful specimen of bird architecture.—*M. T. Greene.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

To Anonymous Querists.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

B. M. Watkins.—Thanks for your note concerning carnation grass and specimens.

R. Wood (Carlisle).—The stick-like specimens found in a trough of water are the cocoons of some insect, we do not know which, but will ascertain. The lists of desiderata for Botanical Exchange Club remain as before.

R. R.—Your query came too late to be answered last month. (1) Sach's "Text Book of Botany," edited and translated by Messrs. Bennett & Dyer, and published at the Clarendon Press at £1 11*s.* 6*d.*, is the best work on botany generally. (2) Hooker's "Student's Flora of the British Islands," price 10*s.* 6*d.*, is the cheapest and handiest work on British botany. Hayward's "Botanist's Pocket Book," price 4*s.* 6*d.*, is an admirable companion to the English field botanist.

J. H. H. (Lisbellaw, Enniskillen).—It is the *Littorella lacustris* (L.), more commonly known as the shore-weed.

J. H. B. (Durdham Down, Bristol).—The example sent was the Lucerne (*Medicago sativa* (Linn.). The best book treating both upon garden and wild flowers is Grindon's "British and Garden Botany," published by Routledge & Co.

T. B. (Newquay, Cornwall).—No. 1. Sea rocket (*Cakile maritima*). No. 2. Sea purslane (*Arenaria peploides*), or the *Honkenja peploides* of most books.

A. S. T. (Beechwood).—It is the *Rosa arvensis*, or the common field-rose, but without either flower or fruit we can never say with great certainty. The roses in our June number were the *R. canina* of Linné, which is now believed to cover many distinct forms.

A. B. (Croydon).—It will be the broad-leaved form, *Potamogeton major* (Fries.): yet it has the three veined leaves of *P. rutilus* (Wolfg.). It is worthy of further investigation.

Salix (Emsworth).—No. 1. *Salix rugosa* (Leefe). No. 2. *S. triandra*, Y.; *amygdalina* (L.). No. 3. *Salix Russelliana*, the one with blackened leaves. No. 4. (Doubtful.) We only give the above after careful comparison with authentic specimens; we should be glad to see perfect specimens, that we could speak with more certainty.

A. U. Erskine.—The insects are the well-known "death-watch" beetle (*Anobium striatum*). The best way to arrest their depredations is to inject spirits of wine (in which corrosive sublimate has been dissolved) into their holes, or otherwise to brush the liquor well in.

J. C. J.—Thanks for the specimens of the blue pimpernel from Loxley, Warwickshire.

C. E. J.—The piece of sea-weed you sent us (Griffithsia) had a good many objects "attached" to it, such as small sponges, hydrozoans, &c., but the principal objects were the spat of some bivalve mollusc, probably of Modiola.

W. Rose.—The "bud-like processes" are *adventititious* buds.

Rev. Dr. McI.—"Article" will appear in our next issue.

A. M. P.—I have always found blue pimpernel as a garden-weed. I have found it both in Leicestershire and Hampshire. In the latter county I saw in a cottage garden quite a bed of it, and very lovely it looked.—F. L. St. A.

H. C. Brooke.—Is not the moth described by your correspondent, H. C. Brooke, the ghost swift (*Hepialus humuli*)? *Vide* "Natural History of British Moths," by F. O. Morris, vol. i. page 32.—J. Sinel.

C. E. Michelson.—In answer to this correspondent's query concerning the feeding of small fish, I beg to state that I have kept minnows for several months, only changing their water once every day.—W. M. Wilcox.

J. Wheldon, jun.—Write to the publisher of Science-Gossip, who will procure for you the volumes of Jardine's "Naturalists' Library" you require.

A. Marshall.—We are not aware that the second volume o "Lives of Eminent Zoologists" ever appeared.

J. Anderson, jun.—The "thunder-blight" insects are *Thrips cerealium*, natural order Thysanoptera.

F. W. Savage.—Duncan's "Exotic Butterflies and Moths" (Jardine's Naturalists' Library edition) may be obtained from the publisher of this journal.

K. B.—Dr. Cooke's "Fern Book for Everybody," published at 1*s.* by Warne & Co., will suit you.

E. A. BRUNETTI.—Get Wood's "Insects at Home" (Longman), or Staveley's "British Insects" (L. Reeve & Co.). Staveley's "British Spiders" (L. Reeve & Co.), will answer the purpose of your latter query.

F. NEWTON WILLIAMS.—See the two articles, "Aids to the Choice of Books on Botany" (by Bernard Hobson), which appeared in SCIENCE-GOSSIP last year. Therein you will find all the information you seek.

W. GREGSON.—You may obtain the "Reports of the American Agricultural Commission," and also Dr. Hayden's "Report on the Geology of the Territories," from Mr. W. Wesley, Natural History bookseller, Essex Street, Strand, London.

A. G. WRIGHT.—There can be no doubt your pottery is Romano-British. From the sketch we should judge it to be some domestic utensil.

A. LEINAD.—We do not think the "moss" could have done the mischief to your aquarium; but we cannot tell what plant the "moss" is. Send us a bit. Perhaps you have too many animals in your aquarium.

EXCHANGES.

FOSSILS from the mountain limestone, coal measures, and silurian rocks, offered for characteristic basaltic, or trachytic rocks, or other minerals.—F. Ashton, 46 Lingard Street, Moss Side, Manchester.

SEVEN volumes of "Nature" offered for Anne Pratt's "Wild Flowers, Grasses, and Ferns."—Elizabeth Edwards, Mayfield House, Newcastle, Staffordshire.

VARIOUS species of Æcidia to exchange for other micro-fungi; send list of offers and requirements to Henry J. Roper, 5 Lausanne Road, Peckham, S.E.

A COLLECTION of minerals, fossils, reptiles, shells, snails, from Portugal, 35 species Portuguese and Madeira ferns pressed, 80 species lichens, 90 mosses, 85 sea-weeds, hepathics, a collection of gramina, some eggs of Portugal, some insects, zoophytes, starfish, echinus, &c., Portuguese old coins and archæological objects, for British birds' eggs, and fossils and minerals classified.—Apply to F. Newton, care of J. Newton, Oporto, Portugal.

WANTED, "Babington's Manual," thin paper pocket edition, complete, clean. State edition and net price post free, to B. Hobson, Tapton Elms, Sheffield.

BEETLES. Wanted to purchase, English and foreign works on the Coleoptera, and odd volumes of journals containing monographs. State lowest price.—E. D. Marquand, Hea, Madron, Penzance.

SCALES of boar-fish, *Capros Aper*, mounted for examination with spotlens, for exchange. Send list to E. Matthews, 40 Ponsonby Place, Vauxhall Bridge, London, S.W.

FOREIGN Lepidoptera, Coleoptera, Hymenoptera, &c., in exchange for other insects, books, or apparatus.—F. W. Savage, University School, Hastings.

OFFERED L. C. 7th ed., Nos. 25, 135, 201, 183, 217, 219, 226, 233, 234, 293, 433, 709, 923, 1014, *Sisymbrium pannonicum* (Jacq.), and many others. Send lists for exchange.—A. E. Lomax, 41 Church Road, Tranmere, Birkenhead.

EGGS of guillemot, eider-duck, Arctic, common and Sandwich terns, herring-gull, lesser black-backed gull, wood wren, garden warbler, blackcap warbler, treepipit, lesser redpole, black-headed bunting, for other eggs.—Thomas H. Hedworth, Dunston, Gateshead.

WANTED, slides of diatoms (good), for slides of *Amphiroa Alata*.—E. W. Burgess, 35 Langham Street, W., London.

SIDE-BLOWN eggs of hobby, kestrel, pied flycatcher, dipper, wheatear, grasshopper, warbler, wood warbler, capercaillie, golden plover, oyster-catcher, redshank, C. sandpiper, dunlin, curlew, lesser tern, lesser black-backed gull, black-headed gull, &c., in exchange for other side-blown eggs not in collection.—J. Lancaster, 15 Henry Street, Carlisle.

FORAMINIFERA, marine algæ, with diatoms *in situ*, characteristic animal and vegetable hairs, &c. (well-mounted), for other good slides or material. Lists exchanged.—J. Ford, The Uplands, Tettenhall, Wolverhampton.

WANTED, in exchange for southern lepidoptera, northern or continental specimens. Lists exchanged.—E. Andrews, Apsley Lodge, Rosherville, Kent.

WANTED to exchange side-blown eggs (one or two holes), of rook, jackdaw, magpie, doves, and lapwing, for micro-slides, animal or vegetable.—G. Forden, Sandon, near Stone, Staffordshire.

DOZEN of young plants of Vallisneria, for half-a-dozen microscopical sections.—John Simm, West Cramlington, Northumberland.

SUPERIOR binocular microscope, with latest improvements and polariscope, &c., no objectives, cost £18 18*s*. What offers.—S., 364 Kennington Road, S.E.

A COLLECTION of 400 micro objects in case; what offers for the lot or exchange. Some for injected slides.—S., 364 Kennington Road, S.E.

WANTED, "Tenby," by P. H. Gosse, will give "Devonshire Coast," by same author, or cash in exchange. Charles A. Grimes, 7 Crafford Street, Dover.

WANTED, British wild flowers named.—Exchange of them or ferns.—Miss Ridley, Moy Laggan Lodge, Kingussie, N.B.

WANTED, two eagle's eggs, two purple emperor butterfly's, two death-head moth's.—R. Darling, Eyke Rectory, Woodbridge, Suffolk.

SOME good birds' eggs, to exchange for others; a small compound microscope with live box, glass for water, six slides, and one and two inch powers, and several accessories for mounting, with about three dozen thin glass covers, for mounting both round and square, with some best ground-edge slips for good birds' eggs or cash.—S. E. W. Duvall, 4 Buttermarket, Ipswich.

WANTED, Neolithic (polished) celt; will give in exchange bones from Cambridgeshire fen.—A. G. Wright, Newmarket.

FIRST-CLASS mounted slides given in exchange for the following: Peterhead deposit, Premnay and Cantyre plat, good gathering of *Navicula rhomboides*, *Pinnularia alpina*, *P. lata*, or animal fleas and parasites.—J. B., 24 Tilson Road, Tottenham.

WANTED, rubbings of monumental brasses, coins, curiosities, &c., in exchange for Thanet sand fossils, &c.—F. Stanley, Margate.

Potamogeton trichoides (Cham.), for *P. nitens*, *P. decipiens*, *P. sparganitolius*, or *P. filiformis*.—A. B., 107 High Street, Croydon, Surrey.

FOR sale or exchange, Baker's Medical Microscope, three eye-pieces. Wanted, Collings' Histological Micro complete.—W. Rose, Braintree.

GOOD specimens of *Lim. Burnetti* (from Loch Skene, Dumfriesshire), *Vertigo alpestris* (from Patterdale, Westmoreland), *Vertigo minutissima*, and *Helix obvoluta*, offered for *Vertigo substriata*, *N. pusilla*, *Testacella haliotoidea*, *Geomalocus maculosus*, or numerous other desiderata amongst the British land shells.—W. Sutton, Upper Claremont, Newcastle-on-Tyne.

Duplicates L. C. 7th ed., 6, 14, 41, 56, 59, 67, 93, 117, 130C, 132, 140, 135, 141, 155A., 156, 173, 205, 220, 259, 271, 273, 277, 282, 283, 303, 350, 351, 368, 384, 407, 468, S. and E., 486, 402, 550, 552, 555, 574, 609, 657, 735, 738, 821, 841, 857, 861, 863, 865, 893, 923, 932, 942, 963, 974, 1003, 1017, 1028, 1051, 1053, 1069, 1138, 1149, 1219, 1244, 1258, 1264, 1306, 1318, 1337, 1387, 1405, 1419, 1421, for others.—G. Robson, 92 Cranbourne Street, Leicester.

L. C. 7th ed. Wanted Nos. 309, 326, 613, 553, 557, 562, 660, 661, 663, 669, 672, 702, 703, 716, 722, 726, 815, 870, 894, 935, 1019, 1032, 1138, 1143, 1246, 1204, 1221, 1225, 1230, 1231, 1235. Good plants in exchange.—J. A Wheldon, 9 South Street, Scarborough.

BOOKS, ETC., RECEIVED.

"The Natural History of the Agricultural Ant of Texas." By H. C. McCook. Philadelphia and London: J. B. Lipincott & Co.

"A Dictionary of English Plant Names." By James Britten, F.L.S., and Robert Holland. Part ii. London: Trübner & Co.

"Notes on Game and Game Shooting." By J. J. Manley, M.A. London: "Bazaar" Office, Strand.

"Animal Magnetism." By Rudolf Heinhain, M.D. Translated by J. C. Wooldridge, B. Sc. London: C. Kegan Paul & Co.

"The Heart and its Actions." London: David Bogue.

"A Treatise of Fysshynge with an Angle." By Dame Juliana Berners (Reprint). London: Eliot Stock.

"Feuille des Jeunes Naturalistes." August.

"American Naturalist." August.

"Angler's Note Book." No. 12.

"Le Monde de la Science et de l'Industrie." August.

"The Book of the Rabbit." By L. N. Gill. "Bazaar" Office.

"American Journal of Microscopy." July.

"Portfolio of Drawings of Living Organisms." By Thomas Bolton.

"Midland Naturalist." August.

"Practical Fisherman." Parts VIII. and IX.

"British Dogs." Part XIII. "Bazaar" Office.

"Fancy Pigeons." Part IV. Ditto.

"Ben Brierley's Journal." August.

"Land and Water." August.

"Animal World." August.

"Journal of Applied Science." August.

"Good Health." August.

"La Science pour Tous." August.

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 9TH ULT. FROM:—T. B. W.—J. F. R.—E. E.—F. N.—W. T. G.—R. L.—J. T. A.—T. P. B.—A. L.—M. H. R.—A. B.—W. R.—Dr. H. J. J. L.—R. S.—S. E. W. D.—W. D.—P. K.—A. G. W.—F. S.—J. S.—J. B.—G. S.—C. A. G.—W. G.—B. H.—K. B.—A. N. E.—F. L. St. A.—A. M.—D. M.—E. D. M.—D. B.—F. N. W.—G. R.—S. E. P.—E. L.—G. A. W.—W. D. S.—E. A. B.—F. S. L.—F. W. S.—R. H. A.—A. E. L.—J. L.—J. W., jun.—T. H. H.—E. W. B.—G. G.—J. C. J.—H. P. P.—Dr. W. M. I.—E. F.—J. F.—E. A.—W. E. M.—G. F.—W. M. W.—G. C. G.—G. D.—H. P. M.—C. E. J.—O. V. A.—P. S.—&c.

THE POLLAN, OR FRESHWATER HERRING

OF LOUGH NEAGH (COREGONUS POLLAN, Thompson).

By W. MACILWAINE, D.D.

ON reading the highly interesting and suggestive paper by his Grace the Duke of Argyll ("A few Weeks on the Continent"), in the "Contemporary Review" for July, I was particularly struck with what appeared to me a coincidence between a portion of the fauna of Italy and that of a well-known Irish locality, and, on a more attentive consideration, this coincidence has appeared to me sufficiently remarkable to warrant my drawing the attention thereto of the readers of Science-Gossip.

The Duke's attention, when visiting Venice, was attracted to a remarkable species of gigantic prawn, (*Nephrops Norwegicus*), there exposed for sale, and on inquiry, its habitat was traced to the northern extremity of the Adriatic. On further pursuing his investigation respecting the occurrence of this crustacean in so unexpected a locality, his Grace goes on to observe, "Is it possible that the Adriatic may be a portion of the Mediterranean Basin, which at one time had a communication with the northern seas, and that this species is a survivor of a northern fauna which has been destroyed in the warmer waters of the rest of the basin?"

The distinguished writer of the paper proceeds to give his own belief, "That this survival of an extinct fauna may be referred to a time when the waters of the North Sea found entrance into the Adriatic over what are now the lower passes of the Alps, and this time belongs to the period of the glacial epoch, when we know from other evidence that there was a submergence of the land in our own islands to the extent of at least 2000 feet."

Further on a fact is mentioned in connection with the fauna of the Italian lakes, namely, the occurrence of "*a small freshwater herring* (Algoni), larger than the sardine, but a good deal smaller than the pilchard, which, according to Dr. Günther, of the British Museum, is identical with the twaite-shad (*Clupea pinta*)."

The following is the inference drawn by the Duke: "The Algoni is, therefore, a survivor of the Italian lakes, from the time when these lakes were actually arms of the Adriatic Sea which occupied the Lombard plain, and were at least accessible from that sea by rivers which presented no obstacle to the migration of that fish."

These remarks at once recalled to my recollection a half-formed theory, in which, during years long past, I had ventured to indulge respecting Lough Neagh and its well-known Pollan. The striking resemblance, both in its outward appearance and structure as well as in its habits, have, as all know, conspired to give it the name of freshwater herring. These coincidences, recorded by W. Thompson in his "Natural History of Ireland," vol. iv. page 168, are so many and so apparent, that they must occur to the most ordinary observer. The gregarious habits of this species, its appearance at stated seasons in certain parts of the lake in enormous shoals, the parts of the lough frequented by it, and other herring-like peculiarities, which afford to the fishers of Lough Neagh their ready means of capture, all conspire to remind us of the genuine herring of the sea (*Clupea harengus*). Thompson refers, though not without hesitation, to the occurrence of the Pollan in other Irish lakes, Loughs Erne and Derg, and probably in Lough Corrib. This is, however, doubtful, and the dissimilarity which that acute observer and distinguished naturalist detected between the Pollan of Lough Neagh and other somewhat similar fish met with elsewhere in the south and west of Ireland, would seem to have led him to designate the former a distinct species. It may here be observed that species of fish allied to, if not identical with, those inhabiting the sea, have been discovered in other European lakes, and under conditions somewhat similar to those observed by the Duke of Argyll, attending the occupants of the Italian lakes. It is, however, unnecessary here to pursue the subject further than to point out the singular coincidence between Lough Neagh and the latter. I am induced to make this attempt very much in consequence of the observation which follows in the Duke's paper.

"Every case," his Grace remarks, "in which fish now confined to fresh waters, whether fluvial or lacustrine, can be identified as a species with what has been marine, is of the highest interest in a zoological and geological point of view." The close resemblance between the lacustrine species of the Italian lakes and the Pollan of Lough Neagh has already been noticed. It now remains that the geological features of the latter be reviewed.

Lough Neagh, the most extensive lake in the British Islands, or as indeed it might be termed an inland sea, occupies a nearly central position in the vast area of the volcanic beds, or sheets of lava, once extending over a surface of about 1200 miles, identical with the entire county of Antrim, together with portions of Londonderry and Tyrone, and reappearing in the Scottish Hebrides and Faroe Islands. Geologists of the highest eminence, in tracing the history of this enormous overflow of molten lava, have assigned it to several periods, including three stages: the first during the later Eocene, the second during the Miocene, and the latest coetaneous with the still later portion of the Miocene, and characterised, according to Professor Hull, "by more solid sheets of basalt and numerous vertical dykes."

It may readily be conceived that an enormous lapse of duration must have intervened between the earliest and the latest periods of this exercise of volcanic energy. At a later stage of the process, as Professor Hull observes: "The country was submerged beneath the waters of the inter-glacial sea, which deposited the sands and gravels which overlie the lower boulder clay; and subsequent emergences during the stage of the upper boulder clay, together with atmospheric agencies, constantly at work, the newer land has been exposed, have moulded the surface into the form which we now behold."

This volcanic action has written its history in the escarpments of the basaltic plateau, which reveal the beds of new red marls, lias, chalk, the basaltic sheets of the Miocene age, and the raised beaches discernible on the shores of Lough Neagh.

The agency of water is discoverable over the vast area, plainly indicating that the waters of the Northern Sea once covered the whole. The action of rivers which have disappeared has been traced here, one of which has, with much probability, been connected with another, the bed of which has been discovered under the Scaur of Eigg, one of the Hebrides, wherein have been found fragments of the silicified wood for which Lough Neagh has long been remarkable.

May it not, in such a state of things, be readily conceived that amidst the upheaving of earthquakes, while the masses of basalt were forced upwards, and the floods of lava were poured successively over the plateau above indicated, and when vast subsidence occurred where Lough Neagh now appears, that which was then a marine sheet of water assumed the lacustrine form which it now presents, and that along with it were included shoals of herrings, which by the adaptive power of nature now survive as the Pollan of Lough Neagh?

Experts and adepts in geological fauna will be better qualified to pronounce on the feasibility of the above hypothesis. It appears, however, to the writer to accord in a very remarkable manner with the observations of the Duke of Argyll on the species of fish which are found in the Italian lakes, as well as with the geological theory to which their occurrence therein has given rise, and which is alluded to in his Grace's valuable paper.

WILD FLOWERS AND THEIR NAMES.

As F. H. Hn. asks for information as to the best means of discovering the names of flowers, perhaps the following remarks may be of some slight use to him. Any one who has not reached a state of scientific petrifaction, will admit that there are many ways of attaining this object, each possessing its special advantages. What is the best method in any case depends on the amount of knowledge of which the inquirer is master. For children, and those who know nothing of botany, the simplest plan is, of course, to compare the plant with a coloured illustration, such as those contained in Pratt's "Wild Flowers," published by the Society for Promoting Christian Knowledge at 16*s*. The next simplest plan is to use artificial keys. Those in Bentham's handbook are excellent, and the edition *without* illustrations is published at 12*s*. The illustrations may be had separately. There is an advantage in this, as the species can first be determined without the help of the illustrations, the use of which many consider unscientific, and the result may be afterwards checked by their aid. After a little practice the tedious process may be shortened, by referring at once to the key to the *genera* of the order, or even to the key to the *species* of the genus to which the plant belongs. It is in the completeness of the keys that the superiority of Bentham chiefly consists. The Linnæan system is in fact an artificial key. Hardly any "Floras" are now arranged in accordance with it, but the older editions of Babington's Manual contain it in the form of a concise key, and many secondhand "Floras" on the same plan may be had. As far as I am aware, there is no artificial key in English on a plan which may be fairly called "thorough." Authors undertake to write one, but have not the courage to do it. They have a secret liking for the natural system, and must give one a key to the *natural* orders and the *genera*, as well as the species; the result is, they make the key longer than necessary, by arranging their alternatives to carefully exclude first the orders, then the genera to which the plant does *not* belong, before coming to the question of species. Even Linnæus must group the species into *natural* genera in his *artificial* system. Why not go straight to the point and enable one to ascertain the species as quickly as possible? The species ascertained, it is merely a question of referring to a dictionary or an index, to learn the characteristics and affinities of the genus and natural order. Some "Floras" seem to be written as though the author never thought of their being used to determine the species. If a "Flora" be merely intended to give one a general idea of the plant-life of a particular district this method is not objectionable, but if it be intended for practical and field use every assistance in the way of keys, indexes, and other helps should be given in order that no time may be lost. Some seem to consider it derogatory to their dignity to discover the name of a plant by any artificial means; but "Floras," arranged on the most natural system, and in fact most suitable for teaching the affinities of plants already well-known, are by no means necessarily the best for practical use, any more than a scientific classification of words, according to their significations, would enable one to find out the correct spelling of any particular word, as easily as the alphabetical arrangement of a dictionary.

B. Hobson.

A NEW DIATOMACEOUS DEPOSIT IN NORTH WALES.

By W. F. Lowe, Assoc. R.S.M., F.C.S., F.I.C.

But few diatomaceous deposits being known to exist in Great Britain, and the interest attaching to them being so great, both to the geologist and microscopist, it has occurred to me that the following account of one I was fortunate enough to discover in Merionethshire in 1879 might be of sufficient importance to warrant its publication. Llyn Arenig Bach, the lake in which the deposit occurs, is situated on the east side of the Mountain Arenig Bach, and is, judging roughly, 1200 to 1500 feet above the level of the sea, the mountain being 2264 feet high, and the lake being two-thirds the distance up the mountain. It lies about seven miles to the south of Yspytty-Evan, and midway between Bala and Festiniog, being nine miles from either place, and one mile from the high road from Bala to Festiniog.

The lake is a quarter of a mile long by about three hundred yards broad at its widest end, and is roughly wedge shaped. On the west side of it a steep wall of volcanic ash rises abruptly from the lake almost to the top of the mountain, and on the south side the ground is high and slopes steeply to the lake, while on the east side the ground is lower and slopes more gently, forming a low ridge (believed to be a moraine) beyond which the mountain slopes steeply down in a large valley which runs up towards Yspytty-Evan.

The stream from the lake flows out at the north-east end of the lake, and at the time of my visit a deep trench had been cut at this point, so as to drain the lake and lower its level some twenty feet.* The lake is of glacial origin, apparently having been formed by a moraine on the east side damming in the water.

The rocks around the lake are of igneous origin; they consist of volcanic ash, and belong to a series of volcanic rocks of the lower Silurian age, which were ejected during the deposition of the Llandeilo Flags.

The edge of the diatomaceous deposit lies at least ten feet below the original level of the lake, and it could not have been seen if the lake had not been partially drained.

At the south end of the lake, a small stream running in has brought down large quantities of black peat, and deposited it irregularly over the white earth, the greatest thickness of peat being at the point where the stream comes into the lake, its thickness here being equal to that of the diatomaceous earth, i.e. one foot. Very little peat covers the deposit at the north end of the lake, and some large patches of the white earth are clearly visible in the shallow water.

Subsequent to the partial drainage of the lake, already referred to, the stream had cut for itself a channel of many yards in length through both peat and earth.

On the sides of this channel sections are exposed, showing very clearly the strongly-marked line of demarcation which sharply divides the two deposits, there being no indication of a gradual transition from the white colour of the earth to that of the black peat. Underlying the deposit was a bed of angular pebbles, forming a coarse kind of gravel, not apparently of much thickness, and composed of fragments of the neighbouring rocks, no foreign or erratic blocks being seen either in the gravel or near the rocks.

The earth is white in colour and slightly sandy in texture, somewhat resembling a china clay in appearance, but microscopical examination shows it to

* I have since learned that this had been done in order to lay a pipe to supply the town of Bala with water, and that the lake has now had its level raised, so that the diatomaceous deposit is more than ten feet under water.

consist of diatoms, mixed with what I am told, by my friend Mr. Siddall, are the chitinous and siliceous skeletons and macrospores in great abundance of *Isoetes lacustris,* Quillwort, in perfect preservation.

On analysing the diatomaceous earth I find it to contain the following constituents when dried at 100° C.:

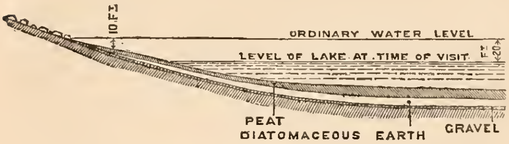

Fig. 135.—Diagrammatic Section of Llyn Arenig Bach.

Silica	88·32
Alumina	3·44
Peroxide of iron	1·30
Lime	·13
Magnesia	·07
Soda	·28
Water	6·42
	99·96

It is very similar in composition to the deposit at Cwm Bychan, which contains—

Silica	84·50
Peroxide of Iron and Alumina	7·35
Water	6·37
Lime, Magnesia, &c.	1·78
	100·00

The amount of silica contained in the Arenig earth after all the water has been driven off is equal to 94·3 per cent., and the silica of the Cwm Bychan earth equal to 90 per cent.

The composition of the peat when dried at 100° C. until constant is—

Organic Matter	60
Ash or Mineral Matter	40
	100

Of this mineral matter 93 per cent. is insoluble in hydrochloric acid, and consists almost entirely of diatom.

If we take the area of the lake at 594,000 square feet, and the thickness of the deposit all over the lake at 1 foot,* there will be 594,000 cubic feet of the earth, and I find that one cubic inch of the dried earth weighs 40 grains, so that the total weight of the deposit will be equal to 2645 tons. Since writing the above I have obtained some peat from the bottom of a small lake, also in Merionethshire, called Llyn Du.

This peat is very rich in diatoms, and a large number of the forms are similar to those occurring in the Arenig deposit, but the remains of Isoetes are absent.

I think from the number of diatoms present that there is a diatomaceous deposit below the peat in this lake, and I also think that these deposits may be found in most of the lakes in Wales, when they come to be thoroughly examined, and that they have not yet been observed because they occur at a considerable distance below the surface, and may in many cases be covered by a layer of peat.

* The deposit is most probably thicker towards the centre of the lake.

VOLCANIC CONES, THEIR STRUCTURE AND MODE OF FORMATION.

By H. J. Johnston-Lavis, F.G.S., &c.

OUR general ideas of its appearance, if we have never seen a volcano, differ considerably from what we find, when actually brought in contact with one.

We always have the tendency to associate a mountain as the site of volcanic outbursts. Such is the case in general rule, though with many exceptions. In fact, the variations are so great that in many cases we should be inclined to attribute the extreme forms to totally different origins, were there not existing intermediate ones which demonstrate that they are all varied modifications of one almost uniform series of physical effects.

Thus to one looking first at the vast volcanic cone of Cotopaxi, almost perfect in form, and comparing it with the ring-like cavity of Astroni in the Phlegrean field, it would be almost incomprehensible to believe that these two extremes are the result of identical forces acting much in the same manner and producing such widely different effects. But in the latter district we have not to travel far to find other vents that act as interpreters in explaining these variations of forms. In the present paper it will be my endeavour to explain the building up of what we will call a normal volcanic cone, and then afterwards to point out the extreme variations to which such a mass is liable.

Given a large volume of heated vapours and liquid rock that has burst its way upwards through the subjacent strata, in what way will it manifest its presence, and what traces will it leave behind? This vapour does not seem to exist separately from the molten rock or lava at any great depth, but as it approaches the surface, the enormous pressure is reduced, the water and other gaseous matter expand, separate themselves into little bubbles scattered through the highly-heated liquid magma. These will collect together, to a certain extent, and from their lightness will float to the surface of the lava and there burst. The vapour may have commenced to form at great depths and in its upward journey have become exceedingly bulky, so when it reaches the surface it would escape with a loud explosion. If we watch lava in the crater of a volcano in a quiescent state, such as Vesuvius, we see these great bubbles, so to speak, continually forming and bursting. As they burst, the surface of the vesicle is blown up as soft pasty fragments, to the height of many feet. These masses appear black by day, but red-hot by night; they may cool or not, before falling; if the latter, when they strike the ground, they adapt themselves to the irregularities of the surface and form as it were a cast thereof. This condition is much exaggerated at the first outbreak of an eruption; the vast column of fragments often reach an altitude of two and three thousand feet. There the pieces ascending meet those descending, and so there is a continual grinding going on between them; the fine dust is taken by the wind and transported often many miles, forming the so-called clouds of volcanic ash. The larger fragments (or lapilli, as they are named) may again fall back and 45°, we find the strata composing the cone (D, E). This arrangement is often called periclinal. The funnel, or chimney, which has been mentioned as occupying the centre, has the form of an inverted cone, the inclination of its sides and its diameter necessarily being proportional to the volume and force of the escape of vapour, and also to the nature, form, and size of the surrounding fragments, forming the growing cone, which have already been ejected. The upper, or basin part, is technically called the crater. The vapour only may have made its appearance at the surface, and in fact may have parted company with the lava at very considerable depths.

Or the latter may have been forced up almost

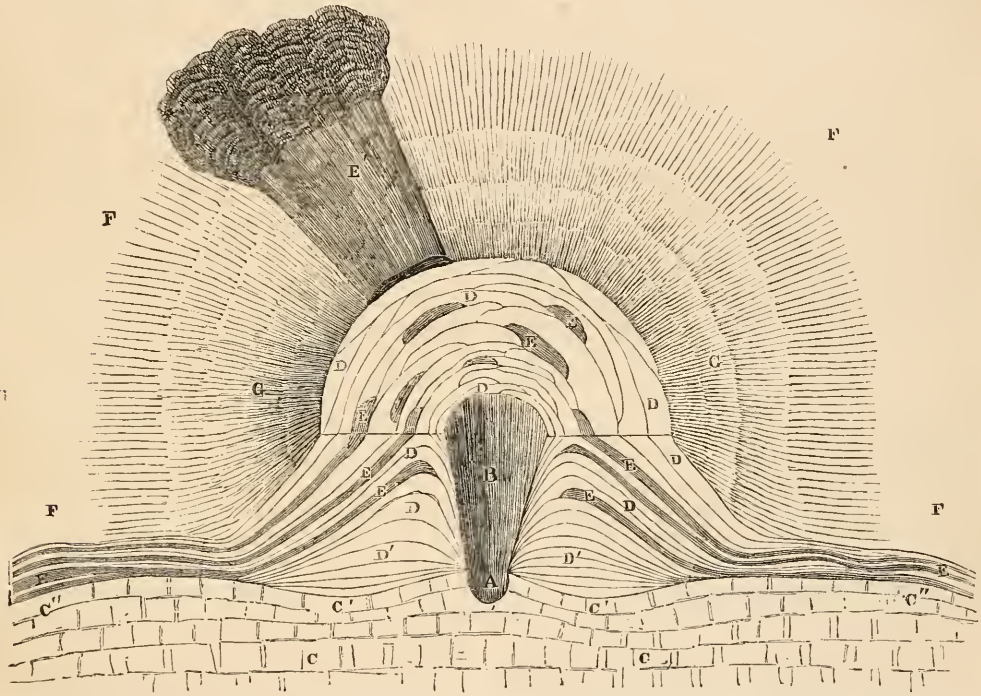

Fig. 136.—Diagrammatic bird's-eye view of a volcanic cone. The upper part is supposed to be removed by a horizontal section and one half of the remaining base by another longitudinal one. A, vent; B, chimney; C, basement rock, compressed downwards at C′ and upwards at C″; D, ash-beds; E, lava streams, one of which E′ is seen to have run down the slopes G of the cone, and spread over the plain F.

into the opening or around its edge, thus building up an annular bank. This is really the foundation of the cone.

If we speculate for a moment on the formation of such a heap, we shall see that the first strata deposited will be horizontal, but somewhat thicker towards the axis of explosions. See D, fig. 136. This, however, as the action continues, will begin to arrange itself in a direction slanting away from the axis, until the beds reach the maximum angle of repose of the rock fragments in question as the beds (DD) in fig. 136. Thus we have constructed a conical mass in the centre of which is the volcanic chimney (B) and dipping away on all sides at angles varying generally between 20° simultaneously with the vapour, and poured out over the edge of the primitive cone. This, however, is not the general rule, for an escape of much gaseous material nearly always precedes for a variable period the appearance of the lava. In fact, when a volcanic outburst has forced a convenient passage for the vapour, the exit of liquid rock seems of secondary importance, for generally the terrific explosions, earthquakes, and subterranean thunder that accompanies the first stage of eruption is more or less absent, or at least much diminished during the welling up of the fluid rock. If, as in the latter case, a cone of some considerable size has been formed, the lava will rise and occupy the whole of the crater cavity. Two things may happen. If the cone which now forms, as it were, an embankment around the lava, is of sufficient strength to withstand the pressure of the fluid mass contained within it and the continual explosive vibrations, the liquid rock pours out over the edge of the crater down the side of the cone, and may continue its course for variable distances from its starting-point. Or if, on the other hand, the cone is too weak to support the strain, it may break away and give free passage to the lava through the breach. This condition is well illustrated in many of the Puys of central France. There is another series of events, that is to say, the formation of dykes, about which we shall have more to say anon.

The lava may form a series of little streams over the cone sides, changing their situation according to the point at which the crater is lowest. Here it will cool, forming a buttress of rock on the slopes of the cone. These masses will be covered again by lapilli, other buttresses formed in same manner, and thus the cone built up higher and made stronger. If we see it in section, as in fig. 136, it will present a stratification of alternate beds of rock and cinders. This, however, is misleading. The lava streams do not form a continuous sheet surrounding the cone—see diagram, fig. 136, where they are seen cut through in transverse section. When a mountain of some height has been formed, it then becomes liable to fracturing, and the formation of so-called volcanic dykes. Mr. Mallet, in a communication to the Geological Society,* thoroughly explained this condition of things. As we have seen, the cone may form an embankment around the column of lava occupying the chimney and crater, consequently there is an enormous pressure put upon the supporting wall of loose material. Let us begin by taking the pressure of a column of water thirty-two feet high, then let us say another 4000 feet, roughly the altitude of Vesuvius, and compare that with a column of molten lava, whose specific gravity is two or three times that of water. This would be an interesting calculation : given the specific gravity of Etnean lava, the height of the crater, what is the unit of pressure at the sea level?

The outward pressure of the lava will increase in proportion to the depth. Also the cone wall necessarily increases in thickness from above downwards. This, therefore, tends to counteract the augmentation of pressure from within. Nevertheless, when this is so great inside that the inner layer of the chimney must necessarily be compressed outward, and therefore the circumference made larger, the consequence is that at one point it begins to yield, forming the commencement of a perpendicular fissure, radiating from the central axis, and, by the same course of circumstances, this will gradually spread outwards. Mr. Mallet,† in his paper describing these mechanical effects, aptly compares them to the bursting of a gun where the greatest strain is on the inner lining, and consequently the fissure commences in this and radiates outwards. In a volcano, as the fissure is formed, it is immediately occupied by the fluid lava. If the fracture extends far enough it may reach the surface, where it may form one or more parasitic cones. By the explosion of vapour from the lava, these cones are generally formed in a row, radiating from the mountain axis, and in a step-like arrangement. This is attributed to the fact that as the lava and vapour escape, the former reaches a lower level, and here forms the second, third, fourth, and so on in succession. This was well illustrated in 1861 at Vesuvius, where seven such hollow mounds were formed, the first being the largest, and gradually diminishing downwards, as the igneous forces became exhausted. The pressure of the contained fluids may be so great, that the entire side of the mountain may be rent asunder with the rapid escape of the contained lava, thus forming a breached cone. In the above-mentioned paper,* in fact, it is supposed by the author that all such have originated in this manner. A third condition of things may be brought about, this fissure may only extend a certain distance from the chimney, never showing itself superficially, and the lava occupying the fissure will gradually become cooled and consolidated, forming a perpendicular sheet of rock or dyke, as it is called, radiating from the mountain axis. These are well illustrated in the Val de Bove of Etna, and the escarpment of Monte Somma. In the former,† Sir Charles Lyell adopted the plan of endeavouring to find the orientation or point of convergence of these dykes, to localise the site of the old crater supposed to have produced this curious cavity. This was followed by the untiring work of Mr. Mallet in the latter locality, to determine where the axis of Somma should be placed. In the latter case twenty-seven of the largest were chosen, but when their directions were taken by a careful survey, they were found not to converge at one point, but in some there were discrepancies of upwards of two kilometres between the points of melting. This we can well understand when we know how irregularly the cone is constructed, and how buried *coulées* of lava may derange the direction of the fracture, such as we exaggerately see illustrated in some old denuded trap dykes, threading their way along plains of least resistance. There is another source of error, that is, that so little of the projecting edge of the dyke is exposed to accurately take its strike, thus rendering us unable to determine by this means the locality of an old volcanic axis.

If we look at the figure 136, at the surface C′ C″ of the subjacent rock, we observe it forms a wave-like

* Proc. Geol. Soc. Lond. vol. xxxii. part iv. page 478.
† Proc. Geol. Soc. Lond. vol. xxxii. p. 478.

* Proc. Geol. Soc. Lond. vol. xxxiii. p. 740.
† Sir C. Lyell. "Lavas of Mount Etna." Phil. Trans. 1858.

line in section. It is again to Mr. Mallet * that credit is due for the explanation of this somewhat anomalous appearance. It is known that the ground under high towers and other heavy structures is gradually compressed by the immense superincumbent weight. At the same time a corresponding elevation takes place around the base of the structure. This is just what occurs in a volcanic mountain. The immense pressure of superposed material compresses, to a variable degree, the subjacent rock according to its yielding power. This will be greatest where the column of materials is highest, that is to say, exactly under the crater edge as at C′, in fig. 136. This causes a corresponding rim-like elevation around the base, or at the toe of the cone as at C″, in diagram 136.

The materials which go to form the cone are the subjects of our next consideration.

Taking as our standpoint the old but useful division of lavas into basaltic or basic, and trachytic or acidic, let us look at the characters presented by these two great classes of rocks. Basalt and its congeners are generally heavy, compact, dark coloured, more or less crystalline. Very rarely vitreous in structure, and only in small patches. Excessively fluid in the molten state, losing heat and fluidity slowly, and then passing rapidly from the liquid to the solid state, the liquid fragments of which, when ejected from the crater, generally fall still plastic, and when cold form an excessively ragged hard angular mass. The surface or scoria of the lava stream also is hard, and not easily broken, the main mass itself being very apt to form the well-known columnar structure. On the other hand, the trachytic or acidic lavas, when molten, are very viscid, which condition increases rapidly as it loses its heat, so that it flows very short distances, often stopping midway down the steep side of the cone, as in the island of Vulcano, or forming a large boss-shaped mass around the vent.† When cooled slowly it crystallises, but it is much more liable to form a vitreous mass or obsidian than the basaltic rocks, resulting probably from its high percentage of silica. In fact, it behaves very much like glass or slag in its physical transformations. As on the surface of the glass pot is formed a frothy-like mass which cools as a light spongy vesicular material, so by the explosions from a trachytic volcano, similar masses are formed and thrown out as well-known as the useful pumice stone. This variety of lava produces often a very ragged surface, much less durable to mechanical agents than that of the other class. Again, this scoria and pumice is very light, often more so than water. These differences, of course, merge into one another, lavas often occurring that are not easy to classify; but for our purposes the extremes are more suitable of illustration. Also the same volcano may at different periods have yielded successively each of the varieties of igneous matter. Vesuvius, for instance, has ejected materials of each of the classes, and many distinct varieties of the basic. Obviously the discordance of these physical characters must necessarily produce considerable distinction in the physical conformation of a volcanic region in general, and of the cone in particular. It may be our want of a thorough examination, but it is apparently the rule that dykes are much less common amongst the trachytic volcanoes than the basaltic, whereas, apparently the largest number of breached cones belong to the former, thus contradicting, to some small extent, Mr. Mallet's * dyke theory already referred to. Thus we see that all the solids so far derived from a volcano, lava, scoria, lapilli, ash, &c., are all mechanical modifications of the one molten rock. There is, however, another important factor of which we have not spoken, the so-called ejected blocks. These are nothing more than fragments of the solid rock walls of the volcanic chimney or vent. They, therefore, vary according to the rock through which the igneous outburst has occurred. Thus we find amongst the constituents of the Vesuvian slopes a great variety of such blocks, amongst which the beautiful minerals yielded by Somma are found. These may be roughly divided into three classes.

(1) Limestone variously metamorphosed, derived from that like Castellamare, which dips under and forms the Vesuvian platform. These fragments are sometimes so altered by the intense heat, pressure, and chemical action to which they have been subjected, that it is only by studying the intermediate varieties that their origin can be detected. It is these blocks that are richest in the Vesuvian minerals.

(2) Calcareous mudstones containing late pleistocene fossils, these being in a very perfect condition, containing generally a great number of well-preserved leaves. This rock is curious, as being of apparently (though not real) volcanic origin, and containing marine fossils without submergence.

(3) Trachytic and corresponding tufa, also basaltic tufa. These are also masses of highly micaceous Felspathic rocks, that probably are nothing more than the excessive metamorphosed condition of the first class.

* R. Mallet, F.R.S. "Hitherto unnoticed circumstances affecting the piling up of Volcanic Cones," Proc. Geol. Soc. Lond. p. 740.
† P. Scrope, F.R.S. "Volcanoes," 1862.

* Proc. Geol. Soc. Lond. vol. xxxii. p. 478.

Hawthorn Bloom.—I can corroborate the statement of R. W. in the August number, regarding the entire absence of bloom on the whitethorn in the north of Ireland. I know of old trees that never failed flowering, but this year were destitute of florescence. It appears to me that the scarcity of bloom has arisen from the wet season of last year, and consequently the young wood was not sufficiently matured.—*S. B.*

NOTES ON SOME OF OUR SMALLER FUNGI.

By G. E. Massee.

No. III.

[*Continued from page* 86.]

RECENTLY the Myxomycetes have undergone a complete revision, and contrasted with old arrangements, the characters are mostly derived from microscopic details of the internal structure, more especially of the capillitium, or network of threads which in some shape or other usually accompanies the spores. Contrary to what might have been expected, this arrangement, based on, in some instances, very minute differences, has resulted in a

Fig. 137.—Group of some of our Smaller Fungi.—No. 1, *Tremella mesenterica* (natural size); 2, Section of same, showing threads with basidia and spores; 3, *Comatricha friesiana* (natural size); 4, Capillitium much enlarged; 5, Portion of capillitium of same with spores (highly magnified).

reduction of the supposed number of species. The genus Trichia in the "Handbook of British Fungi," includes fourteen species, whereas in the "Myxomycetes of Great Britain" all are considered as forms of four species, and from the analysis given in the latter may be distinguished as follows: *T. chrysosperma*, spores with a thickened network of polygonal meshes; *T. varia*, "elaters cylindrical, with two spirals, separated by a space three or four times their diameter;" *T. fallax*, hollow of stem and sporangium continuous; threads frequently branched; *T. fragilis*, hollow of stem and sporangium separated by a membrane; *T. flagellifer* of the "Handbook," constitutes a new genus, Prototrichia, characterised by having the threads fixed by one end to the lower part of the sporangium. They are all minute, varying in form from pear-shaped to round and sessile, colour usually some subdued shade of yellow or brown, and are generally more conspicuous after the sporangium has burst, as the threads and spores then form powdery heaps, sometimes of a very bright yellow. Their usual habitat is rotten stumps or dead wood. A minute plant with a thin, black, shining stem supporting an ovate, or sometimes globular head, which is at first pale, afterwards dark brown, is not uncommon on rotten wood, and when the skin and spores have fallen the capillitium of curved threads forming an intricate network is a very pretty object under a low power of the microscope. This is *Comatricha friesiana*—the genus is closely allied to Stemonitis, but is distinguished by the columella becoming broken up into network before it reaches the top of the sporangium, and, further, the outer threads of the network are never parallel to the investing membrane or peridium. One of the largest British representatives of the present order is *Reticuldria lycoperdon*, common on stumps and fallen branches, looking something like a large slug sticking to the wood, of a silvery grey, and filled with a powdery mass of reddish-brown spores mixed with branched threads. *Lycogala epidendrum* is a plant not likely to be passed without notice, especially in the young state. It grows in clusters, more or less globular. Each plant is the size of a pea or larger; at first rose-colour or blood-red, afterwards brownish-red; the outside is rough with warts. *Spumaria alba*, during its early stage at least, scarcely agrees with our ideal of a plant, even after some acquaintance with the oddities of form and texture presented by members of the fungal alliance. At first it appears as a mass of white frothy substance of considerable size and no definite form, usually attached to blades of grass or twigs. By degrees the mass acquires a firmer texture, a very thin, tender bark is formed, and the interior substance is arranged in a branched coral-like manner, enclosing myriads of dark spinulose spores. In the genus Arcyria, the sporangium is furnished with an evident stem, and when the spores are ripe, the upper half of the sporangium disappears, the lower half remaining fixed to the stem, and resembling a wine-glass in miniature. The threads near the outside of the capillitium are usually more strongly marked with spines or warts than the internal ones. *A. cinerea*, one of the commonest, at least in our own district, has an ovate head on a slender long stem: dull yellow; after dehiscence the threads and spores are usually pale lilac or reddish-grey, on rotten stumps. The species of Craterium, at least the typical forms, are easily recognised by the presence of a white lid, or operculum, closing the opening of the stalked sporangium. In *C. vulgare* and *C. pyriforme* the operculum is white. The two are distinguished by the relative length of the stem, which in the former is as long as, or longer than, the sporangium, in the latter, much shorter. In *C. minutum*, the lid is coloured. *Cyathus vernicosus*, bird's-nest fungus, so called because it resembles a bird's nest containing eggs, is not uncommon on the ground, especially in damp places. Its shape is more like that of a bell, with the opening upwards. Dull lead colour inside, yellowish without. This is the peridium. The small, egg-like bodies contained in this peridium are not the spores or seeds, but sporangia. Each is fixed to the inside of the cup by a long, slender cord.

These sporangia are hollow, and from the interior spring branched threads or basidia which give origin to spores seated on spicules. *C. striatus*, outside downy, brownish, inside lead colour, sporangia more or less three-sided. *Sphærobolus stellatus* is very frequent in conservatories, on cocoa-nut fibre, spent tan, &c., it also grows on sawdust and dead twigs; the plants are nearly round at first, yellowish, and about the size of a turnip seed. The peridium consists of two coats, and when mature the outer covering ruptures in a stellate manner, the inner coat at the same time springs through the opening elastically and projects the single enclosed sporangium to a considerable distance. *Tremella mesenterica* is the showy, golden-yellow, gelatinous fungus, common on rotten branches, and especially so on furze stems; a thin slice under the microscope reveals an intricate mass of slender branched threads enveloped in a structureless, jelly-like substance, towards the outside these threads are swollen into large round or obovate globules containing yellow granules; from each of these globules grow at different periods three or four pointed tubes or spicules, each in turn surmounted by a spherical spore. *T. albida* of a dirty white, sometimes with a tinge of yellow, is equally common on fallen branches in woods.

Small yellow or orange gelatinous specks are usually to be met with on fir-branches or rails, these belong to an allied genus, Dacrymyces, distinguished by the clavate or club-shaped globules or basidia, from which the spicules grow, and by the sausage-shaped curved spores. *D. deliquescens* has the spores triseptate, while in *D. stellatus* there are always more than three septa, and the colour is deep orange. Excluding the moulds, the greater number of small ascigerous fungi present one of the two following types of structure. First, those in which the hymenium during some period is exposed. The genus Peziza may be considered as typical of this division, the receptacle is usually fleshy and more or less cup-shaped, and when young the margin is incurved, so that the plants are at first nearly globular in form; the outside of the cup varies much, it may be smooth, warted, pubescent, or villous: looking under a half-inch power like a miniature sea-urchin, the margin of the cup is also frequently furnished with a fringe of hairs or teeth. When the margin unfolds, the hymenium, which occupies the inside of the cup, is exposed, and is frequently very brilliantly coloured, the asci are elongated cells, usually clavate or cylindrical and are closely packed side by side, their upper and free ends forming the surface of the inside of the cup. That the sporidia when mature escaped from the ascus through an opening at the apex, has been known for some time, but it has recently been

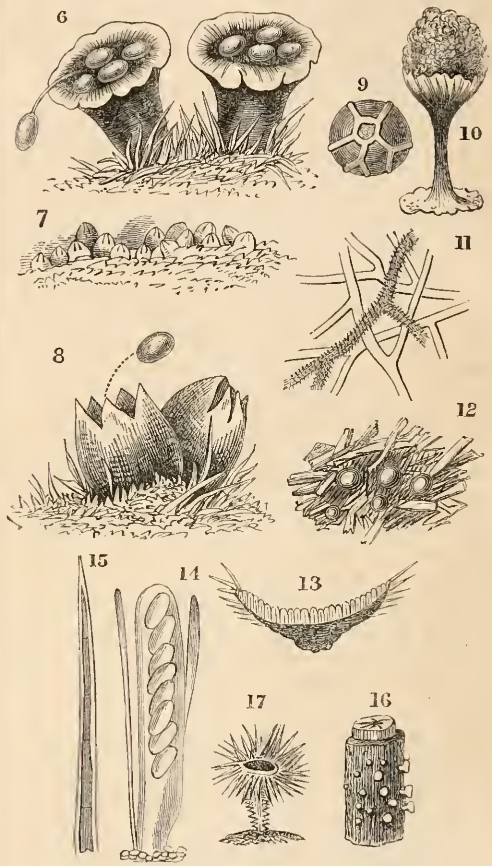

Fig. 138.—Group of some of our Smaller Fungi:—No. 6, *Cyathus vernicosus* (twice natural size); 7, *Sphærobolus stellatus* (natural size); 8, Same enlarged, showing the mode of dehiscence and ejection of the sporangium; 9, Spore of *Trichia chrysosperma* (very much magnified); 10, *Arcyria cinerea* (magnified); 11, The two kinds of threads found in the capillitium (highly magnified); 12, *Peziza stercorea* (natural size); 13, Section of same (magnified); 14, Ascus containing eight sporidia, two paraphyses accompany the ascus (highly magnified); 15, Hair from margin of *P. stercorea* (magnified); 16, *Peziza virginea* (natural size); 17, Same enlarged.

pointed out by Boudier that there are two modes of dehiscence: a little lid or operculum of definite form is elevated at the apex of the ascus when mature, or the sporidia escape through an opening, the edges of which are elevated and frequently torn, but it never assumes the appearance of an operculum.

As to how the sporidia escape through the opening in the ascus has been the subject of much controversy. Dr. Cooke's explanation is as follows: "The asci are produced in succession; the later, pressing themselves upwards between those previously developed, cause the rupture of the mature asci at the apex and the ejection of the sporidia with considerable force. When a large Peziza is observed for a time a whitish cloud will be seen to rise suddenly from the surface of the disc. Theories have been devised to account for this sudden extrusion of the sporidia; in Ascobolus, and a few species of Peziza of the asci also, the most feasible one being the successive growth of the asci; contraction of the cup may also assist as well as some other less potent causes." This idea does not show how the asci that are last developed would dehisce, but nevertheless there is some truth in it, and it is on the whole more reasonable than a theory built up on assumptions and requiring the intervention of forces whose presence it is impossible to prove. In addition to the asci, certain other appendages, respecting whose functions nothing at all is known, are usually present, growing side by side with the former, and termed *paraphyses*, they are long, slender tubes, simple or branched, their free ends are usually more or less thickened and contain granules to which the colour of the hymenium is due, they are usually considered as being abortive asci. The species of Peziza are numerous, above one hundred and seventy have been recorded as British. *P. coccinea*, one of the largest and most striking forms, has the cup not unfrequently two inches in diameter, the inside bright scarlet, outside whitish. In the woods near Scarborough this species is not uncommon, and the rotten sticks, each with two or three specimens, sell readily at two shillings per dozen for decorative purposes, and when mixed with damp moss in a dish, the effect is very pretty.

P. virginèa, a minute form, is common on decayed twigs in damp places, it is pure white, the outside of the cup is covered with long hairs, and the stem is long and slender. *P. nivea*, equally common in similar localities, is recognised by the short stem passing gradually into the cup, so that altogether the plant is like an inverted cone. *P. cinerea*, another minute plant, is very common on dead branches; the substance is fleshy and watery-looking, smooth and ash-coloured, it is frequently much crowded and then the outline of the plant is irregular.

In studying the species, the most important points to observe are, the presence or absence of stem, the structure of the outside of the cup, whether smooth, hairy, pruinose, &c., the form of the asci and paraphyses, and the size and form of the sporidia, and their order of arrangement in the ascus, whether in one or two rows. The structure can be studied in *P. stercorea*, a small gregarious species about one-eighth of an inch in diameter, and of a bright reddish-brown colour; the margin and upper part of the outside is furnished with straight dark hairs, and the paraphyses are not thickened at the ends. *P. granulata* is somewhat similar in appearance and size, but is known by the paraphyses having the free ends clavate: both species occur on cow dung.

(*To be continued.*)

THE BRITISH ASSOCIATION MEETING.

OUR annual peripatetic scientific Congress, held this year at Swansea, although not so successful in point of numbers attending it, seems to have been marked by the delivery of first-class addresses, and not a few telling papers. The American Association for the Advancement of Science was held on the same day, whilst the French Association commenced its meeting on the 11th of August. The two latter are framed on the model of the British, and it is evident both are doing similar useful work in extending and deepening the interest felt in science. One of the most interesting objects exhibited at Swansea was the now famous Neanderthal skull, which was shown by Professor Schaffhausen, of Bonn.

In his presidential address, before the British Association meeting on August 25, 1880, Professor Ramsay stated that in the middle of last July he received a letter from Professor Geikie, in which he informed him that he had discovered mammillated *moutonnée* surfaces of Laurentian rocks, passing underneath the Cambrian sandstones of the north-west of Scotland at intervals, all the way from Cape Wrath to Loch Torridon, for a distance of about ninety miles. The mammillated rocks are, said Professor Geikie, "*as well rounded off as any recent roche moutonnée*," and "in one place these bosses are covered by a huge angular breccia of this old gneiss (Laurentian) with blocks sometimes five or six feet long." This breccia, where it occurs, forms the base of the Cambrian strata of Sutherland, Ross, and Cromarty, and while the higher strata are always well stratified, where they approach the underlying Laurentian gneiss "they become pebbly, passing into coarse, unstratified agglomerates, or boulder-beds." In the Gairlock district "it is utterly unstratified, the angular fragments standing on end and at all angles," just as they do in many modern moraine mounds wherever large glaciers are found. The general subject of Palæozoic glaciers has long been familiar, and this account of more ancient glaciers of Cambrian age is peculiarly acceptable.

One of the lecturers was Professor Boyd Dawkins, who took for his subject "Primeval Man." Professor F. W. Rudler delivered a striking address as president of the department of anthropology, and Mr. F. M. Balfour, F.R.S., a most telling speech in the department of anatomy and physiology, when he reviewed the evidences in favour of evolution from the facts of embryology, in which subject Mr. Balfour is one of our most distinguished workers. Dr. Sorby's address, in the geological section, turned chiefly upon the microscopical examination of sections of slag and other artificial fused rocks, and a comparison of them with such natural igneous rocks as granite and basalt, &c. Excursions were made to the chief of the localities described by Mr. H. B. Woodward, in his papers contributed to SCIENCE-GOSSIP on the "Geology of Swansea and the Neighbourhood."

One noticeable feature in connection with this year's meeting was a conference of delegates from various scientific societies, who met under the presidency of Mr. John Hopkinson, F.L.S., Hon. Sec. of the Hertfordshire Natural History Society, to discuss the possibility of a closer union between provincial scientific societies. Mr. Hopkinson further remarked that the list of delegates prefixed to the list of members usually attending the annual meeting of the Association was practically useless. Mr. Hopkinson had, therefore, proposed that the secretary of any scientific society publishing Transactions, as well as the president, should be temporary members of the General Committee.

At the meeting of the Council of the Association, on Monday, August 29, it was resolved to hold the next meeting at York. Sir John Lubbock was elected president, and the following distinguished scientific men, all of whom, except the Archbishop of York, have passed the presidential chair, were elected vice-presidents: His Grace the Archbishop of York; Mathematics and Physics, Sir William Thomson; Chemistry, Professor Williamson; Geology, Professor Ramsay; Biology, Professor Owen; Geography, Sir J. D. Hooker; Mechanics, Sir William Armstrong.

NOTES ON THE WATER THYME (*ANACHARIS ALSINASTRUM*, BAB.)

FIRST OCCURRENCE OF ITS MALE FLOWERS IN BRITAIN.

WHATEVER may be the fate of the Colorado Beetle when it arrives on our shores, there can exist no doubt that the American colonist, whose botanical name is given above, has found a congenial home in Britain. When or how the New Waterweed (as it is sometimes also called) was introduced into this country, appears to be uncertain. Professor Oliver says it was first remarked in Britain in 1817, and Sir. J. D. Hooker says it was introduced into county Down about 1836, and into England about 1841. In 1847 it was observed by Miss Kirby in Leicestershire, and was first described as a British plant by the late Dr. G. Johnstone of Berwick-upon-Tweed, in his "Botany of the Eastern Borders," published in 1853. At page 191 he gives the following account of the plant: "I found this plant on the 3rd of August 1842 at Dunse Castle in profusion. I noticed it nowhere else until 9th August, 1848, when I found a few tufts of it at Newmills, in the Liberties of Berwick, and in September of the same year I discovered it in abundance at a deep and still reach of the Whiteadder, between Whitehall and Edington Mill. In the summer of the following year the plant was noticed in many intermediate localities, and in 1850 it had occupied almost every part of the river where the water ran sluggishly, almost to choking. This was so much the case at Gainslaw Bridge that the weed was dredged out with grapes. It multiplied and became a noxious weed in 1851 and 1852 and now had spread itself below the bridge unto within half a mile of the river's confluence with the Tweed. No means seem to arrest its diffusion, and it will be found that the principal opponent of its evil propensity to multiply is a spate—a heavy spate, of a few days' continuance. This carries away large quantities. After one of them the plant is found strewed along the sides of the Tweed, and at the end of September, 1852, I saw many cartloads of it thrown upon the shore at Spittal."

When the above was written the anacharis had not made its appearance in the Tweed, but Mr. Brotherston informs me that it is now abundant in the lower part of that river, which it is said to be ascending at the rate of a mile every year. It is a great pest to the salmon-fishers, as large masses of the plant are constantly getting entangled in their nets. It is very brittle, and the smallest piece, if it has a whorl of leaves, is capable of sending down roots to the soft mud wherever it happens to rest; and as it sends out horizonal shoots that rise and spread every five or six inches along the bottom of lakes and streams, it multiplies with extraordinary rapidity, which is rather increased than diminished by the ordinary method of trying to destroy the plant by breaking up its masses. It is now very abundant and troublesome in many lakes and canals throughout Britain; is found in most of the ponds and lochs in this neighbourhood, and the end of the Union Canal at Edinburgh is almost choked with it. It is greedily eaten by swans and other waterfowl, and as "horses are very fond of it, and will wade into deep water to feed upon it," it might be used as a useful addition to hay for a forage plant.

I need hardly say that the anacharis is well known to young microscopists from the fact that its tangled masses are the favourite haunts of hundreds of Entomostraca, Rotatoria, Infusoria, and other minute forms of animal life; and for the ease with which the beautiful intra-cellular motion known as rotation or cyclosis is seen in its leaves. For this purpose all that is necessary is to cut off a leaf, place it in a drop of water on a slide, put it under the microscope, and view it by the aid of transmitted light. The little granules of chlorophyll will now be seen constantly moving round within the walls of the large and somewhat rectangular cells over the greater part of the leaf surface without getting very near each other. But at the midrib and margin, where the cells are long and narrow, the currents are very close to each other, and the little particles seem to be almost rubbing shoulders as they pass on and on, with a clockwork regularity that is both interesting and amusing to observe. To prevent disappointment, when a leaf is to be exhibited, it is best to have it cut off and placed in a drop of water on a slide a few hours previously, as the shock given to the circulation by cutting off the leaf, frequently interrupts it for a considerable time. It will be seen that the

Fig. 139.—Water Thyme (*Anacharis alsinastrum*), male flowers (natural size).

circulation does not take the same direction in every cell.

The anacharis belongs to the Natural Order Hydrocharidaceæ, and in addition to the botanical name already given, the following synonyms are in use among botanists:—

Anacharis canadensis (Planch.); *A. nuttallii* (Planch.); *Elodia canadensis* (Mich.); and *Udora canadensis* (Nutt.). It is a dark green, much branched perennial, growing under water. The leaves are numerous, cauline, varying from roundly ovate to oval oblong, minutely serrulate and generally in whorls of three. The flowers are small and sessile, but as they are provided with a thread-like tube from one to ten inches long, the basal portion of which is enclosed in a tubular bifid spathe, they float on the surface of the water. They are rather variable, and botanists have different opinions concerning them. Wood says* they are polygamous; Babington says† they are diœcious; and Hooker says‡ they are sub-diœcious. The male flowers are rarely seen, and according to Babington and Hooker, unknown in England. But having examined the plant carefully in various places during the last two seasons, in the hope of finding either male or perfect flowers, I have at length been rewarded by finding the former growing sparingly in a pond on the Braid Hills, near Edinburgh on the 2nd of August last, specimens of which I inclose. This is probably the first record of their occurrence in Britain, and curiously enough exactly thirty-eight years after the first discovery of the plant by Dr. Johnstone. As they are seldom seen the following diagnosis may be useful. Male flowers: Spathe lobes broad and keel-shaped. Flower-bud roundish oval. Sepals boatshaped, reddish-green, ultimately reflexed.

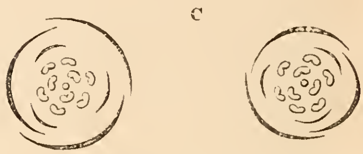

Fig. 140.—Diagram of flower.

Petals transparent, narrow from a broader base, reflexed between the sepals. Stamens nine in two rows. Anthers oval, leaflike, introrse, nearly sessile, six outer at length spreading, three inner erect, and generally surrounding a curiously mammillated and very variable pistil (fig. 142) which is sometimes absent. The pollen is abundant, and the pollen grains in clusters of four.

Unlike the rather firm textured and comparatively straight corolla-tube of the female flowers, that of the male flowers is very brittle—so much so that it takes very careful manipulation to gather a specimen without detaching the flower; and as it lengthens, the basal portion becomes attenuated and hairlike and sometimes breaks away of its own accord; but whether attached or detached, the tube is almost always crumpled and twisted like a cotton thread in the water. Though it does not grow either so long or so fast as that of the female flowers of Vallisneria, the

* "Flora of the United States and Canada," p. 679. 1874.
† "Manual of British Botany," seventh edition p. 331. 1874.
‡ "Student's Flora," second edition, p. 371. 1878.

following notes show that it lengthens pretty quickly. (1) August 3rd, 9.30 A.M.—Flower bud just overtopping spathe-lobes, tube about one inch long. August 5th, 6.30 A.M.—Tube 4 inches long; 9 P.M. same day, $5\frac{1}{4}$ inches long, and flower fully expanded. (2) August 15th, 7.45 A.M.—Tube $2\frac{1}{2}$ inches long; 8.15 P.M., same day, flower just expanding and tube $8\frac{1}{2}$ inches long. A few words in conclusion about the preparation of specimens (male) for the herbarium. It is almost impossible to obtain examples of long-tubed flowers by the ordinary method of drying, as they invariably stick to the paper, and the tube breaks to pieces when the paper is opened; but if the fresh

Fig. 141.—Male flowers (magnified). A, Top view when just expanding, and before the petals and sepals are reflexed; B, Side view, petals and sepals reflexed.

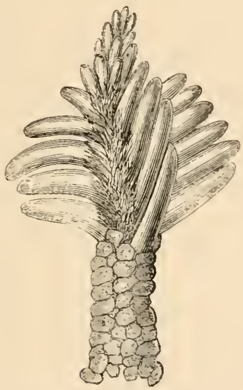

Fig. 142.—Pistil of male flower (much magnified).

specimens are pressed in cloth or blotting paper for a few minutes to take up the superabundant water, and then laid on a drying sheet the size of the one on which they are to be mounted, gummed on the upper side, the mounting sheet laid on the top, and the whole transferred to the press without turning them over, good results will be obtained, as they will be found firmly mounted and perfectly whole when the papers are changed. Short tubed specimens, being stronger, may sometimes be well dried in the usual way.

DAVID DOUGLAS.

Dumbiedykes Road, Edinburgh.

PEAR GRAFTED ON WHITETHORN.—In a cottage-garden in county Antrim, I met with several grafts flourishing on thorn scions, some were bearing good-sized pears.—*S. B.*

A BOTANICAL RAMBLE ROUND BATH.

WE almost began to fear we should never be able to start off plant-hunting till the burning heat of a July sun should make it anything but pleasant work. Day after day the rain had made us put off our excursion. At last, however, upon a bright June morning, and after an early lunch, we seized our collecting case and started off. The district we had determined to look up may be characterised as a homely one, being fairly close to the city. We had decided to take a survey of Hampton Downs and Rocks, and then returning to the road, make for Limpley-Stoke and Turleigh, Wilts, by field and road. Our tour of necessity led us first of all up that interminable hill called Bathwick, which makes one think he will never reach the top. The longest lane has a turning, and so I suppose the most wearisome hill ends in a level; at any rate, after quietly plodding on, we at length arrived at the top of Bathwick Hill, and turning to the left passed into a cornfield, a path through which led to Hampton Down. By the side of this path are found *Veronica chamædrys*, *Viola tricolor*, *Ranunculus arvensis*, *Stellaria media*, *Geranium pusillum*, and *G. dissectum*. On a wall in this field *Saxifraga tridactylites* was flowering abundantly, and a very pretty appearance it made. Turning our attention to the field itself, we espied several fine plants of *Silene inflata*. This field brought us into a lane, with a small copse on each side, a most charming sylvan spot, and one abundant in material for research. Of the Micro-Fungi to be obtained there I hope at some future time to have something to say; but to return to our subject. On each side of this lane we found various plants, viz., *Galium aparine*, *Sherardia arvensis*, *Potentilla fragariastrum*, *Fragaria vesca*, *Lotus corniculatus*, and *Vicia sativa*. Penetrating into the left-hand copse we came across *Listera ovata* in abundance; here too we found *Geum urbanum* and some plants of *Ranunculus auricomus*, with the flowers fast dying off. Passing into the right copse we found *Bunium flexuosum*, and many plants of *Adoxa moschatellina*, some still in flower, and most of the leaves covered with *Puccinia saxifragarum*. Of course *Nepeta Glechoma* was abundant almost everywhere in the lane. Passing on to the Downs, we were refreshed by a glorious breeze. A short walk across the Downs brought us to the Rocks, which, with their wooded base and rugged form, have a very picturesque appearance. Before continuing our researches we are compelled to admire the splendid home scene from this height, which without doubt affords the most picturesque view in the neighbourhood. Below us are verdant meads intersected by the Avon. The Avon and Kennet Canal and the Great Western Railway, which leaving the main line at Bathampton, just below us, runs to Weymouth. Above the meadow to our right is Bathford, with its abruptly rising hill, crowned at the top by Wade Brown's Tower. To our left the valley, with the main line to London running through it, presents a glorious scene. Making a descent, we find *Cynoglossum officinale* flourishing; further on we recognise *Myosotis arvensis*, though the pretty little *M. collina* which we met with here last month had disappeared; and we also miss the flowers of *Oxalis acetosella*. *Apargia hispida* is abundant here. Further down, on a kind of plateau, we find large tracts covered with *Helianthemum vulgare*, in full bloom, as also is *Polygara vulgaris* and *Euphrasia officinalis*. In the rougher ground, we noticed *Scolopendrium vulgare*, with its beautiful shining bright green fronds. A glance at our watch reminds us that if we wished to reach our destination that day we had better be moving on, so we retrace our steps again to the road from whence we branched off, and taking another for a short time, passed through several fields, where we found on our way, *Orchis mascula*, *Sagina procumbens*, *Galeobdolon luteum*, *Stellaria holostea*, *Asperula odorata*, and *Lotus major*. The last of these fields, which afforded us a good view of Westbury White Horse. brought us out to the Brass Knocker Hill; descending which, we found *Geranium lucidum* with its pretty shining stems and leaves, *Symphytum officinale*, some plants with white, others purple flowers; and *Veronica beccabunga*. As we approached Limpley-Stoke we found *Allium ursinum*. Just as we began to ascend Winsley Hill, and close to the gates of the vicarage, we came across a large bed of *Galium cruciatum*. A short distance from the foot of this tedious hill, we turned off by the canal side; continuing our course along the towing-path, we found *Prunella vulgaris*, *Euphorbia amygdaloides*, and *Myosotis palustris*. After a walk of about a mile and a half, we arrived at a point called the elbow, where, quitting the canal, we again traversed some fields, falling in by the way with our friend *Rhinanthus crista-galli*. A short walk brought us to Turleigh Villa, a charming house, beautifully situated and commanding an extensive view of the Valley of the Avon, Bradford to the left, Avoncliffe to the right, and Westwood perched up on its hills almost in front. This was to be our destination, and here we intended to rest and refresh ourselves, sure of a ready welcome from our relatives within its walls. Here then we will leave our subject, simply remarking that it will be observed, that though we came across nothing rare, yet our case was not empty. In a future paper we hope to give an account of a ramble to Conkwell, where we flatter ourselves we shall find a few plants by no means common; and should opportunity permit, we may set forth the result of a ramble to Wick Rocks.

CHARLES F. W. T. WILLIAMS.

Bath.

(*To be continued.*)

MICROSCOPY.

FINISHING SLIDES.—Many suggestions have been made public from time to time with regard to methods of finishing microscopic slides. For example, a writer in a recent number of the "American Monthly Microscopical Journal" advocates a very elaborate process, which includes the application of thick copal furniture varnish by means of a knife point and the turn-table. The slide, we are told, must then be laid aside in a dry place for "at least a week," to harden, and then the superfluous varnish may be cleaned off the glass slip with cotton, stone, and water—a very roundabout and troublesome process, to say the least of it. To save inexperienced hands from needless trials of patience, waste of time, and unsatisfactory results, I am induced (with the Editor's permission) to state briefly what I have found in practice to be a very simple, easy, rapid, and thoroughly satisfactory method of finishing off balsam or dammar-mounted slides. The process is not by any means new, and I make no claim to originality in regard to it; but I have found it to work so admirably in a collection of several thousand specimens, that I feel sure young hands will be thankful for the information. Take some old Canada balsam and dilute with benzole until it is thin enough to flow freely from a sable or camel-hair pencil (the former, of what is known as the "duck" size, is undoubtedly the better tool). Apply this with the turn-table in the usual way, so as to make a neat ring around and slightly projecting over the edge of the thin glass cover. Amongst the advantages of this process may be enumerated the following: 1. There is no risk of spoiling slides by "running in," as too often happens with asphalte and some other coloured varnishes. 2. If the mounting of the preparation has been done with care, and there is not more than a slight exudation of balsam or dammar beyond the edge of the cover-glass, there need be no preliminary cleaning-off before "ringing" the slide—an important consideration in regard to the saving of time and trouble. 3. The ring of balsam dries quickly and sets hard. 4. No after-cleaning process, like that above alluded to, is required; the slide being ready for the cabinet within a few minutes. 5. The process will be found easy of accomplishment by the veriest tyro, and the result is neat and satisfactory.—*J. Ford*, *Wolverhampton*.

MR. BOLTON'S MICROSCOPIC LABORATORY.—We have received the third portfolio of drawings and descriptions of living organisms (animal and vegetable) illustrative of freshwater and marine life which have been sent out with the living specimens by Mr. Thomas Bolton, F.R.M.S., and are glad to see that his microscopic laboratory is, if possible, showing signs of even more vigorous life than hitherto. The organisms which have been sent out at various times, and which are figured, and described in the portfolio are the following:—Vegetable Kingdom: *Draparnaldia glomerata*, *Chætophora elegans*, *Chara* and *Nitella*, *Chara fragilis* (embryo). Animal Kingdom: *Actinosphærium Eichhornii*, *Coleps hirtus*, *Urostyla grandis*, *Dinobryon sertularia*, *Vorticella chlorostigma*, *Anuræa longispina* and *Ceratium longicorne*, *Melicerta ringens*, *Lacinularia socialis*, *Alcyonella fungosa*, *Bowerbankia gracillima*, *Bosmina longirostris*, Larval Shrimp, and *Nais proboscidea*, &c.

The Microscopical Preparation of Sponges.—In a paper communicated to the "Annals and Magazine of Natural History," Mr. Sollas makes the following remarks on the microscopical preparation of sponges dredged by the Rev. A. M. Norman, on the coast of Norway, for microscopical examination:—"In preparing specimens for microscopical examination, I followed the ordinary methods for obtaining the spicules in a free state; but in cutting and mounting 'sections,' I adopted the processes which have hitherto, in this country at least, been confined to the examination of quite soft tissues. A piece was cut from the sponge large enough to contain a representation of each of its different tissues; this was then soaked in distilled water till its contained alcohol was as nearly as possible all extracted; it was then transferred to a strong solution of gum, in which it was allowed to stand for an hour or so; finally it was placed in the well of a freezing microtome, and frozen in the usual way. From the frozen specimen, slices could be cut of any required thinness, the razor, strange to say, passing through the soft tissues and hard spicules with apparently equal ease. The slices so obtained were variously treated; some stained and some not, were mounted in glycerine of various degrees of strength; others were treated first with absolute alcohol, then with carbolic acid and turpentine and mounted in Canada balsam. 'Teasing' was resorted to in the case of some tissues with success, especially when it was found desirable to observe the behaviour of the tissue with reagents. Altogether the various methods pursued have, I believe, succeeded in eliciting nearly all the information that could be extracted from the specimens; and that this is very far from being so complete as could be wished is to a great extent owing to the imperfect manner in which histological characters are exhibited in sponges which have been preserved in spirits without any previous treatment. Mr. Norman's specimens are perfect as spirit specimens; they were not preserved with a view to submitting them to detailed histological examination. And here it may be worth while suggesting that if in the future it should be desired to preserve sponges with this object, a preliminary soaking in osmic acid solution of ·02 or ·03 per cent. should be given to them before placing them in spirits; this will effect nearly everything that may be desired. With osmic acid treated specimens and the help of a freezing microtome, no difficulty should be experienced in obtaining an almost complete knowledge of the minute structure of any sponge."

Trichinium Manglesii.—This lovely everlasting flower, a native of Western Australia, has surrounding each floret, long glistening white hairs. These delicate structures are prettily marked and jointed, each joint having teeth, reminding one of the stems of the Equiseta. They contrast with the brilliant purple of the petals, and under the microscope, viewed by the aid of the parabolic illuminator, they are very beautiful, and should have a place in any collection of vegetable hairs. To those of the readers of Science-Gossip who may not possess a specimen, I shall be glad to furnish one on application.—*M. Medhurst*, 2A, *Dell Street*, *Holt Road*, *Liverpool.*

The Postal Microscopical Society.—It is now some years since this society was formed, which in its origin owed much to correspondence in the pages of Science-Gossip. It has now gained a good foothold and is well established, numbering at the present time about 156 members, who reside in various parts of Great Britain and Ireland. In looking over the list of names I notice that the members are not uniformly distributed, but are sometimes found closely congregated in limited districts, which fact is owing, I presume, to the influence of energetic microscopists inducing others to become members. I am therefore led to believe that the advantages of this society are either not known sufficiently, or are entirely unknown by many lovers of this very enchanting study. Any person (ladies are especially welcome) interested in microscopy may join the society by the following simple process. A proposal paper has to be signed by a member and sent to the honorary secretary. The would-be member may obtain a list of the members and rules of the society by applying to Mr. Alfred Allen, 1 Cambridge place, Bath, who is at once the honorary secretary, and the machinery of the society. New members on joining the society are required to pay an entrance fee of 5*s*., and an annual sum of 5*s*., which latter is due on the 1st of October in each year. Members should receive by post every fortnight a box containing twelve slides, which may be kept three days, and then sent by post to the next person named in the waybill accompanying it. There is also sent a MS. book in which every member is requested to write something of interest relating to the slides in the box; drawings in further illustration of the slides are added, but sometimes these do not appear so often as might be desired. Not oftener than once a year each member is required to insert one slide in each of four boxes, notice of which event is always given beforehand by the honorary secretary. Additional slides may occasionally be required, but occasion for such addition should not often occur. The slides in general circulation are of a varied nature, embracing all branches of microscopy generally. There are also special boxes devoted to histological and pathological slides, and a few confined to such special branches of microscopy as stellate hairs of plants, foraminifera &c. I am just informed that the annual meeting of the society will be held in London on September 30. The honorary secretary will prepare and publish a report of it, including the presidential address, the list of members, rules, &c., early in October, and he will be pleased to send a copy to any person desirous of joining the society. Further particulars may also be obtained of—*C. P. Coombs., M.D., Castle Carey.*

ON THE MOUNTING OF OBJECTS IN FLUID FOR THE MICROSCOPE.—There are few ways of mounting which have been so often attempted, and so often given up as a failure as fluid mounting; and yet there are so many objects that are simply out of the sphere of microscopical examination, unless preserved in this way, and so many more which are so immensely improved by it, that its difficulty and attendant disappointments are much to be deplored. I will not say that I have discovered a method by which fluid mounting may be made perfect and easy, for time proves the success of such things in connection with that great enemy, leakage; but so far, I have been very successful with this class of microscopic preparation, and am consequently anxious to give the results of my experience, in the hope of their being of some use to others, who, like myself, wish to work upon objects which could not be treated otherwise with the success derived from a suitable fluid. The class of objects I have been preparing is the ova of crustacea; but many other specimens of marine zoology I have also treated in a similar way. The fluid which I use is composed of three parts absolute alcohol, two parts pure glycerine, and one part distilled water, and it is important that these components should be of the purest quality. A number of ordinary tubes should be procured, and the specimens can be kept in the above fluid (after washing with distilled water) until it be convenient to mount them; the tubes should be carefully labelled to avoid confusion, and as the preparing fluid is the same as the mounting medium, it matters not how long they are in preparation, in fact it is an improvement to leave them some time, as some ova and zoœa throw down a precipitate which does not increase the value of a slide. As regards the mounting itself, the ordinary sunken cell will do for small or thin objects, but I find for ova, &c., that these are too shallow, so I use the glass ring cell which I fix to a slip with marine glue, and as this must be quite hard, I prefer to have these cells fixed ready for use at least a fortnight before using them, for in fluid mounting haste means failure. We will now take one of these deep cells, and run a ring of marine glue round the top, say six hours before it is actually required, this will render the glue stiff enough to hold down the cover glass without running in; the cell should now be breathed upon and the fluid (flesh fluid) poured in until it is ready to run over. Now take up a small portion of the ova and place it as required in the cell, take a clean cover glass, the size of the cell, and breathe on it, in order to moisten the surface, this causes the fluid to run evenly without enclosing air bubbles; then place it gently on the cell one side first, this presses out all the fluid not required, and the marine glue, having no affinity for the fluid, cuts through it, and unites the cover glass to the cell wall. The slide should now be waved backwards and forwards in a large basin of clean water to cleanse it from the superfluous fluid, and dried very carefully with a hair pencil, and as soon as this is done, a small quantity of zinc white cement should be dabbed very gently on the junction of the cover glass and cell. This zinc white is a capital cement for this work, as it hardens rapidly and is very fine when dry. In a few hours the slide may be put on the turntable, and a good band of the above-mentioned white varnish should be applied over the whole of the cell wall, uniting the glass of the cover with the glass of the slip, and if this coat be applied, say five times,* I do not think that any fluid with ordinary usage will ever get out; when this has been done, any style of finish may be applied as desired. I have said that time will prove the strength of this method against air bubbles, but I may mention that a slide of ova of one of the mollusca which I mounted four years ago returned to me safely after a long journey over England in one of the boxes of the Postal Microscopical Society; and a slide that can stand such knocking about as postal travelling must be fairly tough. I shall be very happy either to give or to receive any further suggestions on this subject, also to make any exchanges of ova and zoœa of named crustacea for other fluid mounts of these or other forms.—*Edward Lovett, Holly Mount, Croydon.*

ZOOLOGY.

OTTAWA FIELD NATURALISTS' CLUB.—We are glad to receive from our transatlantic cousins a copy of the first part of the Transactions published by the above club. It evidences good work, for besides the inaugural address, delivered by the vice-president (Mr. James Fletcher) in the absence of the president, it contains, amongst other matter, papers on "The Graphite of the Ottawa Valley," by Mr. W. H. Harrington; "On the Forms and Structures of some Spongillæ found in the Ottawa," by Dr. A. F. Kemp; "The Connection of Botany with Mythology," by Mr. R. G. Haliburton; "Cystidean Life," by Dr. J. A. Grant; "Museum Education,"

* Allowing the previous coat to dry thoroughly first.

by H. B. Small; "On the Contractility of the Spores of *Palmella hyalina*," by Dr. A. F. Kemp; "Design in Nature," by Mr. W. D. Le Sueur; "Land and Freshwater Shells of the Ottawa Valley," by Mr. G. C. Heron; and an ably compiled "Flora Ottawaensis," by Mr. James Fletcher, containing the list of the flowering plants, juncaceæ, grasses, filices, lycopodiaceæ, &c.

THE "MIDLAND NATURALIST."—The September number of the above magazine contains, amongst other matter, articles on "The Structure and Life-History of *Volvox globator*" (illustrated), by A. W. Wills, F.G.S.; "On the Origin of the Rocks and Scenery of North Wales," by J. J. Harris Teall, M.A., F.G.S.; "On the Occurrence of Foraminifera in the Carboniferous Limestone of Derbyshire," by E. Wilson, F.G.S.; "Meteorology of the Midlands," by Mr. W. J. Harrison, F.G.S., &c.

NORFOLK AND NORWICH NATURALISTS' SOCIETY.—Our notice of the Transactions of the above society, in the September number, was for the session of 1878–79.

"THE LAND AND FRESHWATER SHELLS OF THE BRITISH ISLANDS," by R. Rimmer, F.L.S. This handsomely got up little volume supplies a long-felt want in a very ingenious and trustworthy manner. The author is an enthusiastic conchologist, and writes both attractively and well, and in a manner so simple and natural that we have no fear that any ordinarily educated man will easily understand every phrase. But the feature of the book which strikes us most is that every species of British land and freshwater shell has been photographed, and here we have all the photographs, natural size, in the albertype process, so that the merest tyro will find no difficulty in identifying any shell he may find. The work is published by Mr. David Bogue, 3 St. Martin's Place, Trafalgar Square, W.C.

MOTHS THAT FLY TO LIGHT OF AN EVENING, OR RARELY APPEAR DURING AUTUMN WEATHER.—A relative of mine in North India has been in the habit, during the present year, of sending me examples of the moths that come to their garden lamp of an evening, and as some of them are identical with the typical British species in my cabinet, they have furnished me with a striking illustration of the greater number of broods, or, at least, of the diverse time of appearance in the perfect state of our flickerers at the midnight oil within the warmer temperate regions. Regarding *Sterrha sacraria*, a geometer first noticed by collectors on our south coast in the year 1858, Newman says, "The eggs are laid in August, on several kinds of dock and camomile, on the leaves of which the caterpillar feeds in a state of nature, but in confinement it has been successfully fed upon the common knot grass. The moths fly by day, and appear on the wing in July, August, and October; those of October are certainly a second brood. It occurs very sparingly in the south of England, and Mr. Birchall records the occurrence of one specimen in Ireland in 1864. I ought to add, that from the singular varieties of this moth, bred from the egg by the Rev. John Hellins, I am inclined to think it comprises many of the so-called species described by continental entomologists as distinct, such, for instance, as *Sanguinaria* of Esper, *Labdaria* of Cramer. (British Moths, pp. 96–7). I well remember my first seeing this moth on a lamp-pane hid in the umbrage of a secluded walk near the Shanklin Cliffs one still October evening, and the delight afforded me at that dead season by its chaste canary-yellow wings, with their oblique pink stripe. The next time I met with it was with far different feelings, beneath the pure purple skies of a Neapolitan May, among the myrtle scrub of the Island of Capri; and now I have it sent me from Bareilly in the hot Ganges valley, the 17th of last June. The Indian specimen is the smallest I possess, measuring under 10‴ in wing expanse." "At one time," says Dr. Knaggs, "it is an *embarras de Sterrha sacraria*, which takes us by surprise, at another an abundance of some ordinarily rare *Deilephila* astonishes our weak nerves, and so on. Now *pulchella* is all the fashion; *floreat Deiopeia*." This was in the year 1871, and this pink spotted exotic was then turned up here and there on the south coast during the sporting month of September, although in 1874 and 1876 it was not noticed until October; facts not a little difficult to harmonise with Newman's injunction to be on the look out for it during July. In the south of France it is found during May and October ("Entomologist," vol. xi. p. 186), and lastly I have a spring example sent me from the Ganges valley on the 17th of June; all of which goes to show that exclusion of broods must vary with locality, although there is a probability that like the former moth it is, at least, double brooded within the warmer temperate zone. On Mr. Stainton's scale, my specimen from the land of Indra is again small, measuring only 10‴ in wing expanse. ("British Butterflies and Moths," p. 150). Lastly I have a *Sphinx* sent me at the same time, that I utterly fail to discriminate in any respect but size from our autumnal convolvulus hawk, of uncertain appearance at the petunia beds of a September evening. It only attains 3″ 2‴ in wing expanse. Other tenants of my consignee's papers appear to me—shall I say?—*Noctua flammatra*, and the cosmopolitan of the *Leucanidæ*, *L. Loreyi*, windfalls rarely taken on the south coast; or, if not, they at least come closer than my diagnosis. However, doubtless I have said enough to induce any young student who wishes for rare English moths to apply to friends abroad, and if he desires to benefit science, he has a fair chance of doing so by suggesting the affixing of the date of capture to the papers they are wrapped up in. The dimensions of the specimens are likewise of some little interest.—*A. H. Swinton.*

BOTANY.

Rose of Jericho.—I have read with surprise your correspondent's note in the July number upon the Rose of Jericho. From my boyhood, the name has been familiar to me as designating *Anastatica hierochuntica* (L.), and it was not until about twenty years ago, that I saw seed vessels of *Mesembryanthemum Tripolium*, in a bookseller's window in Cornhill, London, exposed for sale as "The Rose of Jericho;" all the authorities which I possess are against such an appropriation of the name. In Linnæus's "Systema Naturæ," by Persoon, dated 1797, the plant, *Anastatica hierochuntica*, is called *Rosa hierochuntica*.* The "Encyclopædia of Geography," published 1834, under the head of "Turkey in Asia"—Botany, page 880—gives a figure of the *Anastatica hierochuntica* or *Hygrometric Jerosa*; and states that, loosened from the arid plains and rocks where it grows in Syria, it is driven by the winds to the shores of the Mediterranean. Lindley, in the "Vegetable Kingdom," describes the same plant as the Rose of Jericho, and states that it is a native of Egypt, and that (the tradition is) having first bloomed on the eve of the Redeemer's birth, it continued open until His resurrection; a fact, if it be one, that proves that that season was rainy.† Dr. Lindley refers to the "Gardener's Chronicle" for 1842, page 363, for further information upon the subject. Mr. Bennett, in "Outlines of Botany," vol. ii. section 3878, adds to the history of the Anastatica, that in Palestine it is named Kaf Maryam, St. Mary's flower, or the Holy Rose; and he relates, as the late Dr. Macgowan did, when he kindly gave me some of the specimens which I possess, that the plant, in its dry and collapsed state, is in much request by mothers in Jerusalem and elsewhere, from a superstitious belief that, if immersed in water, when the first maternal pains are felt, the expansion of the plant will indicate the progress of the labour, and its full development the birth of the infant! Dr. M. added that some people would give its weight in gold to secure the treasure. That the Anastatica was popularly known as the "Rose of Jericho," sixty years ago, I have this evidence: An old lady of Dublin, a friend of my family, possessed one which I saw, and ardently hoped she would give me; but on her husband's death, she joined the Church of Rome, and made over to the priests all she had, the "Rose of Jericho" included. I was a boy when that happened, but it made a strong botanical impression upon me against Popery, which the gift of several of the plants by friends, since that time, has not quite effaced.—*Gerard Smith.*

* Loudon, in "Encyclopædia of Plants," dated 1829, gives the same Latin and English names; and states that it was introduced and cultivated in this country in 1597, from the Levant.

† *A. hierochuntica* is distributed along the shores of the Mediterranean, and upon deserts between Syria and Barbary.

Preserving the Colours of Flowers.—I have used for several years the following solution, for preventing flowers, while drying, from losing their colour. Water 500 grammes, alcohol 400 grammes, salicylic acid 4 grammes. The flowers should be steeped in the above solution for a few minutes. This in answer to R. B. L.'s demand in the April number of Science-Gossip.—*E. Lefevre, Rheims.*

Caterpillar Fungus.—With reference to a notice by Captain Aitken, F.G.S., in Science-Gossip, May, 1880, page 97, and the paragraph by Dr. M. C. Cooke in a subsequent number, page 140, on the subject of Caterpillar Fungus from Ceylon, will you kindly allow me to remark that I did not understand from Dr. Cooke that it was "a very old species"? On the contrary, I was under the impression that though the characteristics of the genus were well known, this particular species was probably undescribed. It was on this account I left specimens with Dr. Cooke for examination. I am glad, however, to find now on Dr. Cooke's authority, that the species is *Torrubia Melolonthæ* (Tul.); and I am sure Captain Aitken cordially agrees with me in not desiring to increase species unnecessarily. In an "Enumeration of the Fungi of Ceylon," by the Rev. M. J. Berkeley, F.L.S., and C. E. Browne, Esq., F.L.S., in the Journal of the Linnean Society, vol. xiv. Botany, page 110, there are mentioned the following species of Fungi as parasitic on the larvæ of insects: "976. *Cordiceps militaris* (Fr.) On dead pupæ. Nuwara Eliya, Central Province, 1868. Bright crimson, varying much in size. 977. *Cordiceps Barnesii* (Thw.) On larvæ of Melolontha. 978. *Cordiceps sobolifera* (Berk.). *Torrubia sobolifera* (Tul.) On larvæ of some lamellicorn insect at the roots of coffee trees." Whether the species quoted by Dr. Cooke as *Torrubia Melolonthæ* (Tul.) is identical with any of the above I am unable to say, but I believe readers of Science-Gossip will thank Captain Aitken for having placed the character and history of these peculiar fungi before them in so interesting and graphic a manner.—*D. Morris, Jamaica.*

"British Wild Flowers by Natural Analysis," by F. A. Messer. This is quite a "new departure" in botany, and simplifies the diagnosis of British plants in a wonderful degree. On one side of every page we have a pictorial delineation of every organ characteristic of each genus of British plants, and on the other the usual letterpress description. As the eye travels rapidly over the illustrated page, it takes in at one view all the contents, and so presents to the mind a comprehensive view of the subject. The distinctive features of classes, divisions, natural orders, genera and species, are thus recognised at a glance. We regard this work as a great boon to the botanical student in every way, and it ought to command a large success. The publisher is D. Bogue, 3 St. Martin's Place, Trafalgar Square, W.C.

THE LATE THOMAS BIRCH WOLFE, ESQ., OF BRIGHTON.—It is with feelings of deep regret that we have to record the death of this gentleman, whose initials of "T. B. W." have been familiar to our botanical readers from the very commencement of SCIENCE-GOSSIP. We have met with few men who were better acquainted with European botany, and up to a few days before his death, at the ripe age of 79 years, his memory for plant names appeared to have suffered no eclipse. As a friend he will be long missed by many; for his generosity and sympathy were as wide and unprejudiced as they were instantaneous and unparaded. It was to him that the cultivation of the *Euonymus* in and about Brighton was mainly due, and visitors will acknowledge how cheerful the bright green shrubs of this plant render the otherwise monotonous streets of stately houses. The National Gallery owes to Mr. Wolfe the masterpiece by Morland of "The Farm Stable," and another by Gainsborough of "Sir Henry Dudley." Is is a painful pleasure for us to thus put on record the memory of a good man and a dear friend.

GEOLOGY.

THE BRITISH MUSEUM.—Mr. R. Bullen Newton, assistant naturalist, under Professor Huxley, in the Museum of Practical Geology, Jermyn Street, has received an appointment in the Geological Department of the British Museum.

GEOLOGICAL MAP OF ENGLAND AND WALES.—A good geological map of England and Wales on a scale of twenty-eight miles to the inch, size about 1 foot, by 1 foot 4 inches, and price about 2½*d.*, is scarcely to be credited. Yet Messrs. Letts, Son, & Co. have issued such a map in part iv. of their "Popular Atlas," price 7*d.*, which includes also a general map of Africa, and a general map of the Austrian and German Empires. The Geological Map is by Mr. Henry W. Bristow, F.R.S., F.G.S., director of the Geological Survey of England and Wales; it is printed in colours, and contains no less than twenty-two divisions of the strata. Including as it does all the latest published work of the Geological Survey, so far as the scale admits, it will form a very handy map for reference. All the leading railways are distinctly shown.

AMERICAN PALÆONTOLOGY.—We have received from Mr. C. A. White, M.D., two publications, one entitled "Contributions to Palæontology," and the other "Cretaceous Fossils of the Western States and Territories." They are republished from the twelfth annual report of the United States Geological Survey for 1878. Both contain numerous and beautiful illustrations; many of the specimens have never been illustrated before. Dr. White gives abundant evidence of doing good and useful work.

THE FORMATION OF ROCK BASINS.—We have received a copy of Mr. J. D. Kendall's paper on this subject, read before the Manchester Geological Society on May 25. It is a valuable contribution to the literature of the subject, viewed from an engineering as well as a geological point of view.

THE BRITISH MUSEUM.—Collections (Mineralogy, Geology, and Natural History) are being removed to the new building for their reception, on the site of the 1862 Exhibition, in Cromwell Road. Dr. Henry Woodward has been appointed keeper of geology in the room of Mr. G. R. Waterhouse, who has resigned.

NOTES AND QUERIES.

WATER TRAP, &C.—During very hot weather in spring when the ponds in the neighbourhood were dried up, I began examining the yet wet beds of former ditches. I came across some paper that had been thrown into the water, and forthwith proceeded to search it in the possibility of its sheltering some water beetles. Among the folds I found a representation of nearly all the inhabitants of the ditch, with which I was tolerably acquainted. There were newts and frogs; great numbers of the beetle population; snails of course, innumerable, various aquatic larvæ; one water scorpion; of species of water boatmen I could not say how many, and a number of miscellaneous creatures. I went to other ponds and examined paper and similar materials with the same success. I then thought of placing in the water sheets of old paper for the purpose of thus serving shelter to various aquatic beings and examining them at pleasure or even taking what I wanted for my cabinet or aquarium. This I did when the pond beds were again filled, and as I have nearly always been successful, I direct the attention of your readers to this simple mode of obtaining living objects for aquaria, &c. The paper pressed into folds, may either be placed under the water, or else laid out flat on its surface. The one plan does when the other fails, according to the nature of the population of the pond or ditch. In any case it should be left alone for one, two, or even three weeks. In the latter way frogs and newts may be found lurking beneath in a few days. In this manner during spring I could obtain as many frogs as I liked for dissection or for the microscope. I afterwards thought the above resembled, somewhat, the ingenious method of sinking into the ocean bundles of old clothes and periodically examining them for the various marine animals and plants which had appropriated them for housing, employed by the good old Scotch naturalist, Thomas Edward. While on this subject I may as well mention the following incident. Once in walking through a moss by a road I noticed in a ditch close by, not eight inches wide, an old door-mat. I hauled it out, and laying it on the road at once perceived that it was covered with snail spawn, and swarming with life in different forms. Beetles, water boatmen, and scorpions, water woodlice, spiders, snails, worms, scuttled about (except the two latter) and made me wonder how they could all live together in so limited a space. Before leaving, I had secured more than thirteen species of Hydradephaga, some of which were new to me, besides a great number of water bugs, and if I remember rightly several good shells. This will give one a pretty fair idea of what abundance of visible animal life does exist, and subsist in nearly every little accumulation of water. A friend of mine, a practical entomologist of long experience, told me he lately took twenty-two good species of Hydradephaga from a small pond. And I have taken with the net at a single stroke such a quantity of water bugs that their odour was quite discernible at some little distance. But how much more plentiful is life now—in September—for all the above took place in spring! It is impossible to convey to one who does not go and see such things for himself any adequate conception of what numbers of living beings exist everywhere.—*C. Francis Young.*

WOODPECKERS' EGGS.—I have no doubt the variety which Mr. Wheldon describes in some eggs in his possession of the green woodpecker is rare, but specimens which appear from the description to be similar are described in Stevenson's "Birds of Norfolk," vol. i. p. 287.—*J. H. G., jun., Northrepps, Norwich.*

WOODPECKERS' EGGS.—The following extract may interest your correspondent, Mr. Geo. Wheldon. It is taken from an article entitled "On the Nesting of the Nuthatch, as observed in Norfolk," by F. Norgate, which appeared in "The Zoologist" of February last. After mentioning that he had found other birds in possession of the nesting holes of the nuthatch and woodpeckers, and one species of bat in those of the latter, Mr. Norgate says, "Fungi also take possession of these nests sometimes, and so quickly do they grow, that fresh eggs are occasionally imbedded in the solid hard wood of a Polyporus as perfectly as a fossil shell might be in its matrix of flint or chalk. I can well imagine that some of the perennial Polypori such as *Polyporus fomentarius* might preserve eggs for many years. I once opened a green woodpecker's nest by boring a fresh hole into the bottom of it. The bird was in, but there were no eggs, so I plugged up the hole I had made by hammering a dead bough into it. Several days afterwards I reopened it, and found the base of the cavity filled by a very hard fungus which I did not take the trouble to identify. Imbedded in this fungus were three green woodpeckers' eggs, which I had great difficulty in carving out with a chisel. On the top of the fungus were four more eggs mottled and spotted regularly all over with rich brown stains, but beautifully polished, as if the colour was natural. They much resemble the eggs of the common sandpiper in colour and markings. On another occasion I found in an old nest of *Picus major* a clutch of blue tits' eggs stained almost black, but this stain was possibly caused by sap from the oak-tree. The fungus which I have found most commonly blocking up woodpeckers' nesting holes is *Polyporus squamosus*."—*Frederick J. W. Oakley.*

SEA ANEMONES.—I was much surprised the other day to find inside an anemone two animals exactly resembling shrimps, except for the colour, which was olive-green. The smaller one was clasped in the arms of the larger. Both were alive, and evinced great disinclination to be separated. I should be much obliged if any one would tell me if anemones are in the habit of swallowing such animals alive, and also what those animals could be,—whether shrimps discoloured from being retained inside the anemone, or some other animal.—*Minnie, Nimmo Castle, Eden.*

MOTHS.—In reply to H. C. Brooke, in SCIENCE-GOSSIP of August 2, I have no doubt this moth is Deiopeia, genus Pulchella. They feed on forget-me-nots. I have seen one with five chains of red spots, but they are rare.—*Thomas Kingsford.*

PRIVET HAWK AND OAK EGGAR.—In the autumn of 1878, I kept about half a dozen larvæ of *S. Ligustri* which in due time went down. Last spring (1879) I had several larvæ of the oak eggar; these also spun up in the usual way. About August 25th, however, I found a perfect and fully developed specimen of each moth in my breeding-cage—a female Ligustri and a male oak eggar—both buzzing round the inside of their prison. Is it usual for these moths to remain so long in the pupal state?—*G. W. C.*

MIGRATION OF WAGTAILS.—Whilst strolling along the shore at Scarborough, on the 20th of August, I observed a large flock of pied wagtails (*Motacilla Yarrellii*), with which were mingled a few yellow wagtails (*Budytes flava*). There were over forty of them, flitting from rock to rock, and apparently in a state of considerable excitement. Occasionally a dozen or more would fly out to sea, but ere they had gone a hundred yards they would return, apparently with the intention of inciting their companions to follow them. At length the whole flock rose simultaneously and flew off to sea. After they had got a little way from land, they took a turn to the south, but ere they were quite out of sight, I saw, by the aid of a glass, that they once more made for the land, and settled upon the rocks. I did not watch them further; but I have no doubt that they were preparing for migration, notwithstanding that a considerable number remains with us through the winter.—*J. A. Wheldon.*

NESTING OF THE PIED FLYCATCHER.—This year I was fortunate enough to find the nest of a pair of pied flycatchers (*Muscicapa luctuosa*, Tem.). It was rather loosely constructed of hay and moss, in a hole in a pollard willow, close by the banks of the river Wiske, Northallerton. The hole had all the appearance of having been enlarged. Whether the beak of the flycatcher would be strong enough to do this, I cannot say. It may have been tenanted by some other creature before, although it looked as though it was newly done. The nest contained three eggs, considerably incubated. The old birds were very "fussy," and fearlessly approached within a yard or two of the intruder on their home. In reply to Mr. Geo. Wheldon, I may state here that there is a green woodpecker's (*Picus viridis*) egg, very faintly blotched with yellowish-brown, in the Scarborough museum.—*J. A. Wheldon.*

BANDS OF FLIES IN INDIA.—Readers of SCIENCE-GOSSIP may be interested in the following Indian notes:—Being at the palace of the City of Delhi some years back and searching for interesting objects, I noticed a long black band on the ground reaching from the buildings to the edge of the shadow and then disappearing; on nearing to find the cause, I found the black band to consist of an immense number of extremely minute dipterous flies, marching over the sand into the sunshine, on reaching which their wings appeared to dry instantly, and they rose in the air in light clouds, scattering in all directions. They issued from a crack in the cemented wall of a low building at the end of the throne-room, and used as a soldiers' lavatory. I tried to make the tiny creatures alter their course, but to no purpose; the band was six or seven inches wide, and from the wall inside, about eleven paces to the sunshine. I believe them to have been *Musca domestica*, as at times this insect becomes almost a plague in that city. Is this appearance in such numbers a common occurrence?—*J. H. Smith, Belfast.*

VIPERS SWALLOWING THEIR YOUNG.—My friend, the late William Hutchinson, M.C.S., witnessed the young escaping from the mother's mouth, on a spot close to the gate of Sandling Park, near Hythe, in Kent. He killed both viper and young, and preserved them; the young being placed as he had observed them in the park. This group I often saw while living in Kent, and I heard their history from himself. I know not what became of the specimens upon his removal to London.—*G. Smith.*

ENTOMOLOGICAL CAPTURES. — Perhaps a few recent entomological captures may interest some of your readers. On July 27 I took several high brown fritillaries (*Argynnis Adippe*), a good many silver-washed fritillaries, (*Argynnis Paphia*), one dark-green fritillary (*Argynnis Aglaia*). I saw two purple emperors, both in superb condition. On the 3rd of August I took two black varieties of the silver-washed fritillary. These are rarely taken out of the New Forest. The white admiral (*Limenitis Sibylla*), and purple hairstreak (*Quercus Thecla*) usually abound, but this season I have not taken a single hairstreak, and only one white admiral. I have seen a good many purple emperors; in 1876, 77, and 78 I took a good many. This is perhaps one of the best localities in Hants for them. In September, 1877, I took almost a dozen varieties of the clouded yellow, the variety known as *C. Helice;* in the same month I took a Camberwell beauty (*Vanessa Antiopa*). Black hairstreaks (*Thecla Pruni*) were seen here in June, 1877, sporting about in the oak-trees; in September, 1878, I took a brown hairstreak (*Thecla Betulæ*). In the latter end of May, and first two weeks of June, 1876, 77, and 78, I took dingy skippers (*Thanaos Tages*), Duke of Burgundy fritillaries (*Nemeobius lucina*), green hairstreaks (*Thecla Rubi*), and the pearl and small pearl-bordered fritillaries. All the vanessas occur here, the *Comma B.* included. I have taken the wood white (*Leucophasia Sinapis*); and the marble white (*Arge Galathea*) abounds every year. The Bath white (*Pieris Daplidice*) has been taken, besides many other rare butterflies, in the neighbourhood of Hungerford, about eleven miles from here. Numbers of rare moths can be taken in a large oak wood here called Doles, which covers a space of nearly twelve hundred acres.—*G. Dewar, Andover.*

THE CORMORANT.—I see in Waterton's Essay on the cormorant, that he is "positive" only one species of that bird inhabits England: has this careful observer of nature been proved wrong on this point, or are more modern naturalists under a delusion with regard to so common and interesting a bird?—*J. K.*

RAVEN AND ROOK.—In your August number a correspondent asks to be furnished with the distinguishing characteristics of the raven and the rook. The difference in the mature birds is very marked. The raven is nearly two feet in length, bill black, strong and thick, $2\frac{3}{4}$ inches long, nostrils covered with bristles which reach more than half-way down the bill. The rook is only eighteen or nineteen inches long; the bill is tapering and more slender towards the point, formed more for a digging than a lacerating instrument; the nostrils are not covered with incumbent feathers or bristles, and the base of the bill chin and face, as far as the eyes, are bare, covered only by a white and naked scaly skin. This last peculiarity does not appear until after the first moult, but the one found by your correspondent in February would certainly have completed this. — *Oliver V. Aplin.*

CIMBEX EUROPÆA.—A pair of these insects were captured in June last, by the Rev. Canon Grainger, D.D., Broughshane, co. Antrim, flying over a beech hedge. In 1845, at Cultra, near Holywood, co. Down, he secured another pair. Would they not be considered rare in the north of Ireland?—*S. B.*

FIREFLIES.—In answer to C. Willmot, I beg to say fireflies are frequently sent to England alive from Corfu and Therapia, and have been kept under glass at Plymouth for several days. As I have a few dead specimens for exchange from both those places, am open for one or two offers.—*Harry Moore.*

WASP PREYING ON LARVA.—I lately saw a wasp sting a large caterpillar to death, of the cabbage butterfly, which had fallen on the gravel walk, and then commence eating it. Is this an uncommon occurrence?—*S. B.*

DRAGON-FLY.—I should be much obliged if any of your readers could give me the name of a dragon-fly which I caught on August 4th. The upper part of the body is red, and there is a red spot at the edge of each of the four wings.—*A. J. Wheldon.*

THE MANX CAT.—A friend has informed me that a tailless form of the cat is not uncommon in Zululand. Can any of your readers certify the fact from their own experience, or, say whether it is identical in form with the Manx cat or otherwise? Can a specimen be procured, alive or dead? I would willingly make an exchange or give value for it. —*P. K.*

ANOTHER SUGGESTION.—At page 186 of August number of the SCIENCE-GOSSIP, there is a very good suggestion by Mr. Horace Pearce, F.L.S., to publish "A National Manual of British Botany," compiled under the joint authorship of several of our recognised leading botanists. Now were such a work passed through the press and issued to the world as one volume at once, it necessarily would be expensive, for there is no doubt it would be a first-class work and one that the nation would be proud of. I would then first suggest that it should be issued in numbers at fixed periods, say every three months, at 5*s*. a number; many persons would thus be enabled to take it in thus issued, who perhaps could not afford to purchase it if brought out in a complete form, whether in one two or three volumes. Hooker's "Flora of British India," published under the authority of the Secretary of State for India, is thus being published in parts at 10*s*. 6*d*. a part, but each part contains about 250 pages. Sir J. D. Hooker is assisted by various eminent botanists.—*J. Hobson, Colonel.*

HAWTHORN-BLOSSOM.—It may interest your correspondent R. W. to learn that I noticed a great scarcity, although not entire absence of the hawthorn-blossom in the neighbourhood of Harrogate, Yorks.—*G. C. Goody.*

BLUE PIMPERNEL.—In answer to A. M. P. in the August number of SCIENCE-GOSSIP, I have this season found the blue pimpernel growing abundantly in cornfields near the Vicarage, West Hatch, Somersetshire.—*D. S.*

CLAY AND COAL.—In SCIENCE-GOSSIP for August there are some observations by Mr. Woodward in his "Geology of Swansea," on which I should be very much obliged for further information, as an important part of the history of coal depends upon the points alluded to. At page 173, first column, third section from the bottom: "a seam of coal two feet in thickness is worked in the Millstone Grit." Is it to be understood by this that the coal rests on the grit? Page 174, end of first column: "these beds of underclay were evidently the ancient soils upon which grew the vegetation that gave rise to each overlying seam of coal." I should be glad to know if the lowest seam of coal is below the level of the sea, and at what depth, also the general thickness of the clay-beds? On the same page near the top the word "upheaved" is used. Is there any proof of this action? With reference to the remarks on bituminous and anthracite coal, is it not possible that the latter is due to the unavoidable percolation of liquid silica from the formations above it, while the quality of the former is characteristic of the vegetation most abundant in it?—*H. P. M.*

PLOVER'S EGG.—Under this head your correspondent, C. D. Wolstenholme, has a query in SCIENCE-GOSSIP. I have several eggs of lapwing in my cabinet of similar colour and marking to the one he describes, but consider them a very uncommon variety. In the course of my experience as a collector, I have met with many curious varieties of the lapwing's egg, and show a long series in my collection. Often the question is put to me, when showing my eggs to friends: "But which are the pewits?" and when I point them out, the general remark, with regard to the white-coloured ones especially, is, "Why, I should never have thought those were pewits!" One of my eggs is very sparingly, and another very profusely, spotted all over with minute black spots. Another is veined with small lines and spots of dark brown, and another is quite white at the small end, with a well-defined zone of small reddish-brown spots round the greater circumference; another is very faintly spotted with light brown. I have several others with the ground colour of a pale milky-blue tint, not exactly white. All my specimens when taken, were quite fresh; but in all, the thinness of the shell was remarkable. I consider these pale varieties are but one degree removed from "soft eggs," i.e., eggs laid before the membrane is strengthened by a shell. I took an egg last year, of a uniform light clay-brown ground colour, without any markings, except a continuous irregular black zone round the larger end, which gives it a most singular appearance. I have been enabled to procure many curious varieties of the lapwing's egg, having had superior advantages to many collectors, for, independently of the lapwing breeding in great numbers in this locality, I have had the pick from an immense number of eggs collected annually by a person in this neighbourhood for sale in the London markets, and have got many curious ones from him. They are principally brought to him by lads from the Fell districts, and he usually procures from 4000 to 5000 in the season. In spite of this large number being taken every year, I do not think the numbers of the birds are appreciably diminished.—*R. Standen, Goosnargh, Preston, Lancashire.*

CLIMBING POWERS OF THE TOAD.—I have, since reading Mr. Parfitt's note, re-read what I wrote in SCIENCE-GOSSIP, p. 165, and I still am of opinion that it is the "rough surface" which enables toads to climb up "walls" and "steps." "A deep flower-pot" is much smoother than a roughly-built garden wall, therefore I am not at all surprised to learn that Mr. Parfitt has been able to keep "restless toads fast prisoners" in one. I am simply at a loss, as to what Mr. Parfitt could have found in my note to cavil at. I have seen a toad climb a wall and so evidently has a far better authority than—*Helen Watney.*

"VANESSA ANTIOPA."—One Saturday afternoon lately I had the good, though tantalising, fortune to see a pair of the above beautiful insects under the following circumstances. Being engaged with my friend and fellow member, Mr. T. L. Waterman, in pursuit of pond life, I was startled by his exclamation of "What's that?" On looking round I saw a large object floating or flying through the air at an altitude of from thirty-five to forty feet. "My net, where's my net?" was my rapid answer, as I seized on that implement, and rushed off in pursuit,

> "And from field to field the boy it led
> While he pursued the flying thing."

But, alas! it never stopped, only once descending and that a very little, apparently with the object of resting on some sallows that grew on the margin of a large pool, but being disturbed by some youthful bathers, the descent was only sufficient for me to ascertain without doubt that it was a couple of *V. Antiopa*, in cop., the unusual appearance being caused by only one pair of wings being used, as is the case on all such occasions. Having now to make a detour of some two hundred yards to cross a bridge I for a minute lost sight of them, and when again I saw them they were apparently choosing a resting-place on the summit of the willows with which the place abounds, and so leading where I could not follow. I had only to rest and cool and bemoan my lot after a chase of some mile or more on one of the hottest afternoons we have been favoured with this season; but the mere thought of such a capture is some amelioration of the disappointment even while it seems to augment the same still more. I should be glad to learn if these insects always keep so determinedly out of harm's way on such occasions—of course if they only descended, they would prove an easy capture, from the fact that two insects are carried by one pair of wings. I may say I had almost the same tantalising fortune on Thursday, August 25th at Herne Bay, for I then saw a very good specimen of the same insect that had just been captured by a collector and who assured me he should record it in the "Entomologist," which I have no doubt he has done.—*Collis Willmott, F.R.M.S.*

GREEN TREE-FROGS.—In answer to R. Crossley's note on green tree-frogs in the June number of SCIENCE-GOSSIP, I should like to give my experience on the subject. I have kept the frogs for two years, having brought them from Pegli, in Italy, in July, 1878. I have never found them turn black if only kept in water with a little wooden ladder to sit on, but if I have given twigs of trees, especially the oak, they have become spotted with black. I always let them (if I am in the room) sit on the window, where they catch their own flies. They crawl up to the very top of the windows, and with one leap alight on the floor. There are some at the Zoological Gardens which are fed on meal-worms. I never feed mine in the winter, but they do not seem to sleep. They are quite tame.—*Evelyn Fowke.*

BLUE PIMPERNEL.—In reply to your correspondent A. M. P.'s query for localities for the blue pimpernel (*Anagallis cærulea*), I may state that a year or two since I found it in a field in this neighbourhood. Its incomparably lovely blue at once arrested my attention. The scarcity of this colour in birds, insects, and flowers is certainly very remarkable, and difficult to account for. Amongst the British Heterocera, for example, there is not a single instance in which a "true blue" occurs; and the paucity of blue flowers in the garden and conservatory must have been noticed by well nigh every one. Bentham seems to regard *Anagallis cærulea* as a variety only of *A. arvensis*; but from the specimens which I examined, it appears to me to differ not only in colour, but it is more erect in growth, and has the sepals less pointed, and I should certainly feel inclined to agree with those botanists who consider it as a distinct species.—*Joseph Anderson, jun., Chichester.*

SUNSHINE AND FROST.—Here and there, over an area of some two degrees of latitude, trees and bushes of varied kinds have been partially or entirely destroyed this season. In some places patches of foliage have been withered, in others a tree here and there; some with a brown branch, some with the lower half, some with the upper shrivelled up, just as if the winter had overtaken them in their spring-time. The effect is curious; summer green and winter brown or bare branches in July. The destruction is visible along the line of railway between Basle and Strassburg, or to Frankfort and Homburg. The leaf was given out plentifully, but while in its succulent condition, the plants affected were covered with hoar-frost. Upon this the sun shone with its summer heat, hotter than usual over this area, because there was but little evaporation. This heat, striking the frozen leaf, burnt it up at once, and there stand the dead and the dying by hundreds of thousands. There are curious episodes in this visitation. Yesterday evening I passed along an avenue of apple-trees; very few had any fruit; the leaf was all dead on the eastern exposure; but that side had sheltered the other, so that in many places the foliage was nearly natural. The avenue extended to the shelter of a wood. The last tree on the east was in the shade from sunrise till after midday. It looked very healthy, and had a large crop of apples. The trees on the other side were doing well, under the shade. Where the forest trees were low, the early sun had caught the tips of the apple-trees, while the lower branches were well clothed, and moderately fruity. There is a lesson to be learnt from this: at blossom-time, if it is early in the season, or if frosts threaten, shade your fruit-trees from the rising sun. The destruction in the rich garden-ground near Frankfort must have caused a very serious loss, and loud are the lamentations of "*No apple-wine.*"—*H. P. M.*

SAXIFRAGA GRANULATA.—I have found this in three locations in this neighbourhood, on chalk downs, on a gravel bank, and on a water-meadow on a ridge three or four feet above the level of the rest of the field. In the first locality it was growing, sometimes in small patches, and sometimes scattered over a considerable area. In the second there were only two or three plants, and in the third there were a good number, and mixed with them many tufts of very fine *Polygala vulgaris*. In the next field, often a mere marsh, there is an abundance of *Orchis latifolia*. I have observed that the spikes which come into bloom first are not so fine as later ones, and that the individual flowers are smaller and invariably of a much paler colour. The difference is very marked, for when I have gathered dark specimens, I have never been able to obtain perfect light ones. The "Student's Flora" gives the colour as dark purple, and says nothing of variations in the tint of this species, though it does of many others of the Orchideæ. —*E. A. F., Salisbury.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

A. LEINAD.—The moss is a species of Hypnum, and cannot possibly have done any harm to your aquarium. It has doubtless come from spores carried in the atmosphere. We are afraid you have too many animals. Take out at least one of the carp. Stone-leeches cannot be kept healthy in aquaria, as they prefer running water.

EAMARD.—"The Foot and its Covering" was published by Hardwicke. Write to D. Bogue, 3 St. Martin's Place, concerning it. 2. Obtain the "Guide to Bristol and the Neighbourhood," published during the meeting of the British Association to that city in 1875, and giving all the natural history and geological details. Any Bristol bookseller will obtain it for you.

H. SEARLE.—Your exchange far exceeded the limits of the space allowed, which is not more than about three lines, so we were obliged to cut it down. Above this space we are obliged to charge as an advertisement. The number of our Exchanges is increasing so rapidly that we are obliged to carry out this limit as strictly as possible.

J. A. FLOYD.—You will no doubt find an account of the Geology of Ontario in the publications of the Geological Survey of Canada.

E. LOVETT.—The slide of *Pagurus Bernhardus* reached us safely. It was capitally mounted.

H. MORLAND.—You will find a good deal about the Hymenoptera and Diptera in Stavely's "British Insects" (L. Reeve & Co.). We hope to continue the paper you mention shortly. You cannot do better than follow Mr. Bridgman's directions as to setting them.

PETER M. ROSS.—There are many species of "grubs," destructive to grain and grass, as the wire-worms, the larva of the crane-fly or daddy-long-legs (*Tipula longicornis*), of the cockchafer (*Melolontha vulgaris*), &c.; see Taylor's "Underground," published by the Christian Knowledge Society at 2*s.* 6*d.* Also Kirby's "Entomology," and Wood's "Insects at Home."

G. M. G.—Write to the Hon. Secretary, Microscopical Society, San Francisco, enclosing stamps or exchange, and we have no doubt he will forward you some of the San Monica earth.

N. B.—Yes; we think that some of our readers would like to have eggs of the Palmate Newt. Offer them in our Exchange column. Taylor's "Aquarium" (new edition, revised) will certainly be ready in November.

W. ERNEST MILNER.—You cannot do better than procure Tulk & Henley's "Anatomical Manipulation," published by Van Voorst. It is one of the best handbooks ever published on the methods of pursuing practical investigations in comparative anatomy and physiology.

G. H. P.—The species of tick was too much broken up to distinguish the species. The other insect was one of the common spring-tails (*Podura villosa*).

G. WARD.—Please send us another fragment of cucumber leaf affected by fungus.

F. S. SYDDON.—Your Algæ never came to hand.

E. NUTHALL.—It is not a common occurrence in the potato, liable as that plant is to teratological variation, for sprouting to take place in the interior of the tubers. Perhaps you will kindly send us a more detailed account.

A. HAMILTON.—Thanks for the gathering, which shall be distributed as you desire.

S. A. BRENNAN.—Your scarlet water-mite is no doubt *Limnochares holosericea* (*Acarus aquaticus* of Linnæus). These water-mites undergo great transformations when they leave the water. At first they have usually only three pairs of legs, afterwards four pairs.

EXCHANGES.

WANTED, Nos. 16, 17, 18, 19, 20, 21, 22, 28, 29, 30, 34, 43, 47, of "Cassell's Illustrated Travels," edited by H. Bates. State condition and price.—Harry Moore, 50 Rotherhithe Street, London, S.E.

A LAPIDARY's lathe for cutting and polishing works horizontally; also a Greenough's geological map, coloured, size 72 × 66. —Address, T. C. Maggs, High Street, Yeovil.

WANTED, living specimens of the Great Water Beetle (*Hydrous piceus*), for my aquarium; will give Lepidoptera or birds' eggs.—R. McAldovie, 12 St. Nicholas Street, Aberdeen.

WANTED, one or two slides of Rhabdospheres in exchange for other objects of interest.—W. H. Harris, Caerleon Villa, Partridge Road, Cardiff.

WANTED, *Erica Hibernica, Arbutus Unedo, Menziesia polifolia*, and *Pyrola uniflora*. In exchange for any of the above, I will give specimens of each of the following species: *Viola hirta, b. calcarea, Vicia gracilis, Althæa officinalis, Seseli Libanotis, Carum Bulbocastanum, Linum perenne*, and *Lonicera Caprifolium*.—J. W. Carr, 28 Emery Street, Cambridge.

WANTED, good specimens of minerals, spar, crystals, &c., from Cornwall, Derbyshire, and elsewhere, and especially from the Mourne Mountains. Books, &c., in exchange, or purchase. Particulars to F. R. G. S. I., 9 Royal Terrace West, Kingstown, co. Dublin.

WANTED, a good bull's-eye condenser, for a turn-table, and some slides.—F. S. Lyddon, 32 High Street, Warminster.

DUPLICATE birds' eggs and skins to exchange for others not in collection.—J. T. T. Reed, Ryhope, Sunderland,

: *Polytrichum alæfolium*, for *Hypnum Crista-castrensis*; could send other varieties, viz. *Dicranum (Fissidens) bryoides* and *taxifolium, Bartramia pomiformis*, and a host of others. Also want a secondhand or cheap book (good authority) on Mosses.—S. F. Conacher, St. Fort, Newport, Fife.

Carex ornithopoda, and many other British plants, offered in exchange for others.—Address, H. Searle, Rook Street, Ashton-under-Lyne.

AM leaving England, and wish to sell a number of greensand and other fossils, and several of Routledge's 1*s*. "Books for the Country," on insects, aquarium, &c., and other publications, at half-price.—J. A. Floyd, Alcester, Warwickshire.

I HAVE still some mounted slides of *Borago Ziglandica* (Linn.), hairs rising from silvery calcareous tubercules; Mauritius. A most beautiful opaque object. Send list of slides for exchange. —Rev. A. C. Smith, Crowboro', near Tunbridge Wells.

WANTED, some moving spores of the Equisetum.—Rev. A. C. Smith, Crowboro', near Tunbridge Wells.

EMBRYO oysters. Spines of Spatangus, spines of *Ophiocoma rosula*, cleaned, ready for mounting, in exchange for other good unmounted material; also wanted a good quarter-inch objective, for well-mounted micro objects. Will give liberal exchange.—W. White, 7 Warden Place, York Street, Nottingham.

WANTED, "Middleton's Astronomical Atlas," in exchange for shells, fossils, minerals, &c., named and localised.—Address, M. A. O., 82 Abbey Street, Faversham.

BRITISH Mosses wanted in exchange for flowering plants; send desiderata.—J. Harbord Lewis, 145 Windsor Street, Liverpool.

SET of twelve polarising objects, with tourmaline in case, value 35*s*., exchange injected micro slides.—S., 364 Kennington Road, S.E.

SUPERIOR small cabinet with thirteen drawers, suitable for moths, insects, &c.; exchange microscope with polariscope, or good injected micro slides.—S., 364 Kennington Road, S.E.

MOUNTED slides of fossil wood, for other slides.—J. Earnshaw, 91 Wriley Street, Oldham.

L. C., 7th ed. Offered 557, 626, 628, 814, 1043, 1287, and others. Lists exchanged.—D. J. Powrie, M.A., at Mrs. M'Courty's, Dockhead, Dumfries.

WANTED, dried specimens of *Anemone ranunculoides* (L.), *Corydalis solida* (Hook.), *Dianthus caryophyllus* (L.), *Althæa hirsuta* (L.), *Malva verticillata* (L.), *M. parviflora* (L.), *Crocus aureus* (Sibth.), *Onoclea sensibilis* (Willd.), or any other "excluded species." Rare plants in exchange.—J. A. Wheldon, 9 South Street, Scarborough.

WANTED, good microscope in exchange for Harris & Co.'s excellent achromatic telescope, object glass 1½ inch diameter, and own shade, drawing out to 36 inches, closing up to 11½ inches, three draws, the tubes and mountings of brass, the body covered with leather, and a code of signals attached, as good as new.—Edmund Price, Fair View Cottage, Uplands, Stroud, Gloucestershire.

L. C., 7th ed., offered: Nos. 3C, 6, 11, 38, 59, 133, 180, 2C9, 268, 273B, 276, 317, 361, 367, 394, 495, 531, 557, 571, 581, 584, 594, 612, 852, 878, 907, 1123, 1130, 1257, 1258, 1602, 1603, 1607, 1611, 1636, and many others Wanted: 5, 43, 88, 127, 197, 201, 202, 227, 249, 360, 388, 474, 516, 575, 579, 580, 590, 613, 746, 817, 839, 877, 910, 912, 1007, and others. Send lists.—A. W. Preston, St. Phillip's Road, Norwich.

BRITISH birds' eggs in exchange for others not in collection, one hole side-blown. Merlin, kestrel, sparrow-hawk, clipper, wheatear, oyster-catcher, curlew, sandpiper.—A. Stevenson, 2 Knox Street, Paisley.

FIRST-CLASS objects given for parasites from fish. Communicate before sending.—E. Wheeler, 48 Tollington Road, Holloway, London, N.

MOUNTED slides of *P. angulatum*, for other diatoms named.—M. Fowler, Burn Row, Slamannan, N. B.

DUPLICATES L. C., 7th ed., 501B, 626, 12C9, 1287, *Veronica repens*, DC., and *Potamogeton Zizii*, M. and K., for other good plants or mosses, &c.—R. Renton, Fans, Earlston, N. B.

A COLLECTION of minerals, Haldon greensand fossils, and corals, gault and other fossils; polished slabs of madrepore corals, microscopic section of Devonshire corals; also Devonshire corals in the rough, and British shells in any quantity. In exchange for the following: foreign shells, silurian fossils, gault (gault pies), groups of fossils, rare kinds of British shells, polish agates, and all kinds of small foreign recent corals, not larger than an egg, no other offers wanted.—A. J. R. Sclater, 23 Bank Street, Teignmouth.

RAYS of starfishes, *Ophiocoma rosula, granulata, bellis*, dried or in spirits, for other interesting objects, slides, &c.—J. B., 36 Windsor Terrace, Glasgow.

"CHEMISTRY Applied to the Arts and Manufactures," latest edition, complete in eight volumes, published by Mackenzie, Ludgate Hill. For sale, what offers?—H. E. J. Irons, 125 Manor Street, Clapham, S.W.

DUPLICATES L. C., 7th ed., 1, 3C, 6, 10, 22, 26, 39, 40, 45, 57, 59, 80, 112, 178C, 213, 231, 254, 262, 274, 295, 296, 297, 303, 305, 343, 350, 352, 355, 365, 405, 456, 486, 537, 642, 675, 695, 703, 705, 707, 744, 811, 942, 963, 973, 1028, 1036, 1045, 1048, 1164, 1278, 1341, 1342, 1348, 1350, 1504, 1637, 1644, 1645.—J. Jackson, High Street, Wetherby.

Potentilla fruticosa for botanical, geological, or entomological specimens.—Rev. J. Hich, Staundrop, Darlington.

I SHALL be happy to forward to any of your subscribers any fern or Sertularians from this country, in exchange for those of other countries.—A. Hamilton, Petane, near Napier, Hawkes Bay, New Zealand.

"NATURALIST," 1877–1880 (3 vols. unbound), "Midland Naturalist," 1878 (bound), suggestions for forming collections of birds' eggs, by A. Newton, and several vols. and odd numbers of "Natural History Review," in exchange for back vols. (unbound or bound), or parts of "Zoologist," "Entomologist," or "Entomologists' Monthly Magazine," or offers.—Alpha, 18 Upper Fitzwilliam Street, Dublin.

BOOKS, ETC., RECEIVED.

"The Land and Freshwater Shells of the British Isles," with illustrations of all the species. By R. Rimmer, F.L.S. London: David Bogue.

"British Wild Flowers: by Natural Analysis," by Frederick A. Messer. London: D. Bogue.

"Magnetism and Electricity." By Dr. F. Guthrie. London and Glasgow: W. Collins & Sons.

"The Book of the Rabbit." Parts I. and II. By L. N. Gill. London: "Bazaar" Office.

"The Practical Fisherman." Parts VIII. IX. and X. Ditto.

"Fancy Pigeons." Parts IV. and V. Ditto.

"British Dogs." Parts XIII. and XIV. Ditto.

"Etude sur les Tempêtes de l'Atlantique Septentrional." Par N. Hoffmeyer.

"Light and Heat." By Capt. W. Sedgewick, R.E.

"Nectar; its Nature, Occurrence, and Uses." By William Trelease, Ithaca, New York.

"Transactions Ottawa Field-Naturalists' Club." No. 1.

"The Oologist." Nos. 5 and 6, vol. v.

"The Valley Naturalist." September.

"The American Naturalist." September.

"The American Journal of Microscopy." September.

"The American Monthly Microscopical Journal." September.

"The American Entomologist." August.

"Les Mondes." September.

"Le Monde de la Science," &c. September.

"La Science pour Tous." September.

"Feuille des Jeunes Naturalistes." August and September.

"Transactions of the Hertfordshire Natural History Society." Vol. i. part i.

"Proceedings Chichester and West Sussex Natural History Society."

"The Midland Naturalist." September.

"Land and Water." September.

"Ben Brierley's Journal." September.

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—J. H.—C. G. H.—J. F.—M. M.—E. B. P.—S. F. C.—E. G. H. —W. F. L.—T. W. N.—S. A. B.—R. A.—T. B. W.—D. D.—W. F. L.—G. H. P.—J. H.—T. H.—J. T. T. R.—F. S. L.—E. N.—W. F. L.—E. A. F.—J. S.—W. K. Mc. G.—G. M. G. —G. W.—P. K.—F. J. W. O.—H. W.—M. M.—P. M. R.—A. H.—S. A. B.—J. W. C.—C. N. J.—H. M.—F. H. H.—W. H. H.—P. K.—R. Mc. A.—J. C. M.—J. H. G.—E. R. F. —T. W.—G. H. B.—J. W.—B. M. W.—C. W.—P. S.—A. W. P. —J. A. W.—E. L.—D. J. P.—D. D.—E. P.—C. F. Y.—H. S. —J. A. F.—A. C. S.—C. P. C.—W. W.—H. J. S. H.—C. B.—A. B.—M. F.—E. W.—P. M. R.—J. B.—E. C. T.—H. E. J. I. —J. C.—R. R.—A. B.—A. S.—J. J.—J. J. H.—E. M.—A. J. R. S.—H. S.—J. A.—&c.

THE NATURAL HISTORY OF DIATOMS.

WITH the title of "The Diatoms of the Alps and the Jura," an important paper by Professor J. Brun, of Geneva, has just been published in the Proceedings of the Belgian Microscopical Society. We have great pleasure in laying the following translation (by Mr. W. B. Hardy) before our readers:—

Diatoms; their place in Nature.—Diatoms are all microscopic and belong to the vegetable world. When first they were studied, they were thought to belong to the animal kingdom. Ehrenberg, in consequence of the curious movement with which they are endowed, classed them in 1842 amongst the Infusoria. But numerous investigations made since, by means of the spectroscope and polarised light, have made evident their affinities with certain filamentous Algæ, the *Hyalotheca*, *Zygonema*, *Spirogyra*, &c. Their endochrome, their respiration, and their mode of reproduction, place them without doubt, in the great family of the Algæ, where they form a separate and well-defined class.

Their abundance.—Diatoms are indeed amongst the most singular objects of the vegetable kingdom. The more one studies them, the more one is astonished to see with what abundance they are distributed in nature: we meet with them nearly everywhere where water is to be found, whether stagnant or running, limpid or troubled, hot or icy cold, even among the melting snow of the lofty Alps. Everywhere in the deposits of these waters, the eye, aided by the microscope, discovers diatoms, and nearly always in immense numbers.

Their invisible germs are so light (I do not call them spores) that they remain suspended in the air, thus passing from one region to another. Amongst the Alps, these germs are able to remain months without perishing, on the dry rocks exposed to the sun, or on the glaciers exposed to the bitterest cold; and when a ray of sun comes, and some drops of water, we see them appear by millions!

Their dissemination on the Surface of the Globe.—It is by the joint action of the air and water that diatoms are disseminated, and it is the winds and the rains which render their distribution constant. Once dried, their excessive tenuity permits the slightest eddy to sweep them up and spread them abroad over immense tracts of country, and even from one continent to another. When the air becomes calm they gradually settle down. The rains strew this organic dust everywhere on the surface of the soil, and even as far as the highest summits of the Alps, carrying it into the brooks, the marshes, the peat-bogs, and the lakes, and there, in every season, the diatomic dust soon commences to live. This diffusion distributes every species of fresh-water Diatomaceæ all over the surface of the globe. Thus we have in Switzerland nearly all the species which have been found in Saxony, by Rabenhorst; in the environs of Paris, by P. Petit; in the south by M. Guinard; in Austria, by M. Grünow, and in the high Tatra of the Carpathians by Schuhmann.

Nevertheless some species require special conditions. Some require salt water, or water containing lime or silica; others require water perfectly stagnant and warm; others again prefer water running and fresh; whilst a few live parasitically on certain species of aquatic plants. Hence, although the same country receives the germs of every species, they do not equally all develope; it is this which causes the Alps, with their varied conditions of altitude, of heat, of pressure, and of humidity, to support relatively many species. I have collected during eight years six hundred and eighty different species and varieties, and I do not pretend to have found them all, although I have been much aided by my friends of the Alpine Club. Among these species six are new. There are altogether in the known world, about six hundred well-defined freshwater species of diatoms.

Their smallness.—Ehrenberg estimated that a cubic inch could contain forty-one millions of *Diatomaceous carapaces*. I have found that one species averages eight thousand in a cubic millimètre. Other precise measurements show that a cubic millimètre can contain twenty-seven million specimens of *Navicula pediculosa*, and forty millions of *Achnanthidium delicatulum*. These are our two smallest species.

Their Endochrome.—Diatomine, or endochrome, is the substance found within the silicious carapace, or frustule. It is translucent, of an oily appearance, strongly refracts the light, and its colour is brown, tawny, or golden; it corresponds to the chlorophyl of other green Algæ. The endochrome, under the influence of heat, of alcohol, or acids, becomes a beautiful emerald-green. It is thick and viscid, like protoplasm, and its natural division in the frustule takes place sometimes in the form of plates amongst the placo-chromatic diatoms, and sometimes in the form of granulations amongst the cocco-chromatic diatoms.

The endochrome is ordinarily motionless, very rarely one sees it move under the form of granules which appear to be gifted with a slow Brownian movement. It contains a trace of iron, which is found in the form of a peroxide when living diatoms are calcined. It resists putrefaction for a long time. The species which I collected in the Sahara, in 1873, and preserved in the water in which I took them, had still, four years after, their endochrome in good condition. It remained translucent and yellow, but its primitive form had changed and become contracted. I have seen fossil diatoms, from a considerable deposit in Holland, and which, consequently, had been buried for ages, show here and there examples whose endochrome was still yellow and transparent, although it had become thicker and more plastic. Ehrenberg, in studying the "Kieselgühr" of Hanover, noticed the same fact. I am convinced that this only took place in those specimens which had arrived at perfect maturity, and whose two valves were still hermetically closed.

Respiration.—Diatoms, like all the Algæ, respire by means of the carbonic acid gas which all waters exposed to the atmosphere contain in a dissolved state (gaseous nutrition). No carbonic acid, no diatoms. They assimilate the carbon of the gas, but the oxygen is set free and escapes, little by little, under the form of minute bubbles. The carbon is used in the formation and development of all the soft part of the vegetable called the Thallus. At the same time that they breathe it, they also take from the water a portion of the mineral substances which it contains in a dissolved state; as iron, alumina, lime, and, above all, much silica, which constitutes its hard and transparent glassy frustule.

If in a phial containing drinking-water and many living diatoms we inject a very slow current of carbonic acid gas, and if the gas which escapes be collected under the influence of light, experience proves that the latter gas is richer in oxygen than atmospheric air.

Calcareous Deposits due to Diatoms.—Nearly all waters contain lime (*Calcic carbonate*). Lime, it is true, is completely insoluble in water chemically pure; but when the water contains carbonic acid gas, the gas renders the lime slightly soluble. In proportion as the diatoms decompose this gas, the dissolved lime is separated, and then it is either precipitated or else it incrusts the mucilaginous envelope, in the middle of which these Algæ are developed. It is especially the gelatinous spheres where the Epithemia and some Synedra grow which afford the microscope the prettiest groups of calcareous crystals. Where the water is quiet, the lime that is set free settles to the bottom, and partially forms the mud of stagnant waters; but if the water is running, the calcareous particles are immediately swept on with the current. We must not forget that in proportion as the carbonic acid gas off the water is decomposed, the same water dissolves a new amount of gas that it borrows from the atmosphere, which gas serves in its turn to dissolve a new quantity of lime. These infinitely minute plants maintain, then, in the water a constant movement of mineral molecules and of the gas. This rôle is incessant, and takes place in winter as well as in summer, and the Count de Castracane was right when he proved that the diatoms not only co-operate directly by their silicious residuum, which they leave after death, to form geological strata, but also indirectly by the lime which they constantly set free from the midst of the water.

Their Silicious Frustule.—I do not believe that there ever has been in nature a more marvellous organic incrustation than the silicious envelope of the diatoms. It is only with the most powerful immersion lens, and giving a considerable linear magnifying power (+ 1000 or 1500) that we are enabled to resolve the finest striations of certain species. But for the determination of species a linear power of + 300 or 400 is nearly always sufficient, and especially in employing oblique light. However, all works treating on the microscope give the necessary instructions. This silicious envelope resists putrefaction for an indefinite length of time, and remains intact at the bottom of the water as each of the diatoms die, forming in this way in many countries considerable deposits (Kieselgühr), and which require thousands of years to form. This silica resists acids, and even a dull red heat; but at an intense reddish-white heat it softens and presents a half melted and vitreous mass.

The following three analyses give the exact chemical composition of the fixed frustule of the diatoms.

Analysis of the Kieselgühr of Hanover, by M. Tiegler (1862):—

Silica	84·15
Alumina	1·40
Ferric oxide	0·70
Manganese	traces.
Calcic carbonate	1·75
Carbonate of Magnesia	1·10
Potash	0·25
Water	10·40
Losses	0·25
	100·00

Analysis of the Kieselgühr of Franzenbad, by Rob. Hoffmann (1863):—

Silica	77·000
Alkalies	0·401
Magnesia	0·049
Lime	traces.
Oxides of Iron and Alumina	0·910
Phosphoric acid	0·190
Water	6·000
Losses (in part organic)	15·450
	100·000

Analysis of a Kieselgühr of Holland, by L. Lossier, (Geneva, 1878):—

Silica	84·37
Phosphates of Iron and Alumina	2·55
Lime	0·35
Magnesia	0·07
Alkalies	0·60
Water and Organic matters	12·68
	100·62

(*To be continued.*)

THE EGGS OF *CHRYSOMELA POLITA.*

THESE eggs, which are laid in irregular masses of about thirty loosely stuck together by a glutinous matter which soon becomes hard and brittle, are about 1·8 mm. in length, and somewhat over ·5 mm. wide, elliptical, with narrower pointed ends. They vary very much in colour, from pale straw-yellow or buff, to a bright salmon-rose, or even orange-red. They have a thick outer shell which is very finely and regularly pitted, but is often cracked, and has the appearance of scaling off. I was first struck by the thickness, hardness, and brittleness of this shell, giving it a curious resemblance to the calcareous shell of the bird's egg. I soon found that it might be easily removed by rolling the eggs under the camel's-hair brush in a little water, without injury to the inner or vitelline investment and without prejudice to the future development of the eggs, provided they were kept in a sufficiently moist atmosphere—a condition which is easily realised by placing them on a fresh leaf with a few drops of water in a shallow saucer covered with glass.

This double investment of the insect egg, is not always so easily demonstrated. Herold ("Untersuchungen über die Bildungsgeschichte der wirbellosen Thiere im Eie"), in the preliminary remarks to the description of the figures on plate xiii., details the method adopted by him for removing the outer shell of the egg of *Musca vomitoria* in order the better to observe the changes taking place in the contents during the development of the embryo. The process consisted in fixing the eggs to a gummed surface or a wet wafer, and, when dry, by gentle pressure on the side, bursting off the outer shell held fast in the gum or wafer, and turning out the egg with its inner investment entire.

Under the microscope the pits in the outer shell of the polita egg are seen to be irregularly polygonal or roundish, of unequal sizes, the largest being about $\frac{1}{1000}$ inch in diameter, dark by transmitted light, and separated by a much finer, clear network of irregularly hexagonal meshes, the width of the lines of which is $\frac{1}{4}$ to $\frac{1}{5}$ that of the cells — say $\frac{1}{4000}$ inch. In April last I obtained a few eggs of *Chrysomela fastuosa*, which I find described in my notes as "very elongate — white, and beautifully shagreened; about $1\frac{1}{2}$ mm. in length by $\frac{1}{2}$ mm. broad; somewhat pointed at the ends." I am not able to find any note of it, but the impression on my memory is that the "shagreening," under the microscope, was a very fine and delicate hexagonal reticulation, reminding me at the time of the like appearance in the polita egg. The egg of *Apis mellifica* has a similar hexagonal reticulation. Von Liebold, in "Wahre Parthenogenesis" (page 105), quoting Leuckart, says, "As in the eggs of most insects, we distinguish also in that of the bee, two membranes, an inner, the so-called vitelline membrane, and an outer, the egg-shell or chorion . . . . The former is structureless, whilst the latter . . . . is overlaid with a delicate hexagonal moulding (Leistenwerke), as with basket-work (einem Geflechte)." This recalls the sculpturing of many lepidopterous eggs, and the comparison of the same to flasks enclosed in wickerwork. How this sculpturing is impressed upon the insect egg is that which puzzled me for a long time, but which seems to be explained by reference to the genesis of the outer shell or chorion itself. I quote the account of this structure from Von Liebold ("Beiträge zur Parthenogenesis"). At page 57, he says, "The inner surface of this ovary-tube proper [*tunica propria* of Leydig] appears beset in various places with a *cylinder*-epithelium composed of nucleated cells." Then, at page 61: "This epithelium separates itself later from the tunica propria of the ovary-tube, and forms itself into the chorion surrounding the egg," &c. The chorion then, or outer shell of the egg, in these cases is composed of a layer of cylindrical cells, whose long axes are vertical to the surface of the egg, and which by mutual pressure will naturally assume a prismatic columnar shape, giving to the surface the appearance of polygonal reticulation.

J. A. OSBORNE, M.D.

Milford, Letterkenny.

NOTES FROM MY DAY-BOOK.

MAY I first confirm the words of a recent writer in SCIENCE-GOSSIP? I quite agree with him in thinking that the true "Rose of Jericho" is not the Jericho Resurrection-Plant (*Anastatica Hierochuntina*). The latter plant I possess, given to me by my brother, who received it at Algiers from the eminent botanist, M. Durando. It grows in the desert south of Algeria, as well as in more Eastern lands, and is used by Orientals as a charm. The plant figured in SCIENCE-GOSSIP for March last is much like one which I have seen in the possession of Silvanus Thompson, of York.

In the next place, I venture to refer to a paper on "Botanical Curiosities," contributed by me to the SCIENCE-GOSSIP of May, 1879. I send drawings of the there-mentioned varieties of *Plantago major*, the common roadside and cornfield weed; these were kindly executed by my friend Percy Corder of Sunderland. *A* (fig. 143) is a separated flower of the ordinary form. B is the freak by which the bracts have gone far towards foliage-leaves; the flowers themselves being still present, though obscured (see *b*). This is noticed and figured in Deakin's "Florigraphia Britannica," vol. i., p. 193. Ray called it the "Besome Plantain, or Plantain with spoky tufts." It was found in Thanet, Kent, by Dr. Johnson, 1732. (Deakin reads 1632—probably a misprint, for 1709–1784 marks the term of the doctor's life.)* Deakin says further that it has been "occasionally observed in various parts of the country." C (fig. 144), as also B, is a copy from a seven-year-old specimen in my herbarium; the drawing is a fair one, but can by no means give the mind an adequate picture of the beauty of the living plant. B and C were found near together—if not in the same field—at Woodhouse, near Sheffield. Several C's have been found from time to time, but never out of the one field. One of these, discovered and transplanted in the last summer holidays, has survived the hard frosts in my garden. Usually the plant lives with us but a few years. It produces no seed. The flowers are, as will be seen, in a kind of compound *raceme*, or *panicle*, instead of being arranged in the ordinary *spike* inflorescence of this species.†

In the following, the numbers after the names of species are from the London Catalogue. They indicate the frequency of occurrence in the 112 "provinces" into which the London Catalogue marks out Great Britain. Square brackets stand around species which are italicised in the catalogue as not truly wild. Those plants whose "census numbers" are under forty may well be set down as rare. We may note, however, that various matters should be taken into account

Fig. 143.—Variety of *Plantago major*.

in attempting to get ideas from these statistics as to the comparative rarity or abundance of any plant. For example:—(1) one species may be certainly much rarer than another, and yet occur in nearly as many "provinces." I think an instance of this is patent in the two louse-worts. The marsh *Pedicularis*

* No, I am quite mistaken after all! As Ray lived from 1638 to 1705, and refers to this plantain, the date must be 1632. The finder was not the writer of the still excellent dictionary, the dictator in his age over English literature, Samuel Johnson, LL.D. There was a botanist, Thomas Johnson, M.D. In this year, 1632, he wrote on "Hampstead Heath"; in 1620 another Latin work on an "Excursion into Kent"; in 1633, he published an edition of Gerard's "Herbal." He took the Royalist side in the great Civil War, and was slain in a skirmish in 1644.

† See illustration in the "Gardeners' Chronicle" for March 20, 1880.

is certainly much less easily found than the common *sylvatica;* but the numbers are respectively 98 and 100. (2) It is well known how largely the flora is affected by the strata. Again, a plant which is abundant over districts so wide that you can scarcely call it "local," may yet not occur at all over other equally wide areas in our island. *Clematis Vitalba*, 44 (traveller's joy), and *Pastinaca sativa*, 52 (parsnip), are much less frequent in the north than in the south ; Yorkshire is the northern limit of the common Weaselsnout, or Archangel (*Lamium Galeobdolon*), 58 (see Baines's Flora, 1840; but doubted in Hooker and Arnott's Flora, 1850). (3) Seaside plants are decidedly "handicapped." Thus the common sea-pink, or thrift (*Armeria maritima*), only scores 73, sea campion (*Silene maritima*), and common scurvy-grass (*Cochlearia officinalis*), only 67 each. (4) Genera such as *Rubus* (the blackberries or brambles), or *Carex* (the sedges), which are, as yet, satisfactorily known to but a few, will probably be hereafter found to have numbers of too low a figure. Doubtless in the "Topographical Botany," to which I have not had access, but to which the inquirer is referred by Mr. Hewett C. Watson, the compiler of the catalogue, other circumstances will be noted.

I may state here that I am a master in a school where not a little attention is given by some of the scholars to the pursuits of natural history. I have here and there interweaved into the ensuing lines observations which were the joint-stock work of others with myself. I also copy sometimes from notes which I contributed to vols. ii. and iii. of the "Natural History Journal" (W. Sessions, York). Unless specially stated, the less known localities will be in the neighbourhood of York. The dates are in 1878.

March 6, First sweet violets. Already was there a seed-vessel on one of the peculiar inconspicuous greenish blooms; it was split besides, and held ripe seeds.—Variations noted in garden primrose :—(1) stamens and pistil on same level ; (2) three with petals, sepals, stamens, six each ; (3) two turning double ; one had four stamens in different degrees part-developed into petals ; (4) all five petals bifid. Ditto of wild primrose :—(1) eight sepals, seven petals ; (2) five with petals and sepals, six each. In our "school gardens" is a polyanthus with corolla and other floral parts still present, but calyces all transmuted into corollas. At Woodhouse, near Sheffield, was a polyanthus, with scape of great thickness, with an extra whorl of flowers, and with a tendency to a third. At York again, one sepal only of a buttercup was turned into a petal. Pink vars. were picked of wood anemones, wood sorrel, and ground ivy.

May 17. Noticed this year but little maple bloom (*Acer campestre*), 57, and none of hornbeam (*Carpinus Betulus*), 30 ; a contrast to the superabundance in 1877. On Clifton Ings was the large-flower bitter-cress (cuckoo-flower), *Cardamine amara*, 67. You may tell this by its larger leaflets, more cream-coloured petals, and violet anthers. I've seen it by the stream at the Ackworth Hessle, near Pontefract. There were the first leaves, too, of the autumn-flowering

Fig. 144.—Variety of *Plantago major*. *b*, single modified flower of *Plantago major*.

crocus (which is *not* a crocus ; so call it meadow-saffron), *Colchicum autumnale*, 39. This also grows in many other places by the Ouse. I have picked it between Ackworth and Pontefract ; in the Went Valley, near Wentbridge ; at Slade-Hooton, and off the other side also of Roche Abbey, near Rotherham. At the former place, it fruited more abundantly in two successive seasons than I have observed elsewhere; and, I think, in the Peak district. Fruit (near York), on June 1.

May 18. At Strensall Common, which is soon (and more's the pity) to become a northern "Aldershot": the marsh dandelion (*Leontodon palustre*), with its leaves almost entire, and involucral bracts adpressed; the *Andromeda polifolia*, 25, which I have heard called rosemary, the true rosemary being of course a common garden flower, and a labiate. In woods near by, was the lesser winter-green (*Pyrola minor*), 55, in bud; this I found later in the fir woods at Langwith; but there flowerless. In a neighbouring field was a strange form of *Geranium dissectum* (?) with flowers raised erect at a height of a foot and a half, and large, round, deeply indented leaves. In Sandburn Woods, we noticed that the sepals of the anemone seemed nearly as persistent as those of the green hellebore; the carpels were already quite large, and well separated from each other.

May 20. Received from Plym Vale, South Devon, the *Tillæa muscosa*, 8 (of the stonecrop family, *Crassulaceæ*). It was on waste-heaps at the summit of a slate-quarry; and also by a path leading up to these. —May 22. From Settle came that lovely alpine, the bird's-eye primrose (*P. farinosa*), 12. Another species of the same order was brought from the Foss, *Hottonia palustris*, 48 (*cf.* the whorled inflorescence with that of the Japanese primrose, and with that of the abnormal polyanthus cited above). We have seen this "water violet" in many other stations in York; *e.g.* near Wigginton, by the railway north of Church-Fenton, near Clifton, on Tilmire; but, finest of all, and most plenteous, in Askham bogs. At the Heslington locality for drooping star-of-Bethlehem [*Ornithogalum nutans*], there was nothing but leaves to reward our visit. But in the same field we picked the clustered bell-flower (*Campanula glomerata*), 47; this has fallen under our notice on Clifton Ings, on Severus Mount, on Bishopthorpe Ings—all by the Ouse; by the Went (a feeder of the Don), near Pontefract; in Wharfedale, near Tadcaster. True *Viola canina* is to be obtained, as on this date, upon Tilmire, though the specimens are small; Strensall is a second habitat. From â field by Clifton (York), a specimen of lesser spearwort (*Ran. Flammula*), was brought in; its flower was almost, if not quite as big, as the usual size of the larger spear-wort (*Ran. Lingua*). The same day we received from Arley, near Nuneaton (Warwickshire), the same plant—this time with a double whorl of petals; along with it came a peculiar form of butterfly orchis (*Habenaria bifolia*); flower, entirely green (var. *chlorantha*), lip long, narrow, tapering but blunt at the tip; the sweet-smelling [*Narcissus poeticus*]; white blue-bells, or wild hyacinths (*Scilla nutans*).—May 23. Sent from Reigate:—Juniper (*J. communis*), 69; man orchis (*Aceras anthropophora*), 17. Also from a semi-tidal marsh by the Dart, Torne, South Devon, the summer snowflake (*Leucojum æstivum*), 5. Heard of the Tulip [*T. sylvestris*] being found, apparently quite wild, near Bewdley, on the Severn; its roots were deep in the ground; its flowers of a pale yellow, and showing themselves sparingly early in May.—May 25. By Nova Scotia Wood, two curious hogweeds (*Heracleum Sphondylium*)—the one had a rib of its umbrella-like inflorescence fixed below the rest of the umbel; the other had leaf-bearing stems growing out of the midst of the secondary umbels.—May 26. Henry Ibbotson (53 St. Andrewgate, York), informed me of a new locality at Langwith (=long wood) for the heart-leaved twayblade (*Listera cordata*), 51. This is usually a frequenter of mountains, woods and moors (amongst the ling or heather). That it should occur in our flat Ouse Vale, will, however, seem less strange when we reflect that the alluvial Plain of York contains the detritus washed down from alpine localities; hence this with other representatives of a more highland flora.

May 27. The marsh orchis (*O. incarnata*), 18, by some counted a variety of *latifolia*; it has leaves unspotted, narrower, more regularly tapering from the base, and concave at the tip. This was on Clifton Ings; and here also the var. *ebracteata* (?) of the common *Carex ovalis*—this var. grows also at Askham and in a bog at Holgate.

May 28. From by the "Bog Field" at Harrogate there was brought for me the Great Leopard's bane [*Doronicum Pardalianches*]. The sea spurge (*Euphorbia Paralias*) 26, arrived from Burnham, by the Parrot's mouth, near Bridgewater. We picked white red clover (*T. pratense*) on Clifton Ings; the dwarf dark-winged orchis too, not infrequent near York (*Orchis ustulata*), 41.—May 29. In a garden at Holgate we noted a tulip with two petals straggling lower down the scape than the rest.—May 31. Also at Holgate, the great water radish (*Nasturtium amphibium*), 41.

June 1st, 1878. The var. *stricta* of *Barbarea vulgaris*, the bitter winter-cress or yellow rocket, on Clifton Ings, where it is less abundant than formerly. Its marked characteristics are its crowded pods on their adpressed pedicels. On September 11, 1879, I saw this on the stone-work of the Ouse locks at Naburn. Between Skelton and Overton Woods the early purple orchis (*O. mascula*); this is somewhat rare round York; it is fine in a wood near Copmanthorpe (=merchant's village!), and I have heard of it in other spots; *Orchis Morio*, the green-winged meadow orchis, is far commoner with us. *Sanguisorba officinalis*, 57, the great burnet, is frequent on the Ings which fringe the Ouse; it occurs in Askham bog; and again in South Yorkshire, above Rotherham, by the river Rother. A white louse-wort (*Pedicularis sylvatica*) was this day gathered at Strensall, where too the spathulate-leaved sundew (*Drosera intermedia*), 45. To-day (June 1, 1879) there were shown me, what I've seen before and since, small-flowered specimens of one of the common buttercups (*Ran. acris*); the blooms were scarcely ⅛ inch across.

June 2. From Shoreham, near Brighton, I received parsnip (*Pastinaca sativa*), 52; a plant not in flower, but which I believe to be *Artemisia maritima*, 46 (the sea wormwood); the red spur-valerian (in bud) [*Centranthus ruber*]; and beet (*Beta maritima*), 37.

June 3. H. Ibbotson handed me from Hawnby, near Helmsley, east of Thirsk:—Baneberry or herb Christopher (*Actæa spicata*), 5; *Teesdalia nudicaulis*, 61, named after the Robert Teesdale of Castle Howard whose "Plantæ Eboracenses" &c., are referred to in the SCIENCE-GOSSIP of last January (page 3); the red-fruited stone bramble (*Rubus saxatilis*), 50; Herb Paris (*Paris quadrifolia*), 70 (this occurs in three localities near York;—Copmanthorpe, Skelton, and Langwith woods); the fingered sedge (*Carex digitata*), 12; the mountain melic-grass (*M. nutans*), 36 [in 1877 this was mentioned to me as found together with the deadly nightshade (*Atropa Belladonna*), 28, and fly orchis (*Ophrys muscifera*), 42, at Sherburn, near the battlefield of Towton].

York, March, 1880. B. B. LE TALL, B.A.

P.S.—I hear that the resolution to use Strensall Common for military purposes is abandoned. Also, since writing the above, the "Rose of Jericho" has been sufficiently well discussed in these pages.

NOTES ON THE PRE-CAMBRIAN SYSTEM OF AMERICA.

By C. H. OCTAVIUS CURTIS, Ex-Science Exhib., St. John's Coll., Cambridge.

BELOW the Cambrian System, there occurs in many parts of the world an immense series of rocks many thousands of feet in thickness, and of a crystalline nature, composed of gneiss, mica, schists, ophiolites, and limestones.

Such was the nature of a formation that Sir W. Logan discovered in the vicinity of the St. Lawrence, where they covered an area of some 200,000 square miles. His studies in this series brought him to the conclusion that they had a perfect right to a place in the historical scale of rocks, and were not, as had formerly been considered, altered granites, the result of the cooling of our planet, but were nothing more nor less than a metamorphosed series of rocks which had passed through stages similar to those which other formations are now undergoing; and his conclusion was strengthened by the discovery of what was considered to be an organic structure (*Eozoon Canadense*) of low type largely prevalent in this mass.

He therefore looked upon these rocks as the earliest series that the historical geologist has to deal with, and classed all together in a system to which he gave the name Laurentian.

After Logan's opinions became known, geologists in the New World set to work to see if it were possible to find any traces of a system that could be considered homotaxial with the American Laurentian. It now became evident that in our own country there were beds of a nature related to those of the St. Lawrence valley, and that they were overlaid unconformably by the Older Cambrian. Such were found to occur in Wales, Anglesea, the Malvern, and Charnwood, while Sir R. Murchison's "Fundamental gneiss" of North Ross-shire, Sutherlandshire, Lewis, and The Hebrides, all agreed with the Laurentian type.

Gümbel and Hochstetter pointed out a similar series in Bohemia and Bavaria, and were fortunate enough to find an Eozoon only differing from Logan's species in a very small degree.

The Scandinavian geologists had no difficulty in correlating their "Striped Granite" with Laurentian beds.

Logan by no means rested content with his discovery, but was very soon brought to the conclusion that he had a twofold series to deal with, separated by a great unconformability.

The Lower Laurentian, or *Laurentian*, consisted of orthoclase gneiss, sometimes granitoid, with quartzites, passing into conglomerates (in part) hornblendic and micaceous schists, augite rock, serpentine and limestones, the latter being sometimes dolomitic and largely crystalline.

The thickness of this series was found to be 20,000, while its Bohemian representative amounted to 90,000, feet. It was in this series that the organism known as *Eozoon Canadense* was found.* The nature of this supposed fossil is too well known for me to delay the reader by describing it. It may be well to mention that while it is looked upon as a fossil by many of the ablest authorities, among whom I may mention Bradley, Carpenter, Dawson, Gümbel, Jones, and Parker, all of whom take it for a gigantic foraminifer having affinities to the Rotaline genera Polytrema and Calcarina; on the other hand, many petrographers are inclined to treat it as a mineral structure, having no relation to the organic kingdom. Professor Möbius, a once strenuous upholder of the fossil doctrine, has recently, as the result of many years' work, published a monograph in which he strongly upholds its mineral nature.† The discussion, however, is of little moment, as there is ample evidence of the occurrence of life in these beds, in the presence of limestone and graphite.

The Upper Laurentian or Labrador Series.—As has formerly been said, this series rests unconformably on

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* See Nicholson's "Palæontology," vol. i. Q.T.G.S., xxi. 45–50 (Logan), xxi. 51–59 (Dawson), xxi. 59–66, and xx. 219–228 (Carpenter), xxii. 185–216, (King and Rowney).

† See "Nature," vol. for 1879, Möbius.

the Lower Laurentians. It consists of masses of orthoclase gneiss, quartzites, crystalline limestones, and anortholites, of which the last-named rock may be looked upon as a characteristic, no evidence of such occurring in the lower series having been obtained; while there is a strong reason to believe they are similar to the norites of Scandinavia, and the hypersthenites of Skye.

The thickness of this group has been estimated at 10,000 feet.

This was the state of knowledge with respect to the Pre-Cambrians some twenty years since, and consequently our text-books only give scanty descriptions of the series; but latterly investigators have devoted a great deal of attention to this important study, and now we may say the series is understood, at least in one district, viz. that of North America, owing not only to able workers, but also to its magnificent development in that area. But, unfortunately, the results arrived at are only to be obtained by the perusal of a large number of monographs and proceedings of scientific societies. The writer therefore has thought he might bestow a benefit upon the student by collecting the many results and reducing them to a form in which they can the better be placed at the disposal of the reader, who has no spare time for such research. He would at the same time remind the reader that each day brings forth new light upon the subject, and therefore what follows must be taken with the discrimination that the true scientist always exercises while engaged on the study of any new matter.

After Logan, many transatlantic geologists gave their attention to this new series, to which Professor Dawson applied the name Eozoic on the ground that it represented a period of time greater than the Palæozoic and Neozoic together. Professors Hunt, Emmons, and Hall deserve mention as perhaps those to whom we owe the greater part of knowledge, and their work has gone a step beyond that of Logan, for it has produced indisputable evidence that the Eozoic period is not composed of two systems, but rather of four, so that now we must divide our table of stratified rocks somewhat as follows:—

Table of Geological Systems.

Quaternary		Recent.	
		Pleistocene.	
Neozoic .	Tertiary or Cainozoic	Pliocene.	
		Miocene.	
		Oligocene.	
		Eocene.	
	Mesozoic	Cretaceous.	
		Neocanian.	
		Oolite . .	Jurassic.
		Lias . .	Jurassic.
		Trias . .	Poikilitic.
Palæozoic		Permian .	Poikilitic.
		Carboniferous.	
		Old Red Sandstone and Devonian.	
		Silurian.	
		Cambrian.	
Eozoic		Montalbian.	
		Huronian.	
		Norian.	
		Laurentian.	

It will be better for the present to confine our study to the American types, for more is known of that series than of the European; we shall then be more capable of correlating our own series.

Commencing, then, with the oldest system, viz. the Laurentian. The name is applied, on account of the presence of the group in the basin of the St. Lawrence. (The river received its name owing to its discoverers having arrived in the country on the day of the festival of St. Lawrence.)

Nature of Rocks.—The prevailing rock is a massive gneiss of a reddish or greyish colour, sparingly micaceous, but often hornblendic, the latter mineral being in such preponderance as in parts to make the mass look more like hornblende rock.

The gneisses are often distinctly stratified, but in other cases they look more like granites, and have been so named; a negative characteristic of the series is the total absence of chloritic, argillaceous and micaceous schists.

Large quantities of limestone are present, Logan having made out three distinct beds of from 1000 to 1500 feet in thickness, which are coarsely crystalline and often magnesic (it is in these masses that Eozoon occurs), abounding in foreign minerals as augite, hornblende, serpentine, biotite, and graphite, all of which are either scattered in the beds or with other minerals occur in veins and endogenous masses. There are also large veins of quartz rock which are often garnetiferous.

Thickness of beds.—The total thickness of the Laurentians may be taken at 17,000 feet.

Localities.—The Laurentians occur along the Atlantic belt over large areas of Newfoundland, New England, and North Connecticut, on the high ground of the Hudson, and the Welsh Mountains in Pennsylvania, near Richmond in Virginia, the Iron Mountains in North Carolina, round Lake Superior, in the Rocky Mountains, and in parts of the Colorado range.

Norian.—The name is applied from the great development of this series of rocks in Norway. They are separated from the Laurentian by an unconformity.

The rocks are rich in anorthic felspar (norite) at times accompanied by small portions of hornblende and augite or hypersthene, in which case the rocks pass into hypersthenites; epidote, biotite, and limonite are also plentiful. They have a foliated appearance like gneiss.

The best example of these rocks is found in the isle of Hitteren in Norway, we will therefore take them as one type. Here they vary in structure from coarse-grained and crystalline to very fine grained and compact, the colour passing from a flesh-pink through bluish-lavender, smoky-blue to almost black. The whole series is rich in titaniferous iron ore.

Thickness.—Dr. Henry Hunt gives their thickness of from 10,000 to 12,000 feet.

Localities.—Essex county, New York, North, Montreal, where they rest on the Laurentian and pass under the Potsdam sandstone, valley of St. Lawrence near Quebec, at the Bay of St. Paul, Bay of Seven Sisters on the coast of Labrador, and on the shore of Lake Huron.

HURONIAN.—A series of rocks first so named by the American survey in 1855 on account of their occurring on the north shore of Lake Huron.

Nature of Rocks.—This system presents us with rocks of the most variable nature : in places there are masses composed of quartz and orthoclase felspar, which are either simple jasper-petrosilex, eurite, or porphyritic eurite, and in gneissose or schistose forms or in irregular masses ; while in other parts the predominant rocks are diorites or diabases, passing into chloritic or talcose schists and serpentines with epidote. The limestones are mostly dolomitic.

The Huronians are very rich in ores of which the most important are copper, nickel, and iron.

Thickness.—Estimated by Henry Hunt at from 15,000 to 20,000 feet.

Localities.—North shore of Lake Huron, Lake Superior, Newfoundland, the Green Mountains, Blue Ridge and Rhodes Isle.

MONT ALBIAN.—Name applied by the survey of Canada in 1872 to a series of crystalline schists well developed in the White Mountains.

Nature of Rocks.—Fine grained gneisses breaking along lines of muscovite are the prevalent rocks ; hornblende is often an important constituent, so much so as in places to make the gneiss graduate into hornblende rock. In the lower part of the series there are large masses of granular olivine and chrysolite rock which are often accompanied by enstatite and serpentine.

Thickness.—Not yet determined.

Localities.—The White Mountains, Baltimore, Washington, North Michigan, North and South Carolina and Georgia.

Having now obtained a general insight into the American Pre-Cambrians, we will in a future article endeavour to unravel our British and other European types.

A WOOD-CARVER'S EXPERIENCES OF THE DEATH-WATCH BEETLE.

"WORMEATEN!" What a common household word! The smallest sign of the earliest stage of the nuisance is often so deceptive that irremedial mischief is complete before it is discovered. The rough hewn timber of lordly mansions, and the delicate frames of miniature portraits equally and rapidly become a prey to the ravages of the "Death-Watch;" the dark and damp framework of cellars, the intermediate joists, ceilings, flooring and panelling, the strongest supporting beams, the heated principals and rafters of roofs, the exterior boarded portions of every class of buildings ; the stillness of death, the rapidity of revolving machinery ; the resting furniture of closed mansions, the active, and daily dusted and polished furniture of business houses. The very articles of hourly use scrubbed and scoured with boiling water, even to workmen's planes and wooden mallets in constant use—all succumb.

In my daily calling as a wood-carver, I have had frequent experience of the presence and ravages of the "Death-watch." I remember as a child hearing its well-known "tick" with peculiar terror, accompanied with a variety of fully authenticated proofs of its reality. I happen to reside in an old timbered house abounding with several varieties of the Anobium, or death-watch beetle. My most frequent contact has been with the larvæ of *Anobium tessellatum* and *Anobium striatum*, which I have often taken from out of their burrows in wood of all descriptions. I have placed some in confinement in a smooth oak box covered with glass, to test their ability of being again able to penetrate the wood. This they can only do with assistance, such as puncturing a hole with a bradawl and placing them within it. Very soon they are out of sight, throwing back their dusty labour. I have found the perforations varying from $\frac{2}{16}$ inch to the size of a No. 8 sewing-needle—these latter sizes being the clue to the first entry of the larva. After passing through its transformation-state to the perfect beetle, it emerges from its burrows for breeding purposes, unfolding its delicate and pretty gauze wings for flight ; only in this state have I been able to detect its power or desire to use ticking or love-call. I feel some uncertainty whether these two above-mentioned species possess this power at all, although they are credited with it. If you touch them they turn upon their backs and simulate death ; but when the time comes for depositing their eggs, they become unusually active and fly from place to place, seeking the surface of all kinds of wood, and attaching their eggs in a secure manner. There the larvæ are hatched, possessed of all the power of an adult to eat their way out of their shells, and into their native home, leaving the egg-shells as evidence that the work of destruction has begun.

The full-sized *Anobium tessellatum* measures about $\frac{1}{4}$ inch in length, $\frac{2}{16}$ at its head, tapering to less than half its size at the tail. It possesses powerful curved jaws working from right to left when gnawing. The body consists of a tough skin and twelve segments capable of contracting and expanding and lapping over each other. The ridges are covered with rough hairs ; the feet have a small black claw at the tips resembling those of a mole. Its entire construction seems beautifully and perfectly adapted for its habits of life. On turning the insects out, they showed a disposition to curl up like a ball, bringing the tail part between the claws and toward the main side of the jaws. This proved to be their position of locomotion, boring their straight perforations, &c. I have watched one progressing when passing along its empty burrow. It performs a regular revolving action, varying this, as it appears, to drag itself along by the roughest and most prominent part of the surface of its burrows. In this way I have seen it travel two inches in half a minute. The great power it naturally possesses of gnawing the rough surfaces, and the form of its body, its claws to throw back the accumulating wood-dust, enable it to make rapid progress in its work of destruction. At times regular concentric and ornamental circles may be observed in its burrows. In all the softer wood the larva travels indiscriminately, cutting across its tracks in every conceivable way ; but in oak and the harder kinds of deal there is a constant travelling backwards and forwards between the cellular tissues, leaving the structural parts intact. It has been determined that the insect derives its sustenance from starch obtained in its work of boring. Its labour is apparently constant night and day, as evidenced by the output of dust.

It rests but seldom ; its maintenance imposes upon it a very heavy burden ; it seems probable its laborious industry is a source of pleasure as well as necessity. On the 28th of August, 1877, I first became acquainted with the most perfect specimen of Anobium, or death-watch. It rested on the wall, about eighteen inches from my head as I lay in bed. Its ticking only existed at short intervals, lasted consecutively for three nights and then ceased. The weather was warm, dry, and quiet. I heard another specimen in an adjoining room and was rather pleased to think my house possessed the very thing I had so much wished to hear and see ; consequently, in the following August I listened for their return. On the 4th of September, 1878, (in my servant's bedroom) I again heard the ticking at intervals, similar to the previous ones ; also one in an old closet. I now commenced to tear off the paper and remove pieces of wood, that I might obtain possession of one, all which efforts so much disturbed them that I seldom heard them again in the same place. I did occasionally hear them in my bedroom, but not for any length of time, and all signs of them ceased in a few days. I had been listening for several weeks for the return of my little friends previous to the 14th of September, 1879, but on that date I was again gratified with the welcome signal in my bedroom and in other places, and at ten o'clock on that date I was delighted with their activity in my kitchen, where I had never heard them before. I soon discovered the whereabouts of their operations in the rabbeted part of a deal Oxford frame, close under the surface of a paper picture. The beating was the most distinct and continuous I had ever heard, and could be heard eight yards off into an adjoining room. Although there was an eight-day clock going, within two yards of it, the ticks of the beetle were very regular between its intervals, but not successive, and at one time the ticks lasted without intermission for one minute. At times the ticks commenced like the faintest possible pulsations, and gradually increased in loudness to a certain pitch, subsiding again as the little fellow became exhausted with its labour. It rested for a time, and commencing again for two hours I listened with real pleasure, till I was overpowered with the desire not only to see it but to capture a specimen, although, at the same time, I felt unwilling to disturb such a pretty performance. However, at one o'clock its labours ceased, and it obtained a respite at my hands. On the following day, the 15th of September, I heard (about nine o'clock) two others in two separate bedrooms. Although fairly active, there was no comparison between them and the one above mentioned. About half-past ten my little friend in the kitchen commenced again in the same bold distinct manner, and in exactly the same spot. I felt as though I could place my finger exactly upon him ; his performance lasted only an hour, and after waiting some time I concluded his labours had ceased for the night. About the same time (September 16) his ticking returned with all its usual perfection in the same spot. I determined at once to try and capture him. Thinking this the best opportunity I had yet had, I spread a white cloth upon the table, carefully taking down the picture, releasing the stretcher and picture, examining the rabbet, in fact every part, but could perceive no signs of life whatever. I was obliged to come to the conclusion the insect had, in some way, slipped through my fingers. I feared I had injured him and that I had destroyed all further chance of being amused with his merry little tap ; I replaced the picture as before. The next night about ten o'clock we were visited with a very severe thunder-storm, lasting from ten o'clock till daybreak, shaking the house to its very foundation. I mention this because I know the extreme susceptibility of these insects. I have never heard them except under certain favourable circumstances. On the 19th of September, about nine o'clock, my servant excitedly informed me the death-watch had begun again in the picture frame in the kitchen, and as near as possible in the same spot. I still entertained hopes of capturing him, but before attempting, I had the following amusing experiments for two hours : first I lifted the picture quietly in a canting position from the wall, which it instantly disapproved of by ceasing to tick ; I blew upon its exact locality with a blow-pipe, again it was displeased ; I scratched the spot with a pin with the same result. I tingled a tumbler glass, and made noises in several ways, and it instantly displayed its displeasure. Next I imitated its ticks by tapping my nail with a piece of whalebone, and we were the best of friends ; first very slowly, then increasing by degrees, and at intervals, till I had the pleasure and satisfaction of drawing the little fellow out, listening and waiting to follow me in various ways. Thus far we had an excellent understanding, but I must take no improper liberties, or if they were not very extravagant or unreasonable it soon forgave me. This charming little fellow could tick as fast as one could count numbers, and one of its best performances consisted of 160 beats in a minute, with a clear distinct metallic sound, resembling a small Geneva watch. At one time, I prevailed upon it to tick 470 times without intermission, and then I think it was tired out; the ticks became faint; it was distressed. I determined at once to try again and secure it, and form a personal acquaintance. Taking down the picture as before, I carefully searched every part of the frame, and observing the frame was riddled a good deal with holes, I cut off a length extending each way beyond the point of its tapping, splitting it up with no better success. I was disappointed with my efforts; I thought I had perhaps killed it and destroyed every chance of any further pleasure with its acquaintance. And so it seemed—till the 10th of June 1880, the weather being extremely warm, quiet and dry. On that date about eight o'clock, I again made acquaintance with one of my old friends, and as this date was earlier than I had previously heard them, I looked forward to longer and more familiar acquaintance, concluding at the same time that the summers of '78 and '79 being so cold, wet, and uncomfortable it tended very much to curtail their active movements. The ticking was again heard a short distance from the head of my bed, at intervals during the whole night; and a second insect behind some framework near the door covered with paper, and within two inches of the shutting edge (although the door was frequently opened and shut for three successive days) put forth a perfect and regular measured tick. The change to rough weather intervening, all ticks ceased, but I kept a constant watch upon their movements. At ten o'clock on the night of the 26th of August, at the latter-mentioned spot, the bright and busy little fellow put forth all its best efforts, to my especial delight. Could it have remained there all that time? I anxiously waited a return of the kind of weather congenial to its operations. The beating of this perfect specimen, and the occasional performance of the other, although some distance off, continued almost without intermission till the 29th, and till this date I was under the impression they preferred a separate and solitary life, individually remote from each other. I never till that night heard more than one at a time. About 10.30, I was listening quietly to the well-sustained tap of the individual just mentioned. Suddenly another commenced, a third and fourth, all within the space of six inches of each other, and so continuous were their ticks that no entire cessation occurred all night and the greater part of the next day. It was a perfect resemblance in miniature of a watchmaker's repairing-shop. There were gathered together quite a little colony, and although the banging of the door caused them all to stop for a time, confidence was soon restored, and all went on again as merrily as ever. If this power of ticking existed only as a call between male and female, was it possible that a number of either sex had become so separated that they had combined together for the purpose of attracting the attention of the opposite sex, or was it a real musical frolic got up for the purpose of rival charms? There was a perfect resemblance in the tone of ticks, and I thought it singular that all should have succeeded in obtaining the same favourable conditions for its production. Not enjoying the best of health, I have passed many sleepless hours with the delightful relief of listening to their industrious little taps. How laboriously they rattle on; how often I have envied their healthy, tiny activity! Had any one tainted with the slightest superstitious fear concerning the fatal warning of these insects, heard this combined concert, it must have set their minds for ever at rest, and they would have joined with me in a good laugh outright for several minutes. September 1st:—The prospect of now obtaining one of this colony presented such a favourable opportunity that I determined to take every pains to secure one that had actually performed this ticking. I succeeded in capturing two; one became injured, and died. I also obtained a second one during the day, and have two alive, and in captivity. To my surprise I found them to be Anobium, differing considerably from all others, particularly in their active movements, darting instantly into any cavity and hiding themselves from observation. Altogether, the death-watch is a most intelligent little fellow; it travels when unobserved all round the glass box, seeking the means of escape. I have found them beneath paper pasted on a wooden rail, this being somewhat perforated with open burrows along its surface. September 14:—My insects are still alive, and although I have placed pieces of the same wood covered with paper in the box, and they usually hide behind it, I have not been able to detect any sign of ticking, although they have been placed near where others were ticking. I am hoping to preserve them, or that they may deposit eggs, as I am just about quitting my house, and I may never again have so good a chance of making their acquaintance, and knowing more about their habits. The change of weather to-day will doubtless cause an entire suspension of activity.—September 16, 1880.

Ipswich. THOMAS STOPHER.

A CLEVER FOWL.—I saw the other day a cochin cockerel about six months old, which could unfasten the door of his coop which was secured by a button, when he wanted to go to roost, or get at the food placed in the enclosure. This would show reason in the bird, and not mere instinct.—*S. B.*

A HOLIDAY IN GERMANY.

As we had once or twice gone down the railway through the Black Forest, we determined this year to see some of the less frequented parts, at the same time collecting as many of the flowers and insects as our short visit would allow. Having been well rewarded in our searches I hope to give an outline of what we found, in the following brief sketch.

We left England on June 22, arriving at Triberg on the 26th. Here we spent several days, our principal finds in insects being *Polyommatus Eurydice*, and *virgaureæ*, *Argynnis Selene*, *Zygæna minos*, *Ino globulariæ*, *Hepialus humuli*, *Gnophria rubricollis*,

Fig. 145.—Dark-green Fritillary *(Argynnis Aglaia)*, under side of male.

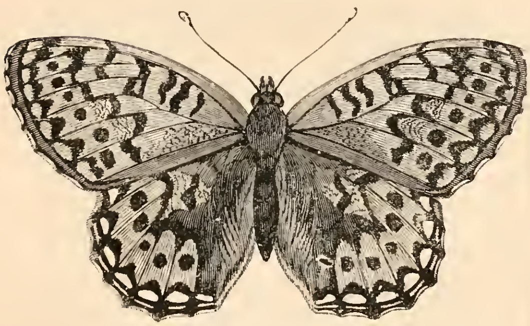

Fig. 146.—Dark-green Fritillary *(Argynnis Aglaia)*, upper side of female.

Fidonia piniaria, *atomaria* and *conspicuata*, *Erebia Blandina*, *Venilia maculata*, *Cicindela sylvicola*, *Adela Degeerella*, *Arctia plantaginis*, and *purpurea*. I cannot see why the last-named species is called *purpurea*; the upper wings are brilliant orange with faint brown spots, the lower wings scarlet with black spots.

Among flowers we found *Ranunculus aconitifolius*, *Saxifraga muscoides*, *Comarum palustre*, *Geum rivale*, *Digitalis lutea*, *Polygonum bistortum*, *Cytisus sagittalis* (everywhere), *Phyteuma spicatum*, *Gnaphalium sylvaticum* and *Antennaria dioica*, *Dianthus deltoides*, *Aconitum Lycoctonum*, *Trollius Europæus*, *Sanguisorba officinalis* (abundant), also a plant or two of Drosera.

From Triberg we drove to the clock-making village of Furtwangen, where, as usual, we were pestered with *Tabani* of all sizes, and next morning went down the beautiful Siemonswalder Thal, and on to Freiburg. Thence by the well-known Hollenthal to Titisee, which seems to be the best place for flowers in the whole Schwarzwald. In one walk we found *Pyrola uniflora* and *secunda*, *Botrychium Lunaria*, *Gentiana campestris*, *Vaccinium Vitis-Idæa* and *uliginosum*, *Polygonatum verticillatum*, *Rosa*

Fig. 147.—Small Pearl-bordered Fritillary *(Argynnis Selene)*, upper side.

Fig. 148.—Small Pearl-bordered Fritillary *(Argynnis Selene)*, under side.

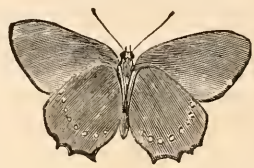

Fig. 149.—Green Hairstreak *(Thecla rubi)*, under side.

Fig. 150.—Green Hairstreak *(Thecla rubi)*, upper side.

alpina, and most of the Triberg flora; the bogs were red with the *Drosera rotundifolia*, and the beautiful *Oxycoccos vulgaris* with its tiny pink flowers was plentiful in them. In another walk we brought in *Aconitum Lycoctonum*, *Listera cordata*, *Pyrola minor*, *Lilium bulbiferum*, *Maianthemum bifolium*, and *Paris quadrifolia*; when there is any abundance of the latter, one is sure to find a plant with five leaves instead of four. We also found three different Polygalas as well as *Orchis bifolia*, *conopsea* and *maculata*; the two last-named, as well as some Campanulas, were sometimes seen with white flowers. I here came upon an extraordinary monstrosity of the Botrychium. There were two fertile fronds, one barren one, and one small one bearing fructification on one side, and the other half with the usual moon-shaped pinnæ. We also found specimens with the fertile frond bifid, and others with one or two sporangia on the barren frond.

I saw a butterfly I took to be *Colias Hyale*, but on catching it in my scissors-net found it to be a different species. I now find it is the *Colias Palæno*, the larva of which feeds on *Vaccinium uliginosum*, and which

Fig. 151.—Scarlet Tiger *(Callimorpha dominula).*

Fig. 152.—Bordered White *(Fidonia piniaria).*

Fig. 153.—Transparent Burnet *(Zygæna minos).*

is a rather uncommon butterfly. The only other insects I found were *Tortrix viridana*, *Thecla rubi*, *Odezia chærophyllata*, and *Scoria lineata*.

During our whole tour we saw no uncommon ferns. *Lastrea Filix-mas*, *Oreopteris* and *dilatata*, *Athyrium Filix-fœmina*, *Asplenium septentrionale*, *Trichomanes*, and *Ruta-muraria*, and *Blechnum Spicant*, were the order of the day.

From the Titisee we drove down to Schluchsee and St. Blasien, thence down the Albthal. I fancy entomologists would find this a good hunting-ground. One passes through some of the wildest scenery in the Black Forest, while, the vegetation consisting mainly of small bushy oaks, a number of white admirals, fritillaries and other butterflies may be seen. We then returned to Triberg, where we found the insects much more advanced than before, although we had only been away a few days. I observed an immense number of flies of the genus Septis, and of both sexes, swarming round the trunk of a tree. I gave a specimen to an entomologist, but have not heard what species it turns out to be.

I found the extraordinary *Ledra aurita*, also *Argynnis Aglaia*, one of the Deltoidæ and a Tortrix (*Penthina cynosbana*), and when making an excursion to Hornberg we observed a great quantity of *Rhizotrogus solstitialis* flying about. One of our party also saw a *Callimorpha dominula*. After leaving Triberg we went up the Schapbach valley to near Rippoldsau. All the streams on the way were a beautiful sight, being fringed with the *Mimulus luteus* in full bloom.

Fig. 154.—Bordered White (male), under side.

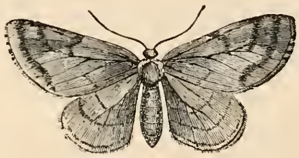

Fig. 155.—Bordered White (female).

According to Bentham, it occurs "in North-Western America and Chili, long cultivated in our flower-gardens, and now naturalised in boggy places in many parts of Britain." It certainly is abundant enough in this valley to lead one to suppose it to be a native there; also it is not a place where one would suppose it to be introduced. Its occurrence there is therefore well worth recording. I have not seen it anywhere else, and our "French Flora" does not mention it.

Next morning we took a walk in the woods and found *Monotropa Hypopitys*, and also a fly of the genus Laphria. We were caught in a thunderstorm, but in the afternoon it cleared up enough for us to drive to Freudenstadt.

On the way we found a quantity of the *Lycopodium alpinum* in full fructification. From the top of the hill, called the Kniébis, we saw a panorama extending as far as the Swiss Alps.

The following day we drove down the Murgthal to Gernsbach, and I had rather a bit of luck on the way. As the coach was stopping at a little village, I got out and walked about a hundred yards and found an *Odonestis pruni* asleep on a leaf. According to Bergé, it is rather rare. From Gernsbach we went to Baden and Heidelberg. I have collected a number of insects here, and find it altogether an excellent locality. This year there was a quantity of *Vanessa prorsa*, a butterfly remarkable for being dimorphic; the spring brood is different from the autumn one. The same is the case with *Anthochæris Belia*, found in the South of France.

I also found *Melitea didyma*, *Lycæna Amyntas*, *Polyommatus Dorilus*, *Sesia ensiformis* and *culiciformis*, *Zygæna Carniolica* and *Peucedani*, *Callimorpha Hera*, *Ocneria dispar*, *Lythria purpuraria*, *Acherontia Atropos*, *Bombyx quercus*, *quercifolia*, and *monacha*, *Catocala fraxini*, besides most of the "British" butterflies, and a host of fritillaries—but of course a great deal is dependent on whether it is a good season for insects or not. Thus, in 1877, *Lathonia* occurred in profusion; also, more or less, in 1878; this year not a specimen was to be seen. Similarly with *Limenitis Sibylla*, *Euchelia jacobeæ*, and many others. *Pieris Daplidice* is rare at Heidelberg. I caught one specimen on the towing-path in 1878. I did not see *Vanessa prorsa* till this year (1880)—but in other respects it has been a very bad year for insects at Heidelberg—hardly a specimen of *Argynnis Paphia*, where a few were seen in 1878, and where it swarmed in 1877. I was not there in 1879 at all, so I do not know whether it was a good season or not.

Heidelberg is also good in Diptera; some rare species of Oestrus and Phasia, *Chrysops marmoratus* in abundance by the river, besides a number of Conopidæ, Anthraxes, Argyromolbas, and others have been found; also a good many Coleoptera. Curiously enough *Geotrupes sylvaticus* is seen everywhere, while *G. vernalis* and *stercorarius* are conspicuous by their absence.

We had arrived too late for most of the flowers, nevertheless we found the remains of *Pyrola minor* and *Monotropa Hypopitys*, besides *Dianthus superbus*, *Armeria* and *Carthusianorum*, *Prenanthes purpurea*, *Gnaphalium sylvaticum* and *luteo-album*, *Jasione montana*. Other years we have found *Spiranthes autumnalis* and *Parnassia palustris*. We also found *Impatiens noli-me-tangere*, *Melampyrum pratense* (everywhere), and the remains of *Cytisus sagittalis* and *Convallaria majalis*.

One day we took the train to Eberbach and ascended the Katzenbuckel. It is the highest hill in the Odenwald, and consists mainly of the red sandstone, but the top is formed of a heavy volcanic stone called Dolerite. By the end of August there was almost an entire absence of insects at Heidelberg. We left there on the 30th, and the night we crossed the sea was most beautifully phosphorescent. We arrived at Cambridge on the 1st of September, and to my great astonishment, I find a greater number of insects here now than there were when I left for Germany.

G. H. BRYAN.

WILD FLOWERS AND THEIR NAMES.

F. H. HN. asks for information as to "the best method of discovering the names of flowers which one may meet with and be able to recognise." Bentham's "Handbook of the British Flora" is generally recommended for this purpose, but F. H. Hn. says it is "a somewhat expensive work." On turning to his reference (page 184 of vol. xv. of SCIENCE-GOSSIP), I find he is alluding to the illustrated edition in two volumes, which, published at £3 10*s*., can, as there stated, "now be obtained at a reduced price." I gave 30*s*. for my copy. The illustrated one volume edition, is, however, the handier work, and is published at 12*s*. With the assistance of this book, the beginner may find the names of most of our wild flowers, though he will probably often fail to do so in the more difficult orders, as the Umbelliferæ and the sedges and grasses. Sir J. D. Hooker does not approve of artificial keys, but admits the necessity for them to some extent. In the preface to the "Student's Flora of the British Islands," he says: "The keys to the genera are naturally arranged, but in Umbelliferæ I have added an artificial key, as essential for the determination of a genus before the whole order has been studied. I have added no keys to the species, preferring curt diagnoses which embrace the more important characters of the plant; finding, morever, from experience, that such keys promote very superficial habits among students!" This work, however, is not specially designed for mere beginners.

F. H. Hn. mentions three plans by which the tyro may possibly learn the name of a wild flower, but does not notice two others which for my part I think are good ones if others fail; I mean pictures, or having it told him. It may be objected that these are not scientific plans, but the same may be said of artificial keys, and he must be something more than a beginner who can trace a plant out in a strictly scientific manner. It is plain that even to use an artificial key like Bentham's requires previous study, and to make anything at all out of the species of the more difficult orders requires more than a little, while to determine many critical forms (not enlarged on by Bentham) calls for all the knowledge and experience of our best botanists. As to the method of investigation, very much must therefore depend upon what exactly is wanted, upon the amount of interest taken in the subject, and the extent to which any one may wish to pursue it.

It has often been said that the Linnæan system is easier by far for the purpose of finding out the name of a plant than the modern system, and this may be the case at first, but could scarcely be so for long, because it requires us to associate plants together in groups, the members of which, excepting in a few instances (as Tetradynamia = Cruciferæ, and

Diadelphia decandria = Papilionaceæ), have but little affinity with each other. They must therefore be forced into these unnatural groups, and retained there by an effort of memory, instead of falling into order as it were of their own accord and being pictured on the mind in groups of well-defined resemblance.

I have known a very fair general knowledge of plants to be gained in one year by observing each kind of flower as it opened, whether wild or in the garden, and entering its name, however obtained, in a book, with the date and its natural order attached. By this means a familiarity with the general characters and appearance of the larger orders is soon acquired and a basis is laid by general observation, from which more particular study naturally and easily follows. The number of orders seems large to a beginner, but of the ninety-two which comprise British flowering plants twenty-three or one-fourth of them have only one native species each. Again, taking the "Student's Flora of the British Islands," there are in all 1221 species of Phanerogams, or, leaving out sedges (86) and grasses (102) 1032, more than half of which (532) are included in ten orders thus:—

1. Compositæ	106	6. Scrophularineæ	44
2. Leguminosæ	67	7. Labiatæ	42
3. Cruciferæ	56	8. Rosaceæ	42
4. Caryophylleæ	55	9. Orchideæ	37
5. Umbelliferæ	54	10. Liliaceæ	29

If we examine this short list we shall see that the marks of the orders are so distinct that with very little practice no mistakes can be made; some obvious if not conclusive characters are seen at a glance. A Composite is distinguished at once by its flowerhead of florets having united anthers; the Leguminosæ, represented in Britain only by the tribe Papilionaceæ, are separated from all others by the form of their flowers; the Cruciferæ are recognised by their cruciform flowers and tetradynamous stamens; the Orchideæ alone are gynandrous. And so the learner goes on to notice obvious marks of orders, which are most easily impressed on the mind by writing down the name of each plant together with the name of the order to which it belongs. While familiarity with the orders is being acquired groups of species by degrees fall into their place as genera, and the student instead of beginning with "This is a Crucifer," says "This is a Brassica"; instead of "This is one of the Caryophylleæ," "This is a Cerastium," and so on. Before so much as this is learnt any British Flora will be used without difficulty, but the one which is the most recent, and contains the most information in the least space, is Hooker's "Student's Flora of the British Islands."

R. H. A.

HERACLEUM.—*Heracleum Sphondylium* is called "Dryland Scout" in the neighbourhood of the Rock, co. Tyrone.—*S. B.*

MICROSCOPY.

YOUR correspondent J. T. G. (in No. 169, p. 213) thinks "that the microscope might be used for more practical purposes than is usually the case, as, for instance, in the study of wool, its nature, quality," &c. The microscope can be so used, more than it "usually" has been, to the advantage both of the user and of the commercial and scientific worlds. As a learner, J. T. G. cannot select a more promising or worthy subject for study, and he should be encouraged to persevere, until he masters his selected speciality. J. T. G. is evidently unaware of what has already been done and published on this subject. There is an elaborate work in German ("Das Woolhaar," by H. Malthusius, von Grunow) on the microscopic character of wool. In English, a report by Dr. J. J. Woodward, Professor J. L. Le Conte, Dr. J. G. Hunt, and Dr. E. M. Schaeffen to the secretary of the United States Treasury on "The Scientific Examination of Wool and Hair." *Bulletin of the National Association of Wool Manufacturers*, vol. v. No. 7—Boston, 1875, which is the best thing in English—perhaps in any language to my knowledge. "As a learner," J. T. G. is in a "difficulty as to the manipulation of the instrument." It is hardly to be supposed that he would undertake such a study until he had learned the uses of his tools. The manipulation of the instrument for this study is the same as for any other study. As I have done something at it, I will give a few hints on the manipulation of the wool and hair. The fibres whether unmanufactured or from fabrics should be well washed—clean—free from dirt and grease; alkalies or soap may be used, and also alcohol or ether. It will be well to examine also the uncleaned, to learn if the cleaning agent produces any effect or change in the fibres or scales. In case of dyed fabrics it is sometimes needful to discharge the colouring substance in order to render the fibres sufficiently transparent. A $\frac{1}{10}$ objective of the highest grade I have found the most useful power, supplemented by an immersion $\frac{1}{6}$th of equal quality for special cases. A few fibres may be placed on a slide in water for preliminary investigation. For permanent mounts, glycerine or glycerine jelly I have found the best medium. (I hope J. T. G. will find something better.) The slides that have been mounted some weeks or months seem to show the peculiarities of the fibres better than when freshly mounted. The above hints may be of service to the inquirer. All the rest he must search for himself: be an original investigator, not take anything second-hand from any authority, however high its reputation may be; verify by observation all statements of fact or theory. If he will do this, he can in the course of three or four years make valuable contributions to science and commerce, and be able to answer his own questions better than any one can now answer them.—*Carl Reddots, Boston, Mass., U. S. A., September 7th, 1880.*

A new Microscopical Lamp.—Enclosed I send you a diagram of a lamp and shade which I have designed to serve three purposes: 1. An ordinary microscopic lamp; 2. One which may be carried in the great-coat pocket for meetings away from home; 3. A lamp for reading lectures, &c., when exhibiting

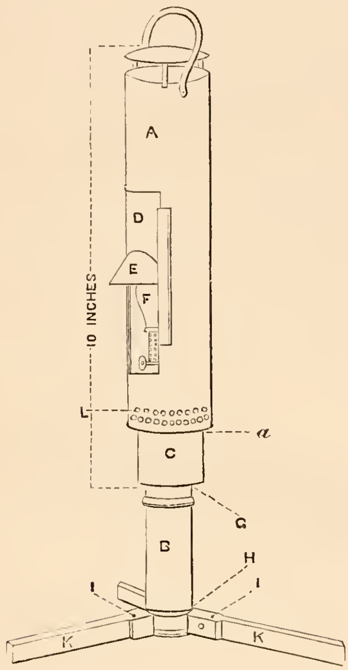

Fig. 156.—New microscopical lamp. A, Lamp-shade made of lacquered brass, it is fastened to the cap C (which holds the lamp), by a screw, *a*; B, Stand containing one or two sliding tubes for elevating; D, Shutter; E, Hood on shutter, silvered on the inside. A small reflector is fastened behind the opening to reflect the light; F, The lamp. The wick is at right angles to the opening; G, Screw to detach the stand; H, Reversible screw, so that when the foot is turned the legs K lie close against the tube B, by means of the hinges, I; I, Double series of holes to keep the oil cool.

lantern slides. Besides combining three lamps in one, it is more powerful than other similar ones, and is so much liked here that I venture to think it may be useful to some of your readers. It was made for me by Messrs. Gray & Selby of this town.—*A. H. Scott White, Nottingham.*

Microscopical Society of Liverpool.—The Seventh ordinary Meeting of the Twelfth Session of this society was held at the Royal Institution, October 9; the president, Dr. Hicks, in the chair. Dr. Carter was unanimously elected president of the society for the year 1881. The Rev. William Banister, B.A., gave an interesting account of the Microscopical Exhibitions of the Chester Society of Natural Science at their annual conversazione held the previous evening. About seventy microscopes were exhibited, of which twelve were by members of the Liverpool Microscopical Society, fifteen having accepted the invitations to attend. Mr. Charles Botterill exhibited and explained Mr. J. Smith's method of illuminating opaque objects by means of a bull's-eye condenser, the condenser being placed horizontally between the lamp and object, and so arranged that the rays from the lamp are totally reflected from the upper plane side, and refracted upon the object.

Quekett Microscopical Club.—The Journal of the above club for August, 1880, contains papers on:—"A simple Method of Cleaning Diatoms," by H. Stollerfoth, M.D., M.A.; "On Undescribed British Sponge of the Genus Raphiodesma," by J. G. Waller; a "List of Objects found at recent Excursions," by M. C. Cooke, M.A., LL.D., A.L.S.; "On Two Species of Acarina," &c., by A. D. Michael, F.L.S., F.R.M.S.; "Further Observations on Micro-Filariæ," by Patrick Manson, M.D., Amoy; "Helminthological Observations upon the Endemic Disease of the Mount St. Gothard Tunnel Labourers," by Enardo Perroncito, M.D. Turin, &c.

Permanent Microscopic Preparations of Plasmodium.—Mr. S. H. Gage, in a paper recently read before the American Association for the Advancement of Science, advises picric acid as a means of hardening this interesting motile form of the Myxomycetes, without change of colour as by osmic acid, or shrinkage and change of colour by drying. Pieces of rotten wood containing plasmodium are placed on moistened microscopic slides, taking care that some of the protoplasm touches the slide, and the whole placed under cover to prevent drying. In an hour or so any plasmodium that may have crawled out upon the slide may be fixed by placing the slide a few minutes in a mixture of equal parts of ninety-five per cent. alcohol and a saturated aqueous solution of picric acid. Yellow plasmodium may then be at once mounted, through absolute alcohol in balsam; but these forms should be first bleached in twenty-five per cent. alcohol.

Sea Anemones.—I suspect that "Minnie's" shrimps were large sand skippers. Sea anemones are very partial to these creatures, but they generally crush them in swallowing them and reject the shells after extracting the meat. I used to find my "sand shrimps," as the fisher-girls called them, disappear very rapidly in the aquarium, and see the bottom of the tank covered with their shells in a day or so after the frost. The anemones were accustomed to suck them in as they did the raw beef with which, in the absence of sand skippers, I occasionally fed them —*H. E. Watney.*

ZOOLOGY.

Occurrence of Vanessa Antiopa.—On the 17th of August, I saw a very fine specimen of the Camberwell beauty (*Vanessa Antiopa*): from its perfect condition, I should say it was just out of the chrysalis. Not having a net with me, I was unable to secure it.—*Edith C. Thomson, Tonbridge.*

Land and Freshwater Shells of Derby.—Being anxious to obtain a complete list of the land and freshwater shells found in the county of Derby, I shall be much obliged to any reader of Science-Gossip that can help me in this matter.—*H. Milnes, Winster, near Derby.*

Hertfordshire Natural History Society and Field Club.—The Transactions of the above Society, published September, is a continuation of the Transactions of the Watford Natural History Society, and contains, besides the president's (J. Gwyn Jeffries, LL.D., F.R.S., &c.) address, the following papers: on "Animals which have become Extinct in Britain within Historic Times," by J. E. Harting, F.L.S., "Our British Beetles: Notes on their Classification and Collection," by Arthur Cottam, F.R.A.S., and "General Observations on Spiders," by F. M. Campbell, F.L.S., F.R.M S.

"A Manual of the Infusoria," by W. Saville Kent, F.L.S., &c. London, David Bogue.—We have received Part I. of this splendid work, and much as we anticipated from so well-known a specialist as Mr. Saville Kent, our highest expectations are greatly exceeded. If the remaining five parts are turned out as attractively and solidly as this (and there is no reason to believe they will be otherwise), this Manual will be one of the best and cheapest scientific monographs which has issued from the English press for many a year. The publisher has done his part well, in supplying excellent paper and clear type, the eight plates of objects are exquisitely drawn by the author, and as beautifully engraved. The present part consists of 144 pages of historical and descriptive letter-press, including Chapter I. "Introductory—General History of the Infusoria from the time of their discovery by Leeuwenhoek in 1675, to the year 1880." Chapter II. "The Sub-kingdom Protozoa" (in which we have the taxonomial, biological, and structural values and affinities of the various groups of Infusoria, and a classification attempted). Chapter III. will prove especially interesting to all microscopists. It is on the "Nature and Organisation of the Infusoria," and deals with their morphology, internal and external differentiation, their encystment, locomotive and prehensile appendages, the nature and functions of their contractile vesicles, nuclei, and nucleoli, their colouring matter, their accessory structures, such as trichocysts, as well as with all the phenomena of reproduction, whether by binary division or fission, external and internal germination, sporular multiplication, or sexual reproduction. We confess, however, we should have preferred that the author had not employed the terms "Macrospores" and "Microspores" to the sporuloid bodies seen in encysted Infusoria, seeing that these terms are already in botanical use for club-mosses, &c. Mr. Kent also discusses the affinities of the Infusoria to the higher zoological groups, and gives instructions for the preservation of Infusoria, as well as full practical explanations of the methods for their investigation. The fourth chapter treats on "Spontaneous Generation," and in this the reader will find a very clear and full summary of all that has been said on this debated subject up to the present time. Our greatest surprise in connection with this much wanted and magnificent work is, that the publisher has found it possible to publish it so cheaply as in monthly half-guinea parts

Hibernation of Lady-birds, &c.—The time is now arrived when the various insect inhabitants of our fields that live through the winter begin to look out for winter quarters where to hibernate and pass the dreary months in undisturbed rest. So soon as their food becomes scarce and the weather cold, instinct prompts them to retire. This is pre-eminently the case with lady-birds (Coccinellidæ), whose food departs with the heat and with the leaves; when aphides fail, lady-birds are to be seen as early as September, wandering over palings, &c., for this purpose. In the sunny days of December they are allured from their hibernacula in crevices of tree-trunks and palings, under bark, among dry leaves, and such-like places; while in early spring they are the first to announce the opening of the season. When snow covered the ground and ice the ponds, I have found great numbers of several species congregated together under the bark of trees, their legs drawn up, and antennæ collapsed as if lifeless, but on slight warming they would become as lively as they could have been in summer. This is precisely the case with many other beetles, especially the geodephaga; and it is only necessary to shake the rotten leaves of winter and tufts of grass and moss over a sheet of brown paper to obtain a supply of hibernating species. For the same reason, early spring is a good time for collecting Coleoptera, when numbers may be taken by lifting up flat stones, &c., which have lain on the ground undisturbed for some time. They come to the surface from their winter homes on the approach of warm weather. Another good situation for beetle-hunting in winter is the turf at the foot of walls. By pulling up the tufts of grass, beetles may be found hiding among the roots. The above hints may be useful to young collectors, and I hope other notes on winter work from correspondents may follow.—*C. Francis Young.*

YORKSHIRE NATURALISTS' UNION.—We have received parts 1, 2, and 3, of the Transactions of this well-known Association of the various Field Clubs scattered throughout Yorkshire. A prominent feature in these Transactions is that they are paged in separate series, each being intended to be bound independently of the others, thus avoiding the heterogeneous mixture of subjects which would be the result of printing the papers continuously as received. The societies of the Union are fortunate in numbering among their members naturalists whose names are well and widely known, and whose contributions are here to the front. Thus we find papers on almost every department of Yorkshire natural history, from Entomology and Conchology to Vertebrata, from Messrs. W. D. Roebuck, W. E. Clarke, G. T. Poritt, J. W. Taylor, W. Nelson, S. D. Bairstow, S. L. Moseley, &c., whilst the botany of the district is being worked by Dr. Parsons and the Rev. W. Fowler.

"DEATH-WATCHES."—At page 215 of the September number of SCIENCE-GOSSIP, in the column replying to correspondents, you describe the "Death-watch" as *Anobium striatum;* on reference to Rye's "British Beetles," page 148, he gives *A. tessellatum* as the "Death-watch," again, at page 79, vol. ii. of Cox's "Handbook of Coleoptera," said to be the text-book on Coleoptera, he makes no mention of either *A. striatum* or *tessellatum;* whereas, at page 201 of Stephens's "Manual of Coleoptera" he gives both. Shuckard, at plate 53, figure 6, gives an illustration of *A. striatum* (Oliv.) as the "Death-watch." It is strange that Cox should have omitted such a common and well-known beetle; since he gives no synonyms: is one to suppose that *A. striatum* is described under some other specific name?—*J. Bohnso.*

BIRDS AND FRUIT.—On the principle that fruit owes its succulence and colouring to the agency of birds, which are supposed to be attracted by these qualities, it would be interesting to know if any and what birds feed on the scarlet berries of "lords and ladies" (*Arum maculatum*), now standing so attractively by our lane sides.—*J. E. Taylor.*

BOTANY.

FLORA OF DEAL.—I do not know whether there exists any account of the flora of the neighbourhood of Deal. I cannot at any rate trace one, and was prepared on a recent visit to find from the unfavourable terms in which the district had been represented to me that there was little or no work in the botanical way. I have however been agreeably surprised at the abundance and variety of wild flowers, even in the month of August (during which my visit was made) when the blossoming or most conspicuous period for the most part ceased and seeding time commenced. I should much have liked to come across a complete list of the flora, and I can only offer the following as a far from exhaustive list containing such flowers (other than the very commonest kinds) as I came across in my rambles, and which I offer in the hope that it may be of some service towards the compiling of a list or to other searchers. 1. Pretty generally distributed:—*Ranunculus bulbosus* and *R. repens; Papaver rhœas, Senecio Jacobæa, Calamintha clinopodium, Malva sylvestris* and *M. rotundifolia, Chrysanthemum leucanthemum, Convolvulus arvensis, Calystegia sepium, Anagallis arvensis, Silene maritima, Knautia arvensis, Prunella vulgaris, Onopordon acanthium, Anthemis nobilis, Campanula rotundifolia, Daucus carota, Ononis arvensis, Solanum dulcamara, Lotus major.* 2. The following were more or less local:—(a) On or near the sandhills.—*Calystegia soldanella, Pastinaca sativa, Solanum nigrum* (very small), *Lycopsis arvensis, Eryngo maritima, Glaucium luteum, Cakile maritima.* (b) On the road to Sandwich, viâ Sandhills—*Dipsacus sylvestris, Pulicaria dysenterica, Fœniculum vulgare, Astragalus hypoglottis.* (c) Fields near and about Walmer Castle.—*Scabiosa columbaria, Echium vulgare* (in front of the castle), *Thymus serpyllum, Hypericum perforatum, Fumaria officinalis, Reseda lutea, Cichorium intybus.* (d) *Veronica serpyllifolia,* on the railway bank. *Origanum vulgare,* very plentiful near Mongeham. *Linaria vulgaris,* uncommonly fine and abundant in a field on the right-hand or west side of the beautiful valley at the back of Walmer Castle, proceeding southwards. *Plantago major,* ubiquitous, but specially fine near Mongeham. I gathered a spike nineteen inches in length. *Erythræa centaurium,* very plentiful in field at the back of the Castle Inn by Sandown. The curious in trees may find in Ringwould churchyard, about twenty feet from the north-east corner of the church, a yew with a girth of twenty feet three inches at three feet from the ground.—*F. H. Habben.*

BEE ORCHIS (*Ophrys apifera*).—Have any of your numerous correspondents observed a scarcity of *Ophrys apifera* this season? It usually occurs in considerable numbers at various places on the Chiltern Hills, in South Beds and North Herts, and last season was particularly abundant on one hillside of the Lower Chalk escarpment. Having promised a botanical correspondent to supply him with living specimens of both *O. apifera* and *O. muscifera,* it was made a special point to obtain them. The fly orchis (*O. muscifera*) was found the third week in June in a locality on the chalk escarpment where it has occurred regularly in about the same number for several years past. But diligent as was the search for bee orchis both of myself and of friends who live near the hills, not a single specimen could be found either in flower or in fruit. The examinations of well-known localities were continued during the latter part of June, till the third week in July, and as has been mentioned in

SCIENCE-GOSSIP that this plant is often associated with yellow wort (*Chlora perfoliata*) particular attention was paid to the spot where this has been growing this season, but with no success. Determined, if possible, to redeem the promise given, an opportunity was seized of taking a few days' excursion to the south coast of Sussex. Last year bee orchis grew plentifully on the sea cliffs between Beachy Head and Eastbourne, and after a careful search two specimens were observed, both nearly gone off flowering as it was the last week in July. These are the only two plants seen this season, although many miles have been traversed over their usual haunts, and it would be interesting to know if other observers have noticed the same scarcity. If so, would the excessive moisture of last summer be the proximate cause?—*J. S., Luton.*

LYCHNIS VESPERTINA.—The last week in August I gathered a specimen of this plant, which exhibited some peculiar traits with regard to colouring. The top panicle of flowers was white, with green calyx and bracts. The panicle below this had the petals, calyx, and bracts deep crimson, and the third panicle had half of the petals white half crimson. One side of the calyx was crimson, the other light green. Each of the bracts was bicoloured in the same peculiar manner. All the flowers were male ones.—*J. A. Wheldon.*

WILD FLOWERS AND THEIR NAMES.—The questions asked by F. H. Hn. in the August number of SCIENCE-GOSSIP are those that will cause very many to look anxiously for an answer. I have been for many years (unfortunately only at intervals) a field botanist; my collecting commenced thirty years ago, but it has only been within the last few years that I have been able to add many more specimens to my herbarium. The difficulties so well described, I also have felt, but have surmounted them by the use of the "Synoptical Table, according to the Linnean System," and also the coloured plates of the N. O.'s Umbelliferæ, Compositæ, Gramineæ and Filices, which were bound up with Hooker and Arnott's "British Flora." With these I have been able to name every plant that I have as yet found. For example, let me take the mallow. Upon dissecting the flower, I find that the filaments of the anthers are combined in one set; it is therefore of the class Monadelphia; if the stamens are numerous, it is of the order Polyandria. I am by the key referred to N. O. Malvaceæ; here my difficulty ceases, as I turn to this N. O. in the "Student's Flora," and at once am able to decide to which species my mallow belongs. There were some of the N. O.'s more difficult than the rest I did not attempt for want of time, but now I venture more deeply into varieties. On my excursions I frequently take the opportunity to rest whilst I compare some known plant with the short description given in Hayward's "Botanist's Pocket Book," to ascertain if I have it, or if different to what I have previously collected; for I not only use this useful book for reference in the field, but also as an index to my herbarium and note book for specimens wanted. I should like an opinion as to the value of the "New and easy Method of studying British Wild Flowers" by F. A. Messer.—*J. Astley, Coventry.*

DEVELOPED PRIMULAS.—In your September issue Mr. W. West writes: "I have seen large quantities of *P. farinosa* growing, but never came across it with a sessile umbel. I should like to know if this form is often seen; it must have been seen, as Hooker writes, 'Scape stout; 2–8 in., rarely 0.'" In July 1878 I found *P. farinosa* with sessile umbels and also with scape 4–6 in. long, growing side by side close to the cliffs of Holborn Head, near Thurso. I have a specimen of each which I gathered at that time, and identified with the description in Hooker's "British Flora."—*W. K. McGhie.*

THE BOTANICAL EXCHANGE CLUB OF THE BRITISH ISLES.—We have received the report of the above club for 1879. It is occupied with short notes on the rarer plants gathered during that year; the localities where the specimens were obtained are accurately specified. The pamphlet is crowded with evidences of the untiring industry of British botanists.

"NECTAR, ITS NATURE, OCCURRENCE, AND USES."—Under the above title, Mr. William Trelease has republished a chapter contributed to the U.S. Department of Agriculture Report on Cotton Insects. In it he sets forth, first a true definition of nectar, and then shows its different uses; as directly useful when secreted by the leaves, and thus rendering the plant less liable to mildew, or indirectly useful, as when secreted to aid cross-fertilisation. He notes that perhaps its most curious appliance is when nectar is secreted by plants in order to induce a body-guard of ants to protect them from enemies such as larvæ, leaf-cutting ants, &c. Mr. Trelease concludes with a comprehensive catalogue of books, &c., treating on the subject.

"THE HERTFORDSHIRE POMONA."—We have received part iii. of this magnificent work, edited for the Woolhope Club by Dr. Robert Hogg, F.L.S. It contains a pleasantly written essay by Mr. Edwin Lees, F.L.S., of Worcester, on "The Crab: its Character and Associations;" and another on "The Orchard and its Products: Cider and Perry," in which we find full notes of the date of introduction of different varieties of the apple, diseases of apple-trees, &c. The coloured plates in the present part are to our liking, superior in beauty and finish to any that have yet appeared, which is paying the highest compliment in our power. In addition there are woodcut illustrations of each notable variety of apple and pear.

Turritis glabra.—I was surprised to find this species mentioned by Mr. Dillon at page 210, among a list of plants "not now considered native in any part of Britain." My brother and I found it growing abundantly in a deep rocky gorge, among the Cheviot Hills, near Hownamkirk, in 1860, which was a new Scottish station for the species, and where it was very unlikely to have been introduced by man. It may also be noted that neither Babington nor Hooker give the slightest hint in the last editions of their respective Floras, that it is not a native, and Hooker is always very particular on that point.—*David Douglas.*

North American Mosses.—Messrs. Eugene A. Ran, and A. B. Hervey, A.M., have issued an excellently arranged "Catalogue of North American Musci," and have thus ably supplied a want which has long been felt by American botanists. The classification is mainly that adopted by Professor Schimper in his "Synopsis of European Mosses."

Botany of North Devon.—While botanising in North Devon during July, I came across *Saxifraga umbrosa* growing wild some way from any cultivated garden. Is not this very uncommon in the south? *Corydalis claviculata* was growing in profusion near the moor, and by the side of a stream one plant of *Campanula hederacea* I found with pure white flowers. I procured a great number of specimens of *Cotyledon umbilicus* and *Melampyrum pratense.* In no specimen of the former did I see a raceme of panicles as figured in Bentham, but merely simple racemes, and in no specimen of the latter were any of the leaves toothed at the base. Which are the commonest characteristics of each? I received from Jersey a specimen of a fern, whose fronds were exactly similiar in form to the barren fronds of *Blechnum spicant.* The fronds of this specimen bore fruit on the back and there were none corresponding to the fertile fronds of the hard fern. What is its name?—What is the signification of the terminal endings of the families in Botany, *e.g.*, *-aceæ*, as in *Eric-aceæ*, *Campanul-aceæ*, &c., and *-ineæ* as in *Scrophular-ineæ*, *Plumbag-ineæ*, &c. Bentham has a family called *Lentibulaceæ.* I can find this in no other botanical book. It corresponds to the *Lentibulariaceæ* of Lindley.—*Walter G. Woollcombe, Trinity College, Oxford.*

Borago.—If *Borago officinalis* is, as stated by S. Dillon, Fore Street, Hertford, "not indigenous," how comes it to be growing among the ruins of Corfe Castle in this county? I have seen it there for the last forty years; and in the parish of Swanage, it is abundant, though I admit, in somewhat suspicious places. Hooker and Arnott do not hint at any doubt of Borago being a native plant.—*Julia Colson.*

GEOLOGY.

A Palæolithic Implement Manufactory.—Mr. F. C. Spurrell has discovered, in the brick-earth of Crayford, in Kent, at a depth of forty feet from the present surface, a large number of flint-flakes associated with the cores from which they had been struck off. Mixed with them were flint implements of the Palæolithic type. The site is believed to be that of an original manufactory of palæolithic flint weapons.

Geology of Swansea.—In answer to H. P. M., in your October number, p. 238, I may mention that the seam of coal "worked in the Millstone Grit" is included in the series of strata grouped as Millstone Grit, and that these strata pass insensibly up into the coal-measures. The lowest seam of coal, as will be apparent from the section published in my paper (p. 172), occurs sometimes many feet beneath the sea-level, at others high up above it. The underclays are most uncertain in thickness, averaging about three feet. H. P. M. will find precise information on these matters in the sections published by the Geological Survey, and mentioned by me in a footnote at the bottom of p. 173. These sections may be consulted at the Geological Survey Office in Jermyn Street. Not having them with me I cannot give particulars. The anticlinal structure exhibited at Newton (see diagram before-mentioned) is a clear case of the "upheaval" of the rocks, for all the strata represented were originally laid down in approximately horizontal layers, and the Carboniferous Limestone was deposited at some depth beneath the sea. In reply to his last inquiry, I would refer H. P. M. to a paper by Mr. E. T. Hardman, "On the Origin of Anthracite," published in the Journal of the Royal Geol. Soc. of Ireland, ser. 2, vol. iv. p. 200.—*H. B. Woodward, Fakenham.*

Geology of Swansea.—I send you the following list of Fossils of the Carboniferous Limestone, in the vicinity of Swansea, as a note to the valuable paper communicated in the two last numbers by Mr. H. B. Woodward, F.G.S. With the exception of a few species in the Swansea Museum and in the collection of Mr. Wm. Terrill, I collected the whole during the recent meeting of the British Association, and although a very incomplete list, it may be of sufficient interest to appear in your pages. *Clisiophyllum turbinatum*, *Cyathophyllum Stutchburyi*, *Lithostrotion irregulare*, *Syringopora reticulata*, *Phillipsia truncatula*, *Fenestella plebeia*, *Athyris ambigua*, *Chonetes Hardrensis*, *Orthis resupinata*, *Productus cora*, *P. giganteus*, *P. longispinus*, *P. Martini*, *P. punctatus*, *P. semireticulatus*, *Rhynchonella acuminata*, *R. pleurodon*, *Spirifera attenuata*, *S. bisulcata*, *S. glabra*, *S. lineata*, *Terebratula hastata*, *Euomphalus rotundatus.* It is remarkable that *Productus giganteus* should be rare in the Gower Limestone, for it is very abundant in the Carboniferous Limestone in North Wales.—*G. H. Morton, F.G.S., Liverpool.*

Death of an "Assisting Naturalist."—Many readers of Science-Gossip will read with regret that death has already made an inroad in the ranks of the "Assisting Naturalists" whose names so recently appeared in your columns. I refer to the decease of Mr. Wm. Gault, of Belfast, an ardent student of geology, and especially of the Cretaceous rocks of his native county, Antrim. Mr. Gault was not by any means a common man. Born of humble but industrious parents he had little assistance from external circumstances, and the creditable position to which he attained as an investigator of the geology of his country was due entirely to an innate love of knowledge and a force of character which caused him to despise the frivolous occupations and baneful literature that so often engross the leisure of persons in his own rank, and indeed all ranks. His education did not extend beyond that given to others in his humble social grade, and though his progress at school was above the average, yet he did not manifest any very exceptional aptitudes. He early developed a taste for reading, and he has stated to the writer that for this taste he owed much to his mother, who in his boyish days encouraged him, as far as means permitted, by obtaining the books that he wanted. He served his apprenticeship to the brushmaking, in which he attained to the rank of foreman. He accompanied his parents to Glasgow, and in October 1868, was elected a member of that flourishing and energetic association, the Geological Society of Glasgow, and attended many of their instructive meetings and excursions. In the course of a few years he returned to Ireland, and became one of the working members of the Belfast Naturalists' Field Club, who awarded him, in several years, prizes for collections of geological specimens, and to whose proceedings he contributed several papers. Gault had wisely taken up a special subject, and his investigations were directed to the better elucidation of the Cretaceous rocks near Belfast. He was no "holiday geologist," to use a phrase hurled by a professional against the club to which he belonged. His opportunities, as may be supposed, were not considerable, but were utilised to the utmost extent. During the long summer days of this latitude, it was his common practice on leaving off work to run away to some of the hills which encircle Belfast, and, hammer in hand, continue his survey as long as sufficient light remained, returning in time to obtain the rest necessary to enable him to be at his work at six in the morning. On Saturdays he left off work at noon, and starting usually direct from the shop, without dinner, he was enabled to enjoy a long afternoon, and to reach more distant sections. Holidays and other non-working days, were almost invariably devoted in this way, and thus he was enabled to do more than many whose opportunities are much greater. Though Gault had always pretty fair health, yet he was not at all robust, and he has fallen a victim to rapid consumption. Working at the Black Mountain, one very cold Saturday last spring, he caught what seemed only a bad cold. He did not anticipate anything serious, and continued at his work for some time, but ere long it was manifest to his friends that his course was run, and he expired on the 25th September, at the early age of 35, leaving behind a widow and one son to lament his untimely end.—*S. A. Stewart, Belfast.*

Proceedings of the Geologists' Association.—No. 7 of vol. vi. of the above, issued July, contains amongst others, the following papers: "Visit to the Museum of Practical Geology—Demonstration on Earthy Minerals." This is in fact a petrographical demonstration on the minerals of the Horse-shoe case (Jermyn Street), by Mr. W. H. Huddleston, M.A., F.G.S. The most important paper is a "Demonstration of the Elephantine Mammals," confined chiefly to the fossil remains in the North Gallery, British Museum, No. 1., given by Professor Owen on the occasion of the visit of the Association to the Museum. This is accompanied by a large plate of teeth.

"Oceans and Continents."—This is the title of a paper by Mr. T. Mellard Reade, C.E., F.G.S., &c., from the "Geological Magazine." It consists of well-arranged arguments in opposition to the theory that the oceans and continents of the globe have always occupied their present positions, and that the latter are, in fact, concretions built up around the prominences of the earth's crust which first hardened, whilst the oceans have occupied their present abysses within certain limits during all geological time. Mr. Reade objects to this prevailing theory, and argues "that on attempting to follow out the sequence of events by which oscillations of land and sea in a limited area could account for all those enormous and successive stratified marine deposits almost everywhere to be found on every continent, nay, even on islands such as New Zealand, the mind actually fails to grasp what could have been the formative process." He takes exception to the statement put forward that all known rocks are shallow water deposits, either littoral, or in shallow seas bordering land; bringing forward in opposition the description given by Professor Alex. Agassiz of dredging up from over 1000 fathoms, and fifteen miles from land, in the Gulf of Mexico, masses of leaves, pieces of bamboo, of sugar-cane, dead land shells, and other land debris which Professor Agassiz says would, if found fossilised in rocks, be taken by geologists to indicate a shallow estuary surrounded by forests. It is, as Mr. Reade remarks, well known that the materials of sedimentary rocks have been used up again and again, and that their breaking up is usually preceded by a removal of cementing calcareous matter in solution—limestone being removed nearly wholly in a state of solution in water as carbonate or sulphate of lime. It is insisted upon by those who hold the views which Mr. Reade combats that the mechanical matter is deposited near to land—not in deep oceans. It therefore follows as a corollary, that if the oceans have been fixtures, the carbonate and sulphate of lime have been continuously abstracted from the rocks and deposited in greater or less proportion in the ocean, through incalculable ages, where it must remain to this day. It also would follow as a further consequence that the newer rocks would be less calcareous than the older ones. But the reverse is the case, as the valuable analyses made by Dr. Frankland prove.

NOTES AND QUERIES.

Glow-Worms.—These insects do not emit heat, and A. B. may safely place them in water without extinguishing their light; in fact, moisture rather increases their brilliancy, for they shine best on a dewy night, and according to various experiments that have been made, hot water makes them more luminous. The female glow-worm is the one that "lights up," she like "Hero," burns her lamp in order to guide her "Leander home." She is wingless, so cannot rove very far. Most writers believe that the light is intermittent or continuous at the will of the glow-worm, some asserting that in time of danger the insect extinguishes it entirely. How does A. B. keep his specimens? The change of food of the glow-worm from animal juices in the larva state to tender plants in the perfect condition explains many of the contradictory statements made respecting this insect; and as the intermittence of light is dependent on the different amount of air introduced into the trachea, and the varying activity of respiration and muscular action, regulated as I have before observed by the will of the creature when in its natural state, they may not, if kept in confinement have a sufficient quantity of aerial fuel to light their lamps with for A. B.'s pleasure.—*Helen Watney.*

Dwarf Linnets' Eggs.—In your July number of Science-Gossip, you kindly inserted a note for me about dwarf eggs; I have since had an opportunity of measuring the linnet's eggs I mentioned. The smallest egg is four lines in length by three in breadth. Three more are almost as small, another one is six lines in length by four and a half breadth. The largest is about the size of a long-tailed tit's egg. I give these measurements because they are the smallest dwarf eggs I ever saw or heard of. I have now a linnet's egg before me, which is little short of an inch in length. I have several other dwarf eggs in my collection, amongst which is a pheasant's, in length twelve and a half lines, in breadth ten lines.—*G. Dewar.*

Blue Pimpernel.—In 1877, I found one or two plants of the blue pimpernel near St. Leonards-on-Sea; but it is not common there.—*C. B.*

Green Woodpeckers' Eggs.—In your issue of Hardwicke's Science-Gossip for last month, a correspondent states that he has lately taken some green woodpeckers' eggs mottled with brown, and asks if this is unusual. Having made a study of oology for several years now, I am in a position to state that it is very unusual indeed; in fact I never heard or read of woodpeckers laying any but pure white eggs. Buffon states that the eggs of the green woodpecker are "always white." Gould says, "of a pearly whiteness," and a later authority says, "The eggs are nearly always white," but I have frequently found the latter authority to be in error as to the colouring. I should like to see your correspondent's eggs very much.—*J. J. Hammond.*

Hawthorn Bloom.—I have no doubt the absence of the hawthorn blossom has prevailed this year in the whole of the North of England, and whether it has reached to other counties farther south I cannot say. In Northumberland, the condition of the hedges was precisely the same as described by R. W. in the August number of Science-Gossip, viz., an almost entire absence of the blossom of the hawthorn. In addition to this, there was in Northumberland an equal scarcity of the blossom of the laburnum. Last year whilst every tree was covered with its golden blossoms, it was a rare sight to witness in the past spring a single flower, and it may be said that they were entirely barren in this respect. The year 1879 was very favourable to the growth of trees, but the absence of heat in the autumn prevented the young shoots becoming sufficiently hardened to bear the severity of the three days' intense frost which prevailed in December, and to this cause I attribute the absence of flowers both on the hawthorn and laburnum. In Northumberland the following trees have either been destroyed or greatly injured by the severe frost just mentioned, which, for intensity, exceeded any other that I ever experienced during the last half-century, viz., the Lombardy poplar, holly, male oak, bay laurel (*L. nobilis*), which latter was entirely destroyed above ground, and the walnut.—*Dipton Burn.*

How to destroy Mites, &c.—Would some reader kindly give me some information through the "Notices to Correspondents'" column at an early date regarding the generation, food, and best means of eradicating from household furniture a mite (specimens herewith) which made its appearance a few months ago in myriads in a bedroom and has now spread over the whole house? The furniture has been exposed to concentrated sulphurous acid fumes, saturated with solution of carbolic acid, corrosive sublimate, turpentine, acetic acid, &c., but, although considerably reduced in numbers, the family is still in a flourishing condition. Any means whereby they could be got rid of would be willingly tried by —"*Antimite.*"

Longevity of Cats.—(P. 213.) I knew a cat which had been in the possession of a near relative of my own for a period of twenty-two years. It died finally, not of old age, but by violence. In the same house was another cat which was believed to be at least as old—but of this I have no precise information. The old cat just named continued to have kittens until a late age. I have been told of a cat belonging to a public house at Ashford-in-the-Waters, Derbyshire, which was thirty years old at its death, and continued to have a kitten annually up to the last year of its life. The name of the owner of this long-lived cat was Mrs. Martha Hulmes.—*Jane Axon.*

A BURIED FLOOR.—Some time since, while cutting away a bog in the neighbourhood of Pomeroy, the workmen came upon a level floor covered with sawdust; this was at the depth of twelve feet eight turf, in depth twenty-two feet of earth. This being strange, I think it worth recording.—*S. B.*

CURIOUS PLACE FOR A SWALLOW'S NEST.—On the top of some potato onions, hung from the rafters of a loft. They were placed there the first week in August, and the old birds must have commenced to build at once, as the young brood are able to fly now. September 18th.—*S. B.*

CLIMBING POWERS OF THE TOAD.—If Helen Watney would kindly give some idea of how the rough surface of a toad, and the surface of a "roughly built" garden wall, or of a stone step, are going to adhere simply in virtue of the toad's rough surface, she would greatly enlighten both myself and, I doubt not, many others. Now I think that if the toad I observed climbing a flight of stone steps in the manner described at p. 213, was able to attain his desired end, the "venerable fat toad" would also by the same means have been able to climb the steps, which I presume were at the entrance of the house, and so gain admittance. Also if the flower-pot were as rough as a garden wall, the toad would have found some hold for his hands and so have escaped.—*Edward B. Parfitt.*

BULLFINCH INCUBATION.—It may interest some of your pet-keeping readers in the bird line, if I send you a sequel to the account published in your last number. I have since (last week) visited the country house therein mentioned, and saw, as the result of the hen-bullfinch's incubation inside the stag's skull, four very fine young birds. She is again sitting in the same peculiar situation, with the cock bird in attendance.—*W. Hambrough.*

WASPS DEVOURING FLIES.—In answer to S. B.'s query in the October number of SCIENCE-GOSSIP, it may interest him to know that I have frequently seen wasps devouring flies, and once saw a wasp attack a spider and defeat it.—*A. M.*

WASP PREYING ON LARVA.—In answer to your correspondent S. B., I beg to say, that the incident he mentions in the October number is by no means of rare occurrence. Wasps, it is well known, are of a cannibal and carnivorous nature, and I have frequently amused myself with giving them small pieces of raw meat, which they would sometimes eat on the spot, but more frequently carry away. A few weeks ago, I observed a very much worn specimen of *Vanessa* *Urticæ* crawling on the ground. It was utterly unable to fly. Presently a wasp came hovering over it, and finally settled near it. Crawling over its body, it stung it in several places, and then endeavoured to drag it away. Failing in this, it commenced to gnaw off the wings, and actually separated three from the body whilst I was watching. Time did not allow of my witnessing the final results of the unequal conflict, but I have no doubt the wasp either ate or carried away the dead body of its victim. There is a highly interesting account of spider-killing wasps in the September number of this periodical.—*J. A. Wheldon.*

SHEET LIGHTNING.—Can any of your correspondents explain to me the cause of sheet lightning? The common explanation is that it is the reflection of fork lightning. If so, how is it that their shapes are so utterly different?—*C. B.*

BLACKCAP'S EGGS.—I have this season taken some blackcap's eggs, in which the ground-colour is a yellowish-brown, and the spots dark brown. Will any of your readers tell me if this variety is unusual?—*H. J. S. H.*

DRAGON-FLIES.—The specimen seen by A. J. Wheldon must surely be a foreign species the larva of which has been brought over to England. I have read of a Chinese dragon-fly with scarlet on the wings, but never of a red-bodied English one. Some of our native species vary in colour at different ages, *Calopteryx splendens* and *Calopteryx virgo*, for instance; one kind, *Libellula maculata*, has a lemon-coloured body with blotches at the bottom of the wings. The male and female dragon-flies also differ in hue; one, Mrs. Dragon-fly, having a green bodice whilst her lord sports a blue coat.—*Helen E. Watney.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

TO ANONYMOUS QUERISTS.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

TO DEALERS AND OTHERS.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

M. B. H.—Feed your glow-worm larvæ on grey or yellow slugs and snails. They will remain in the larval state till April or May, and then change to the pupal condition, in which they will remain a fortnight longer before attaining their adult or fully developed state.

R. BLIGHT.—The fungus was in a "high" state when we opened the box (owing to the delay caused by a holiday), and it was difficult to make out. It appeared to be a species of Morel, probably *Morchella semilibera.*

C. H. G. (Wimbledon).—The specimen with large ovate leaves is *Daphne laureola;* the other with smaller leaves is *Negundo fraxinifolium.*

J. H. (Kendal).—It is *Alonsoa incisæfolia,* of the N. O. Scrophulariaceæ.

F. A. D. (Winchester).—*Atriplex hastata*, yes, and *Chenopodium album*, β. *viride* (L.), by some authors known as *C. viride* (Linn.), (*vide* Babington's "Manual").

R. W. (Wigton).—We should have no hesitation whatever in naming your No. 4, *Juncus conglomeratus* (L.); it certainly looks unlike it in its early stage of growth, and we do not wonder that you are puzzled.

J. BRABY.—Your slide reached us in a smashed condition, but sufficient was made out to indicate the parasite to be *Chelifer cancroides.*

H. BANGHAM.—The enormous development of the "sucker" is undoubtedly due to the richness of the soil, in which the nutriment must be in excess.

R. A. B.—Your specimen is the eye-bright *(Euphrasia officinalis).*

J. P.—The red seeds are those of *Abrus precatoria*. The shells are a species of *Neritina.*

H. L. E.—The objects on the oak leaves are not fungi, but *galls*, popularly known as "oak-spangles." They are formed by an insect. See Taylor's "Half Hours in the Green Lanes," page 197.

T. D. R.—A notice shall appear in next month.

J. COLSON.—Kindly put your query to the editor of the "Gardeners' Chronicle," as your query is purely a horticultural one.

G. T. HARRIS.—Mr. Edwin Waugh's books are published by Abel Heywood, Manchester.

DR. C. STUART.—Thanks for your notes, which shall appear in an early number.

COL. F. A. D.—The specimen is *Saussurea alpina.*

H. RICHARDSON.—The price of new books is not always known when we announce them as "received." Mr. Rimmer's "Land and Freshwater Shells" acknowledged in our last number you will see advertised in the columns of the same number at 10*s*. 6*d*.

META.—You will find figured and described in Newman's "British Moths," both the convolvulus hawk moth and the privet. We have no doubt your caterpillar is that of the death's head moth.

A. GARDINER.—The insect pests appear to be the larvæ of *Thrips ochraceus*.

A. R. GRAHAM.—Your specimen is a little millepede called *Geophilus electricus*, which may often be seen during October on moist hedgebanks giving out a phosphorescent light as it crawls about.

EXCHANGES.

COLLECTION of 60 coins; what offers in mounted micro-slides? Also willing to exchange lists of mounted and unmounted micro objects.—Nathan C. Haring, 112 Upper Brook Street, Manchester.

ARCTIC peat-bog found at Oldham, for slides, mosses or hepaticæ, &c.—L. Tetlow, 19 Radclyffe Street, Oldham.

MOUNTED vegetable hairs and unmounted fungi and pollens for good unmounted diatom deposits, especially Peterhead, Mourne Mt., and Llyn Arenig Bach.—C. H. S., Fairoak, Palatine Road, Didsbury, Manchester.

FOR well-mounted palate of *Acmæa testudinalis* send other well-mounted slide to John G. Patterson, 2 Dalrymple Crescent, Edinburgh.

WANTED, Sachs's "Botany," Pratt's "Wild Flowers," Bentham's "Handbook of British Flora," Grindon's "British and Garden Botany," Masters's "Teratology," for cash.—R. T. Porter, Beckenham.

A QUANTITY of chemical apparatus, new, in exchange for good slides or slide cabinet.—W. H. Rean, Kingswood Park, Gunnislake, Tavistock.

BRITISH shells. Duplicates for exchange, for lists of same and of desiderata apply to J. W. Cundall Carrville, Alexandra Park, Redland, Bristol.

PURE gathering *Rhinosolenia styliformis* in exchange for really good slides.—W. H. Shrubsole, F.G.S., Sheerness-on-Sea.

FOR specimens of *Chelifer subruber* (American), unmounted, send object of interest, or material to W. O. Haydon, Oil Mill, Dover.

A 3 ft. one-draw telescope, 2 in. obj. gl., brass body, partly covered in leather, with sun-shade &c., in capital order, for good C. and F. eye-pieces by Swift or other good maker, or offers.—T. S., 16 King Street, Reading.

FOR seeds of *Urtica pilulifera* (L.), and var. *Dodartii* for planting in spring, send stamped envelope to Dr. Morton, New Brompton, Kent.

FOR starch from Crown Imperial (*Fritillaria imperialis*), Polar. Send other material.—Dr. Morton, New Brompton, Kent.

OFFERED, specimens of the rare carboniferous fish *Cosmoptychius striatus*, Ag. sp., and plaster casts of good ditto. Wanted good carb. fishes, or palæozoic crinoids.—T. Stock, 16 Colville Place, Edinburgh.

WE want to exchange our fine fossil flora, palæozoic fossils, fungi, algæ, and other plants and animals, archæological remains, for foreign natural history, &c. specimens.—J. M. Mousfield, Indiana Asbury University, Greencastle, Indiana, U.S.A.

WANTED, 4B, 6B C, 15B, 23, 28B, 37, 48B, 50 and B, 78 and A B C, 101 and B, 106, 108. Offered 82, 85. 530, 1070B, 1071, 1128, 1473, and a large number of others. Lists exchanged.—C. A. O., 76 Trafalgar Road, Old Kent Road, London, S.E.

WILL send a mounted section of tooth from saw of saw-fish in exchange for really first-class insect preparations, or injections or other objects not common, to the value of about four shillings as per dealer's lists.—Address J. Horn, Yew Villa, Bacup, Lancashire.

LARVÆ of fox moth.—Desiderata: pupa or imago of other species of Lepidoptera.—Address S. Smith, Castle Street, Walmer.

EGGS of cormorant, shag, lesser black-backed gull, shieldrake, herring gull, &c., for other British birds' eggs. Send lists.—John F. Cruickshank, 12 Gladstone Place, Aberdeen.

BRACE of pheasants, stuffed, in case, mahogany front, gilt beading; pair of jays, stuffed, ordinary case; sparrow-hawk and lark, stuffed, ordinary case. What offers?—J. B. Crossley, 149 Bradford Road, Huddersfield.

ROSE OF JERICHO. A few specimens are offered for mineralogical, geological or microscopical exchanges, by James Campbell Christie, Hamilton, N.B.

WANTED, British grasses in exchange for dried specimens of British plants.—A. Sangster, Cattie, Oldmeldrum, N.B.

DUPLICATES, British butterflies and moths, many species; also a few foreign do. in exchange for others, or offers.—A. H. Shepherd, 4 Cathcart Street, Kentish Town, London.

SCIENCE-GOSSIP (numbers) for 1867 and 1868, in exchange for any two years between 1870 and 1875 inclusive.—W. T. Cooper, 234 King Street, Hammersmith.

DUPLICATES, eggs of coot, blackheaded gull, lesser black-backed gull, landrail, waterrail, rook, jay, jackdaw, magpie, curlew, red-backed shrike and bullfinch. Desiderata very numerous.—C. Candler, Harleston, Norfolk.

WANTED, Newman's "British Moths" (last edition, price £1). Can offer many valuable works "Lives of Indian Officers," 3 vols. crimson calf, new. Hook's "Dictionary of the Church," good condition. Bruce's "Travels in Palestine," drab calf new, and many others.—C. Candler, Harleston, Norfolk.

BRITISH marine, freshwater and land shells. For exchange, *Pandora rostrata*, *Thracia phaseolina*, *Pileopsis Hungariensis*, *Scaphander lignarius*, *Artemis exoleta*, &c. &c. Lists exchanged.—R. Ley, St. Leonard's Lawn, Exeter.

SEVENTEEN four-shilling parts, "Quarterly Journal of Geological Society," 1874 to 1878; 21 parts Cassell's "European Butterflies"; "Field Geology," by Penning; "Dawn of Life," by Dawson, what offers?—J. S. Ilsley, 6 Trevethen Terrace, Falmouth.

WANTED, Gatty's "British Seaweeds," for six hundred species of British plants, either all phanerogams or a third of them cryptogams. All good and recently collected specimens.—X., 14 Sherborne Road, Bradford.

I HAVE a dozen good microscopic slides, including diatoms, lichens, parasites, and dredgings from the "Challenger" and "Porcupine."—Desiderata: side-blown British eggs, named foreign shells, or books on natural history.—"Science," 105 White Ladies Road, Bristol.

H. arbustorum and a few *H. pomatia*, in exchange for *A. acicula* and rarer varieties of Clausilia.—Address Miss Elwell, Holmesdale Villa, Sevenoaks.

BINOCULAR microscope large size, with polariscope and other apparatus, cost £18. Exchange large astronomical telescope. S., 364 Kennington Road, S.E.

SUPERIOR mahogany cabinet containing 13 drawers 8″×5″, cost 50*s*. Exchange injected or Cole's micro slides.—S., 364 Kennington Road, S.E.

OFFERED Nos. 25, 55, 135, 183, 234, 293, 497, 590, 683, 737B, 809, 852, 981, 1124, 1209, 1416, 1470, 1665A & B. Wanted 19, 99, 100, 101, 103, 104, 176, 194, 255, 280, 286, 347, 348, 349, 360, 490, 491, 493, 522, 523.—Address A. E. Lomax, Church Road, Tranmere.

DUPLICATES—Dominula, Caja, maculata, hamula, prodromaria, fasciuncula, Gothica, pinaria, lucipara, myrtilli, plecta, Imitara, derasa, tiliaria, Corydon, Euphrosyne.—Desiderata: imagoes or pupæ of butterflies, send list.—Fredk. Frohawk, "Haddon," Upper Beulah Hill, Upper Norwood, S.E.

BOOKS, ETC., RECEIVED.

"Wrecked Lives, or Men who have Failed," (1st and 2nd series). By W. Davenport Adams. London: S.P.C.K.

"British Bee-Farming." By J. F. Robinson. London: Chapman & Hall.

"Outlines of Physiography." By W. Lawson. Edinburgh: Oliver and Boyd.

"Some Heroes of Travel." By W. Davenport Adams. London: S.P.C.K.

"A Manual of Rational Bee-Keeping." By C. de Ribeaucourt. London: David Bogue.

"Epicureanism." By W. Wallace, M.A. London: S.P.C.K.

"Stoicism." By W. W. Capes. London: S.P.C.K.

"Practical Plane Geometry and Projection," vol. i. text; vol. ii. plates. London and Glasgow: W. Collins, Sons, & Co.

"A Manual of Palæontology for the Use of Students," in two vols. By Professor H. A. Nicholson, D.Sc., &c. Edinburgh and London: W. Blackwood & Sons.

"Land and Water." October.

"Popular Science Review." October.

"The Midland Naturalist." October.

"Ben Brierley's Journal." October.

"Journal of Applied Science." October.

"Le Monde de la Science et de l'Industrie." September.

"La Science pour Tous." September.

"Feuille des Jeunes Naturalistes." October.

"The American Naturalist." September.

"Good Health." (New York.) September.

"The American Entomologist." September.

"The Valley Naturalist." September.

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 9TH ULT. FROM:—E. R.—E. H. W.—A. C.—B. J. H.—W. D. R.—H. J. J. L.—G. C. C.—M. B. H.—G. H. M.—G. D.—W.—T. S.—H. L. E.—J. A.—S. B.—R. A. B.—C. P.—J. C. W.—H. B.—J. M. M.—R. S.—F. A.—W. H. N.—O. G.—N. C. H.—A. R. G.—F. A. D.—W. H. S.—A. M.—E. B. P.—H. R.—F. C.—G. H. B.—W. G. W.—L. T.—J. B.—H. M.—T. S.—W. H. K.—W. H.—J. W. C.—J. M.—T. S.—J. F.—A. B. H.—J. G. P.—H. W.—J. B.—S. A. S.—B. M. O.—H. M.—C. H. S.—A. S.—C. F. Y.—J. D. R.—F. J. G.—G. T. H.—M.—A. H. S.—F. F.—A. E. L.—W. W.—W. B. R.—H. B. E.—J. C.—W. T. C.—J. C. T.—H. W. K.—R. L.—G. D. W. C.—C. S.—J. P.—C. P.—D. B.—C. C.—J. S. I.—J. B. C.—A. C.—J. C. G.—J. F. C.—H. M.—R. H.—P. S.—B. J. G.—H. W.—J. H. H.—&c., &c.

A GOSSIP ABOUT NEW BOOKS.

A "NEW BOOK," by Alfred Russell Wallace, the co-discoverer with Darwin of the Law of Natural Selection, is an event to most naturalists. No other scientific writer exceeds him in his clear marshalling of facts, and none equals him in his power to see inferences and meanings unperceived before. His generalisations are of so brilliant a character as to carry the reader irresistibly along in the flood-tide of the author's speculations, without leaving to him the power of protesting! *Island Life*, by A. R. Wallace (London: Macmillan & Co.), is in every sense of the word worthy of its industrious and gifted author. It abounds with new and striking generalisations, sometimes almost too rapidly crowding on each other's heels. As regards the contents, the first part has in reality nothing to do with the title, which applies only to the second part of the work. The former is taken up chiefly in discussing the causes of Glacial and Tropical Climates in the Northern Hemisphere, in which he shows that Dr. Croll's theory of the high eccentricity of the earth's orbit, with winter in *aphelion*, is not sufficient to produce the former without the aid of such geographical conditions as high lands within the Arctic circle to condense vapours into snow. Similarly he prefers to fall back upon Sir Charles Lyell's theory (but without altogether ignoring or opposing Dr. Croll's) that the warm climate indicated by the fossil plants and animals of the Arctic regions might be produced by warm oceanic currents, provided there were no high lands. We do not think all geologists are so ready to concede the point which Mr. Wallace requires for his theory of the geographical distribution of animals and plants in geological times, that the continental land masses and great oceans have been permanent during all geological time. Nor do we think Mr. Wallace is so dependent on this conclusion as he appears to imagine. Mr. Mellard Reade's paper on the subject in a recent number of the "Geological Magazine" is all but unanswerable. Mr. Wallace is occasionally obliged to adopt the practice of minimising an opponent's argument and unduly strengthening his own weak one, as when he compares the analyses of oceanic ooze with those of chalk, in order to prove that the latter was a shallow-water deposit; notwithstanding the close resemblance and even identity of most of its microzoa to those from the bottom of the Atlantic and Pacific. He forgets that in the pure white chalk a good deal of segregation has taken place —the silica into flint, the iron into nodules of pyrites, and frequently even the alumina into reddish argillaceous concretions—all of which operations have left the chalk relatively much richer in carbonate of lime. If chalk be formed like the white mud in the neighbourhood of coral reefs, how is it we find few or no reef-building corals fossilised in the chalk, and so many of the others? It is not because the conditions were unfavourable to the preservation of the former. Again, if the Pacific and Atlantic have always been oceans, we may reasonably expect that along their floors the oceanic sediments of every geological epoch, from the Laurentian to the Human have been continuously and uninterruptedly deposited!

But although we do not thus far agree with Mr. Wallace, the objections we have named are small in comparison with the important character of this book. In it the reader will find, popularly digested and attractively described, all the generalisations and conclusions made by the author in his larger work on *The Geographical Distribution of Animals.* The intimate relationship between biological and geographical changes, particularly as exemplified on such great islands as Madagascar, reads as attractively as one of George Eliot's novels. This work is one of those splendid contributions to the doctrine of evolution which have caused that theory to take such firm hold on the mind of most naturalists. By its means the seemingly chaotic abundance of scientific discovery is being reduced to the simplicity and order of unity. Our own convictions are quite in agreement with Mr. Wallace's conclusion to the present work:—"We are thus encouraged to study more completely every detail and every anomaly in the distribution of living things, in the firm conviction that by so doing we shall obtain a fuller and clearer insight into the course of nature, and with increased confidence that the 'mighty maze' of Being we see everywhere around us is not without a plan."

A Manual of Palæontology for the use of Students, by H. A. Nicholson, M.D., D.Sc., &c., in two volumes. (Edinburgh and London: William Blackwood & Sons.) This is the second and greatly enlarged edition of a book concerning which we wrote when it appeared a few years ago—"In this Manual the geological student has a most valuable and extensive work placed at his disposal." Dr. Nicholson then laid the foundation for a splendid and most useful work, such as few naturalists besides himself were fit to undertake. It has now grown to a book more than double the size of the original edition, in which every new palæontological fact finds its place. The woodcut illustrations are of a very superior kind, and are between seven and eight hundred in number. This is a matter of much concern to the student who is desirous of identifying fossils. The Glossary of Terms at the end of the second volume is so full and complete that it would easily make a small volume itself. Practically the present work is a new one compared with the first edition, which ought rather to be regarded as its pioneer, for it has been completely re-cast and often re-written. Professor Nicholson has placed all geological and most zoological students under a great obligation by the masterly way in which he has collected, arranged, and classified the facts of the most difficult of modern sciences, Palæontology. No library of natural science can afford to be without the present work.

The Natural History of the Agricultural Ant of Texas, by Henry Christopher M'Cook. (Philadelphia and London: J. B. Lippincott & Co.) Dr. M'Cook is well known to naturalists for the years of observation he has devoted to perhaps the most intelligent and sagacious of all insects, the agricultural ants of Texas. These little creatures grow corn and store it up for winter use in their granaries. They make clearings, cut down grass for the purpose, carry away the material composing mounds, and even make roads! Dr. M'Cook has now published the result of his long labours, in a handsomely got up illustrated volume of more than two hundred pages. All who are interested in insects will read it, and will acknowledge that not only is fact stranger than fiction; but also that the history of a Texan Formicary reads as charmingly as that of Liliputia!

A large number of most useful and ably written works have recently been issued from the "Bazaar" Office, 170 Strand, London, among which one of the most generally pleasant is *Notes on Game and Game Shooting*, by J. J. Manley, M.A., a well-known writer on the natural history of sport. This book is well got up, the illustrations being of a higher order than usual. Although more especially written for sportsmen, the author is a true naturalist, with a keen power of observation and possessed of an easy, cultured style of description which will make his book a welcome companion to the sporting and natural history library. Other books are now issuing in sixpenny monthly parts, from the same publishing office, all of which we can heartily and earnestly recommend, such as *Practical Trapping*, by W. Carnegie ("Moorman"); *The Practical Fisherman*, dealing with the natural history, the legendary lore, and the capture of British fresh-water fish; *Bee-keeping for Amateurs*, by Thomas Addey (the Lincolnshire apiarian); *Practical Photography*, by O. E. Wheeler; *British Dogs*, by Hugh Dalziel ("Corsincon"), which deals with all the varieties, history and characteristics of the canine breeds, and is capitally illustrated with numerous portraits of the leading dogs who are having their day; *Fancy Pigeons*, by J. C. Lyell; *The Book of the Rabbit*, by L. U. Gill, &c. The same publishers have also issued an interesting reprint of a rare and curious old book which appeared in the year 1576, entitled *Of Englishe Dogges*. The book first appeared in Latin by John Caius, "Doctor of Phisicke in the Universitie of Cambridge," and was "newly drawne into Englishe" in the above year by "Abraham Fleming, student." Speaking of reprints reminds us of another which has been lying on our shelves awaiting a notice—*A Treatyse of Fysshynge with an Angle*, by Dame Juliana Berners. (London: Elliot Stock.) This is one of the best of the well-known reprints which Mr. Stock has yet published. It is a facsimile reproduction in every respect, paper, printing, and even binding, of the first book on the subject of fishing printed in England by Wynkyn de Worde at Westminster in 1496. The Rev. M. G. Watkins, M.A., writes a very pleasant and scholarly introduction to it.

Two new books on *Bee-Keeping*. We are more pleased with the revival of bee-culture in our midst than with many other movements of greater pretended value. The very mention of it conjures up those qualities of providence in which we English are lamentably deficient. We are importing both wax and honey into this country, at the rate of scores of thousands of pounds per annum, and meantime our own crops are going unfertilised because there are not bees enough to cross them! *British Bee-Farming: Its Profits and Pleasures*, by J. F. Robinson (London: Chapman and Hall), is a capitally-written, enthusiastic, and thoroughly exhaustive book on the subject, by an old and valued contributor of SCIENCE-GOSSIP. It takes quite different grouud to any other "bee-book" we know, and is not likely to interfere with their special work. At the same time it is original enough to chalk out ground of its own, and to fill up the outlines with appreciative detail. *A Manual of Rational Bee-Keeping*, by C. de Ribeaucourt (London: David Bogue), is a translation, by Mr. A. F. G. Leveson-Gower, of the work of a well-known Swiss pastor, who has effected a great reform in bee-keeping by his cheap and newly-devised hives, which can be efficiently made out of any old box. We can, too, thoroughly recommend this cheap and highly practical little book to all who are interested in apiculture.

Animal Magnetism, by Rudolf Heidenhain, M.D. (London: C. Kegan Paul & Co.), is well translated by L. C. Wooldridge, B.Sc., and is further recommended by a preface from the pen of Mr. C. J. Romanes. This book marks a well-known line of departure in the pseudo-science of "electro-biology." It deals with the phenomena of hypnotism, mesmerism, catalepsy, &c., entirely from physiological data, and removes for ever all those semi-mystical illusions which have rendered this subject the "forlorn hope" of the vulgar and the empirical. It is most pleasant to find phenomena hitherto unexplainable fall into their orderly places under the experimenting hand of such a skilled practitioner as Dr. Heidenhain. This is a small book, but likely to be a very effective one. *The Heart and its Functions* (London: David Bogue) is another of the shilling series of practical works which Mr. Bogue has issued and which have been so well received by the public. The list of the names of this series includes the highest medical and surgical authorities in Great Britain; and we cannot but feel grateful that these gentlemen do not feel it beneath them to write shilling "Health Primers" for the benefit of the people! *Magnetism and Electricity*, by Professor Guthrie (London and Glasgow: William Collins, Sons, & Co.), is a cheap, comprehensive, and exhaustive manual, intended for the general student, and written by one of our best authorities on the subject. Its practical value is indicated by the fact that the work is based on the notes of the Lectures Dr. Guthrie has been in the habit of giving to mining students and science teachers during the last six years, in connection with the School of Mines and South Kensington. It is a clear, full, and complete digest of all that is known up to the present of these rapidly increasing sciences. *Practical Plane Geometry and Projection*, by Henry Angell, is another of the "Advanced Science Series" by the same enterprising publishers (Messrs. Collins, Sons, & Co.). It is in two volumes, one devoted to the text, and a larger-sized volume to the illustrative plates. The selection of the problems is original, being based on the author's own class-teaching. The solution of each problem not only elaborates a method, but also teaches a principle. *Outlines of Physiography*, by William Lawson, F.R.G.S. (Edinburgh: Oliver & Boyd), is another of the Manuals which South Kensington has called into existence for the use of science teachers as well as science students. Although the author modestly terms it a "Text-book for the Elementary Stage," it is in our opinion more clearly compiled than many larger and more pretentious books. The ground taken is extensive enough, so much so that nothing short of "Physiography" would have included it. It comprehends chemistry (as applied to the elements in their natural combinations), geology, vulcanicity, physical geography (formerly so-called) in all its multitudinous departments; as well as the relations of the earth as a planet to the solar and stellar systems. Mr. Lawson, however, has performed a difficult task clearly and well, and we heartily commend his cheap little book to the notice of those for whom it has been written.

The Society for Promoting Christian Knowledge has recently taken a new lease of vigorous life, as is indicated by the various new grounds they are endeavouring to cover by their publications. Here we have several seasonable books:—*Some Heroes of Travel*, by W. H. Davenport Adams (London: S. P. C. K.), in which the author very skilfully and pleasantly relates the discoveries of geographers from the time of Marco Polo to those of Sir Samuel Baker. This book is a very skilful digest of geographical discovery in every quarter of the globe during the long period represented by those two names. *Wrecked Lives; or Men who have Failed*, is by the same author and publishers, and deals (in two series) with such biographies as those of Wolsey, Chatterton, Savage, Robespierre, Burns, Poe, Heine, &c., in Mr. Adams's well-known animated style. The "Ancient Philosophies for Modern Readers" series (also by the S. P. C. K.) has recently received two additions—*Stoicism*, by the Rev. W. H. Capes; and *Epicureanism*, by William Wallace, M.A. Both these books are worthy of their predecessors, which is according them high praise, seeing that *Buddhism* is written by so talented an Oriental scholar as Mr. T. W. Rhys Davies, the *Koran*, by Sir William Muir, and *Hinduism*, by Professor Monier Williams.

DULNESS IN OBJECTIVES.—I have only just returned after a long absence and have been unable till now to thank many correspondents for their suggestions as to the cause of dulness in the field of my ¼ in. objective noticed by me in SCIENCE-GOSSIP two months or more ago. Some of the suggestions were very ingenious, but I find that the real cause lay in the fact that changes of temperature cause a film to be deposited on the surface which requires to be cleaned off occasionally.—*W. G. Woollcombe, Trinity College, Oxford.*

THE SEMICIRCULAR CANALS OF THE INTERNAL EAR; THEIR PROBABLE FUNCTION.

By H. J. Benham, M.D. Lond.

THE internal ear, or labyrinth, consists, as is well known, of an ovoid chamber, called the *Vestibule*, from which open the three semicircular canals behind, and the cochlea in front. The labyrinth is filled with a watery fluid, the *Perilymph;* in which float a series of membranous sacs and tubes. These are filled with a similar fluid—the *Endolymph*, and are attached by a portion of their circumference to the bony walls of the labyrinth (Rüdinger*) whence they derive their blood-vessels and nerves. The labyrinth is bounded by hard bony walls in every direction except towards the tympanum, where its walls are pierced by two windows. The upper one, called the *Fenestra ovalis*, contains the base of the stapes, attached to its margins by an elastic ligament. As the membrana tympani vibrates, the base of the stapes moves backwards and forwards like a piston, and communicates its motion to the perilymph. The other window, the *Fenestra rotunda*, is simply closed by a flat membrane, which bulges out when the base of the stapes is pushed inwards, and *vice versâ*, thus permitting the movement of the perilymph.

The complex structures in the spiral cochlear duct, known collectively as the "organ of Corti," are generally admitted to be the "lute of 3000 strings" (Tyndall) by means of which we analyse sounds into their constituent tones and over-tones; but the membranous semicircular canals have not yet been assigned any definite function.

Whilst preparing a paper recently for the Ipswich Scientific Society on "The Mechanism of Hearing," I was examining the base of a skull in which I had laid open the various parts of the labyrinth from above. It then struck me that since the three semicircular canals certainly lie in three planes at right angles to one another, possibly their function might be to analyse sounds into three sets, according to the plane in which the molecules of the perilymph are vibrating. If we consider the motion of one molecule, it is evident that it may oscillate to and fro along a given horizontal line, to and fro in a vertical plane at right angles to this line, or to and fro in a horizontal plane, at right angles to the given line. Furthermore, all oblique motions of the molecule may be considered as the resultant of movements in two or three of these planes simultaneously; or, in other words, all possible oscillations of the molecules may be expressed in terms of movements in one, two or all three of these planes.

The stapes moves to and fro in a nearly horizontal plane, in a line which forms an angle of about 35° with the vertical mesial plane of the body. This line may conveniently be termed the auditory axis, it is approximately the axial line of the external auditory meatus, and is the line in which sounds are heard with the greatest distinctness by one ear.

The vestibule is somewhat conical, or rather pear-shaped, the stalk of the pear representing the commencement of the posterior semicircular canal. Hence vibrations, transmitted from the stapes in the direction of the auditory axis, are concentrated upon this point, the inner and hinder portion of the vestibule. From this point spring two cylindrical canals, at first for a short distance both horizontal. The most anterior continues to run in a plane almost horizontal. After a short straight course outwards, it curves forwards and then inwards, describing rather more than half a circle, and then expands into an ovoid chamber twice the diameter of the tube. This is called the ampulla, and lies close to the wall of the vestibule behind and external to the fenestra ovalis.

Through a very short canal, the ampulla is supplied

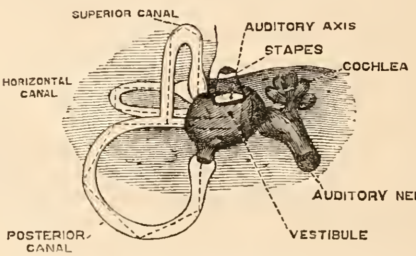

Fig. 157.—Section of the Labyrinth of Human Ear.

with blood-vessels, and a branch of the auditory nerve. It is filled by a membranous sac, forming the end of the membranous canal, which however, occupies only one third of the lumen of the rest of the bony canal and is attached along its convex border (Rüdinger). The other end of each membranous canal is connected with a large ovoid sac, called the *utricle*, lying in the hinder part of the vestibule. In front lies a smaller sac, the *saccule*, from which springs the cochlear duct. Where the utricle and saccule are attached to the inner vestibular wall, and at the fundus of each ampulla, is a conical heap of highly-specialised epithelium, in which the fibrils of one branch of the auditory nerve end as "auditory hairs." These are the organs by means of which the sonorous vibrations are (so to speak) translated into neurility, and telegraphed to the auditory nucleus in the medulla, where the messages are combined into auditory perceptions. The canal thus described is the horizontal one. The other two are precisely similar in structure and arrangement, and only differ in that they lie in planes at right angles to this and to each other.

* Stricker's "Manual of Human and Comparative Histology." New Sydenham Society.

The posterior canal is the prolongation of the hinder of the two short horizontal canals alluded to. It lies in a vertical plane, inclined at an angle of about 55° with the mesial plane. Running at first outwards and backwards, it curves downwards and then inwards and upwards, ending in an ampulla close below the floor of the vestibule.

The superior canal springs from the horizontal commencement of the posterior canal, near the apex of the vestibule. Rising at first vertically upwards, it curves over in a vertical plane at right angles to that of the posterior canal, bending forwards and outwards and then downwards, till it ends in an ampulla close above that of the horizontal canal.

Since the ampullæ are completely filled by the membranous sacs, the perilymph space ends there. Vibrations transmitted through the perilymph are reflected down these curved tubes, passing easily through the thin membranes floating in fluid but reflected from the hard bony walls.

But I believe that some vibrations reach one ampulla with less loss of intensity than others, and are thus discriminated.

For when a ray of light, heat, or sound is reflected from a surface, there is more loss of intensity in proportion as the angle of incidence is small, and less as it becomes more obtuse.

The rays proceeding along the auditory axis impinge at a very obtuse angle on the inner wall of the vestibule, and are reflected with but little loss into the posterior canal, coinciding in direction with the axis of its first straight part.

My theory is, that those molecular vibrations in the ray of sound which take place along the line of the reflected auditory axis, find their way most easily, with the least loss of intensity, because with the fewest reflections (as shown by the dotted line in the diagram) into the ampulla of the posterior canal.

Since the axis of the first part of the superior canal is at right angles to the preceding in a vertical plane, I believe that those molecular vibrations which take place at right angles to the auditory axis in a vertical plane, are transmitted with the least loss of intensity to the ampulla of the superior canal.

Similarly, I think that vibrations at right angles to the auditory axis in a horizontal plane, are transmitted with the least loss to the ampulla of the horizontal canal.

If this be so, we have in the semicircular canals an apparatus by means of which we perceive, by the relative intensity of the nerve-excitement telegraphed from the ampullæ, in what plane or planes the molecules of the perilymph are oscillating; and are hence able to differentiate sounds to an almost infinite extent; for it is obvious that the possible combinations of these ampullary signals is innumerable.

Besides these ampullary messages, we have messages from the heaps of auditory epithelium in the utricle and saccule (upon which the rays of sound impinge directly without reflection); and also from the organ of Corti, representing the pitch of its component tones and over-tones. All these, combined with the messages representing the actual tension of the intrinsic muscles of the tympanum, in their adjustment to the intensity of the sound, unite in the auditory centres of the brain with those from the opposite ear to form one perception of a single sound. Here is room indeed for the variety that we actually find in our conscious perception of the sounds of the external world.

THE NATURAL HISTORY OF DIATOMS.

By Professor J. Brun.

[*Continued from page* 243.]

THEIR *movement.*—Every one knows by this time, that the spores of all the algæ are endowed with the power of moving in the water, that is before they become fixed, and commence the reproduction of new individuals; but amongst the diatoms it is the individual itself, or rather the frustule, which moves. This movement takes place in a straight line in the direction of the length of the valves; there is an alternate advance and return. Amongst the naviculæ, this movement is caused by an external current which is set up in the central nucleus of one of the poles, and then changes suddenly and always passes the central nucleus of the other pole. The current reacts against the surrounding water. This current can be rendered very plain by diluting the water with carmine or indigo-blue. We then see the fine granules of these colours running along the valve with the current. I have seen this curious phenomenon in the *Stauroneis Phœnicenteron.* One thing is certain, that the endochrôme does not co-operate to produce this movement, and that the living and mobile valves have no external organs, cilia, or plates assisting in locomotion. I have proved that the appendices which we sometimes perceive on the surface of the valves and which many naturalists have taken for swimming organs, are only parasites.

Their Parasites.—There is scarcely any living being which has not its parasites. Diatoms, small though they are, have theirs. So true is it that amongst the infinitely small beings one finds "the battle for life," and "the struggle for existence," and if the great in general feed on the small, it is but natural that, the small reuniting should destroy the great. Amongst the diatoms, these parasites are always other kinds of algæ. Five common diatoms, *Nitzschia linearis* and *sigmoidea*, *Synedra splendens* and *Cymbella maculata* and *cymbiformis* are found sometimes in this country covered all over with a filamentous parasite, having the appearance of thick transparent hairs, straight, rigid, and of a very pale greenish-yellow.

Viewed with a strong light and under a considerable power (+ 1200) they appear like a string of vesicles united like a necklace. This is the *Leptothrix rigidula.* The living frustule is never incommoded in its movements by them, and when (under the microscope) it strikes an obstacle in the midst of the water, we see these threads fold up from their base, but they straighten and stiffen again as soon as the obstacle is past. Boiling in water, and the action of nitric acid sets free these threads, which are not of a silicious nature. In addition to this, potash distends them and alcohol does not green them, which proves the absence of diatominc. It is evidently this parasite which Ehrenberg and, since then, other naturalists have taken for motile cilia. What Kützing said seems to indicate that he also thought that these appendices formed a portion of the diatom. I have a preparation from water where this same Leptothrix adheres at the same time to *Synedra parvula* and to the filamentous algæ (*Zygonema*) upon which their Synedra is itself parasitic ; also another preparation where it adheres at the same time both to *Staurosira parasitica* and to the *Nitzschia linearis* which supports it, thus offering the curious phenomenon of three parasites superimposed in a space of the five to six hundredth part of a millimetre !

Their development.—Every diatom commences its existence in water and in the midst of a slightly coloured mucilage, which is translucid and often feebly visible. Whether it begins life as a germ, a spore, or from deduplication by fission, the first vital state is always a gelatinous amorphous mass in the middle of which the young frustules appear. The frustules have not then their striations so plain as when they are perfect and free. This is important to note, and it has been the cause of many errors in the determination of species, especially when the intensity of the striations forms one of the specific characters.

Their reproduction.—Once fixed in a situation which is favourable to them, their development and their multiplication proceed with astonishing rapidity. Numerous observations have proved that their reproduction takes place : 1st, by germs (sporules) ; 2nd, by direct deduplication ; and, 3rd, by reproductive sacs (spores) which result from this deduplication.

The sporules are so minute that they have escaped up to the present the eye of observers aided by the best immersion lens, such as those of Spencer, Ross, Powell and Lealand, Zeiss, Hartnack, and Prazmowki, &c. Ehrenberg thought that they were able to divide by fission in one hour, and that thus in four days a diatom could produce one hundred and forty billions.

A diatom, indeed, does deduplicate itself in an hour, but only when it has arrived at the necessary degree of development for its deduplication to take place, for the works of W. Smith, Thwait, of Brebisson, and my own observations have proved that it takes on the average six to ten days, from the state of a germ, for it to be able to reproduce.

Their collection.—It is by the borders of ponds or brooks where the water is slightly deep and very clear that we most find these microscopic algæ. One can easily detect their presence by great glairy patches, yellow, tawny, or brown, which they form at the bottom of the water. Sometimes also they constitute that organic scum, soft, brownish, or golden, which floats on the surface of stagnant water. They may be found also adhering in great abundance to the surface of submerged aquatic plants. They form that tawny mucilage, sometimes clear brown or greenish, which covers submerged stones, piles of dams, lake jetties, floating wood, &c. They abound in damp rocks of the Alps and Jura, and where there are permanent springs and cascades ; or even where glaciers or the snows of the high névés are permanently in contact with rock heated by the sun.

For their study it is only needful to collect these films, these mucilaginous scums, and place them in phials with the name of the locality where they were collected. Humid rocks, stones from brooks, or aquatic plants should be brushed lightly with a small camel's-hair pencil ; or else delicately pass the brush over the slime of the pond, over the organic felt, dipping every time what the brush brings away into a phial half full of water. At home leave the liquid to settle, which has been decanted in order to observe the sediment (see further, the manner in which preparations are made for the microscope). At Geneva it is not uncommon to find *Nitzschia fusidium* and *Navicula pelliculosa* in vases of water left in the rooms. The water in which flowers have been standing often contains *Tabellaria flocculosa* and the different Gomphonemas, &c. At the bottom of the water-tanks of our houses we nearly always find *Cyclotella Kützingniana* and *operculata* with the different Cymbellæ, together with many other lake species. In the plain, it is during the months of March, April, and May (in a word, at the end of winter and during spring) that excursions to collect them alive are most fruitful. During the height of summer and in autumn their development partially ceases. In the elevated and colder parts of the Alps we still find them abundantly in the middle of summer, especially in the Alpine lakes, or in the high torrents of the Jura. It is when the torrents of the high Alps in winter flow limpid from the glaciers that they are the most rich in diatoms, even in water covered with ice. In summer, when the melting of the snows becomes rapid, and when their water is muddied by the slush which it carries, this richness of vegetation considerably diminishes. These are the results of observations which I have been able to make during our winter ascents with the Alpine Club.

Sometimes, when I wished to obtain some particular species where I had already collected it, it had disappeared, and another species had succeeded it. But mostly the species were able to develop simultaneously and in great abundance without injuring one another. It is in general during spring, and when all the vital conditions are best fulfilled, that the species found are most separated. Later on, in summer, we often find in the same place and at the same time, as many as twenty, thirty, or even forty different species.

Determination of the Species collected: First Examination.—In order to determine a diatom it is necessary that the observer takes the water just as he has collected it, and in the normal state, in a thin film of water under the covering-glass of the microscope. A magnifying power of + 200 or + 300 linear is sufficient. All the soft and mucilaginous part, the membranous envelopes, or even the filaments, the points of endochrôme attachment, &c., are visible, and furnish important characters. It is well, for this examination of living diatoms, to change their position by pressing lightly and by tapping (with a fine point of wood or of a pen) on the glass covering the drop which contains them. We, in this way, are able to appreciate clearly their exact form and the relief of the different faces.

Second Examination.—We next heat a few to a dull red heat on a plate of iron, porcelain, or platinum. The organic matter which much obstructs the observation of the valves, is carbonised and burnt. There then remains the silicious envelope, which is termed the frustule. It is only after this operation that the beautiful striations appear in full relief, and the varied designs which afford us so many useful specific characteristics. It requires for this a power of about + 400 or 600 (rarely 1000).

Method of making Microscopic preparations.—Those who wish to make a herbarium of diatoms, or in other words, a collection of preparations all ready for microscopic examination, and preserving indefinitely their distinct characteristics, should proceed as follows:—

(*a*) *Quick Method.*—Of all the methods employed, the following is the most rapid: it is necessary at once to separate with the greatest care the diatoms from the slime or organic débris with which they are encumbered. This is accomplished with a powerful lens and a very fine bristle.

They are next dried (after the addition of some drops of nitric acid) in a small porcelain capsule, or better, of platinum, afterwards they are heated to about a temperature slightly below dull red heat, and this is maintained for from five to ten minutes, till all the organic matter is completely burnt. As this incineration sometimes proceeds with difficulty, we can accelerate it much by leaving it to cool, adding a few drops of nitric acid, and then drying slowly and heating again two or three times in a very airy place, in order that the acid and corrosive vapours should not injure the operator nor attack the microscope. The residuum is in general light yellow; sometimes the colour is reddish-brown, in consequence of the presence of peroxide of iron proceeding from the endochrôme and the gelatinous envelopes. It is next sprinkled with hydrochloric acid, then heated (but not to boiling-point), and the whole set in a lipped glass, and then filled with water. The first decanting separates the sand which settles rapidly. As soon as the diatoms are deposited they form a light stratum, white and powdery, they are then washed with boiling water by decanting, next with very pure distilled water. The purity of the distilled water may be tested by evaporating a few drops on a perfectly clean plate of glass; it ought not to leave any trace of deposit. A little water is left in order to deposit the diatoms clean, and they spread about on the small plate of glass called the cover-glass, and are left there to dry.

For the preparations called dry, we make on the surface of the carrying-glass a circle of bitumen (cellule) that has been heated, and then place the covering-glass over when the bitumen is very dry; or else during the evaporation of the essence of the bitumen the internal surface of the cover will be covered with little oily globules, much obscuring observation. It is necessary to have slender covers, averaging one-tenth, or at the most two-tenths of a millimetre thick.

The adhesion of the cover to the dry bitumen of the cellule is produced by heating to almost dull red heat a piece of iron, and passing it over the entire edge of the cover; it must be pressed lightly. The eye can easily follow the softening of the bitumen and its immediate and certain all-round adhesion to the edge of the cover.

For the preparations in balsam it is necessary (once the diatoms on the cover are perfectly dry) to soak them with a little essence of terebinthine, and add a drop of half viscid Canada balsam; then apply the cover on the slide which has been heated with care in a spirit-lamp until the balsam is just about to boil. At this moment quickly remove the flame. The balsam is then sufficiently dry to adhere strongly. The essence of terebinthine is for the purpose of removing (by the tension of its vapour) the bubbles of air which always remain in the interior of silicious valves.

This method gives very pure preparations and of great beauty, but it is necessary to be careful in avoiding a heat too strong, for there are some diatoms whose silicious valves are so thin that even a dull red heat softens and deforms them. Such are, for example, the valves of *Amphipleura pellucida*, those of *Navicula pelliculosa*, *oculata*, *levissima*, *Bacillum*, and *appendiculata*; those of *Synedra gracilis* and *tenera*, and those of *Nitzschia Pecten*, *palea*, and *parvula*, &c.

If then the first examination under the microscope shows the presence of the delicate species just mentioned, we must act in the following manner :—

(*b*) *Slow Method.*—The diatoms are slightly heated (by the sun or on a hot stove) with some hydrochloric acid, to which we add little by little small crystals of chlorate of potassium. The chlorine is left to operate for some days (being frequently stirred), until the diatoms are bleached white at the bottom.

If the endochrôme is not entirely destroyed, it must be removed by decanting the acid liquid and allowing aqueous caustic ammonia (volatile alkali) to act on it for one or two days. This alkali is decanted, then we allow several days to intervene, during which cold concentrate nitric acid is operating. (The action of the alkali in juxtaposition to the acid operates through the silica of the valves by endosmose, and this internal current completely destroys the endochrôme and the coléoderme.) Washing and drying follow as in Method *a*. I recommend this method ; it is slow, but it is excellent, and when followed exactly it gives a remarkably beautiful preparation.

(*c*) *Type Preparations.*—When the diatoms have been well washed and dried on the slide, the most beautiful examples may be picked out and chosen in order to make preparations containing only one type species. This is done with a prism, having a power of + 100 or 150, and with a hair from a brush, which serves to detach them and transport them one by one on to the cover, in the centre of a small circle, previously necessary, drawn with red, blue, or black varnish. This circle can be easily made, and it enables us to find the objects rapidly. The slide should be previously covered with a thin film of glycerine, which serves to fix the diatoms when placed upon it. A gentle heat afterwards volatilises this glycerine. The preparations thus made are clean and very useful, but they require much time and skill.

Translated by W. Bate Hardy.

THE ROSE CUTTING BEE (*MEGACHILE WILLOUGHBIELLA*).

THE constructive instinct of insects is apparently developed to its greatest perfection in the order Hymenoptera, more especially among the sociable species. Yet there are some solitary individuals that approach, if they do not equal, them in this respect. And among the latter none more so than the leaf rollers.

I observed one of these solitary species of bees (*Megachile Willoughbiella*) constructing a domicile for its progeny in the loose earth of a flower-pot, though the soft wood of a decayed post, or the crevice in an old wall is frequently selected by it for the same purpose. If it chooses a flower-pot it burrows a cylindrical hole about half an inch in diameter ; tunneling with its powerful jaws, it tears down small particles of earth which it rakes to the surface by means of its feet, for which purpose they are admirably adapted, but as it accumulates the earth from within at the entrance, it from time to time levels the successive heaps to a uniform surface. This tunnel which occupies the persevering toiler about two days to form, is from three to four inches in length, sometimes it is a straight or curved cylinder, and sometimes it is branched or bifurcated, but in all cases it is

Fig. 158.—*Megachile Willoughbiella* cutting a piece of leaf for wall of cell.

smoothly finished inside. It may happen that another bee of the same species will select the same flower-pot in which to construct its nest, but each works independently of the other. Should a wooden post be selected for its nest the bee will carry the extracted particles some few inches away, and scatter them about, evidently not caring to accumulate

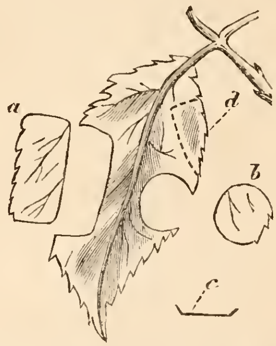

Fig. 159.—The leaf of a Rose cut by *Megachile Willoughbiella*. *a*, A piece cut for the wall of a cell ; *b*, A piece cut for roof of a cell ; *c*, Section of *b*, showing the turned up edge ; *d*, Defective cutting.

rubbish that would be liable to betray its sequestered home.

Again, the crevice in a wall may be chosen, then it has little else to do than to clear the loose material away and construct its cells. Having completed the boring operations or adapted a ready-formed burrow as the case may be, it sallies forth to some bush, that of the "tree peony" or "rose" (from which it derives its name) or some other suitable plant.

Then hovering about the bush with a continuous hum it flies from leaf to leaf, apparently with a selective impulse, choosing that leaf best adapted to its purpose, and, having alighted upon the edge of the selected one, commences cutting with its shearlike jaws inwards from the edge about a quarter of an inch, then making a sharp curve, cuts parallel with the midrib for a distance of one-half to three-quarters of an inch; simultaneously with this cutting it rolls the leaf between its legs in such a manner that only the narrow surface of the edge of the leaf opposes its flight, and again another curve is made at right angles to the parallel cutting, and it goes on shearing until all is severed but about the eighth of an inch; then

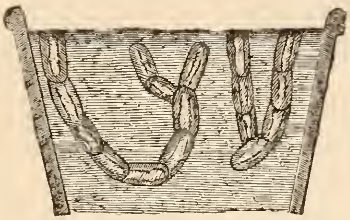

Fig. 160.—Section of a flower-pot, showing the arrangement of the cells in the burrow.

Fig. 161.—Section of cell of *Megachile Willoughbiella*, showing egg *in situ* when first deposited.

Fig. 163.—Cocoon and pupa of *Megachile Willoughbiella*.

Fig. 162.—Larva of *Megachile Willoughbiella* fully developed.

poising itself upon its wings, in a few moments the last operations are completed, and with a soft contented hum it soars away with its treasure to a spot exposed to the sun, evidently to relax the piece of leaf that it may be the better moulded into the desired shape, and after resting for a period of from five to ten minutes it betakes itself to its burrow. In this manner the miniature builder brings leaf after leaf, of a similar shape and size, always taking them to the same relaxing spot, from which it steers itself with every successive piece of leaf by the same course to its burrow. In the latter it arranges them in the form of a short tube, in such a manner that the joint of the upper layer does not come opposite that of the one beneath it, but they are alternate as the joints of the slates of a house, so that as these curved pieces of leaf dry they contract into a substantial leafy receptacle for the offspring. This selecting, cutting and moulding of parts it repeats eleven or twelve times to construct the walls of a single cell, and occupies about five minutes in arranging each piece in its burrow. When the cell is ready for the reception of the pollen and honey the bee revels among the flowers that secrete the necessary food, which it carries upon its thighs and ventral side of its abdomen until it has stored sufficient to half fill the receptacle. Then in the centre of the cell, on the surface of the store of food is deposited a single egg of a pear-shaped form, a pearly lustre, and of the consistency of a globule of gelatine.

The egg gradually sinks into the pollen, but as it sinks it bends over so that the more extended surface which it offers prevents it from being wholly submerged in its food, or that food which is to support its life would be the means of destroying it.

The mother bee now has recourse to the leaves again for the purpose of covering the cell up. Away she goes apparently with the foreknowledge of what she is about to do, though probably for the first time in her life; nevertheless she alights upon a leaf (perhaps the same one from which she obtained a piece for the walls of her cell) and commences cutting a circular piece this time, and so round that a pair of compasses could not have defined it with greater accuracy. However, it is not always that she is so accurate; mistakes occur both in the oval-shaped pieces that form the walls of her cell and in the circular pieces which compose its roof; but, apparently with the power of choosing those pieces that are capable, and those not capable of being shaped into cells, she disregards all those in which she is unsuccessful and commences to cut fresh ones. These errors are repeatedly to be seen on those trees or shrubs visited by the insect for obtaining the materials to construct its cells. Four or five of these circular caps are brought to the burrow, and the edge of each disc is turned up as they are laid in the cell, the result being that when they dry the contraction causes the turned up edge to bite tightly the inner portion of the cell. For obviously if the disc be put in the cell without being thus shaped, as it becomes dry it would also become smaller and looser; whereas it being shaped, the drier it becomes the greater is the tendency for the perpendicular edge to become horizontal. Above the last cap is left a shallow cavity for inserting the base of the succeeding cell, and the like is observed with the one following it, and so on till the last cell in the burrow is laid.

The number of these cells varies greatly sometimes; there are as many as a dozen, and sometimes there are only three or four. The diversity in these numbers seems to accrue from the conditions by which they are surrounded. If the burrow be a short one, the bee will probably be satisfied with half the number of cells in that particular one, and go elsewhere to construct others. Or it may be that the supply of the particular leaves is limited, necessitating its seeking a different locality for completing that marvellous impulse of building and providing for the perpetuation of its species. In any case, whether the nest be a large one or a small one, the last cover being laid upon the last cell, the industrious artificer encloses all with loose earth and levels it to one smooth unbroken surface : its great task being completed, it soars away leaving its offspring to their fate, apparently enclosed in their earthly sepulchre, an offspring which it will never see, and if it saw would never know. Meanwhile the fluid contents of the egg are slowly metamorphosed into definite and distinct structures with specialised functions; and in a few weeks the enclosing membrane bursts, and there issues from it an elongated fleshy grub destitute of limbs and clothed with a semi-transparent skin through which the digestive organs may be faintly seen at work, and the pair of black jaws on either side of the mouth wallow in the luscious and nutritious food. Surrounded by this store it rapidly increases in size, so much so that in a few weeks the food that was provided and stored so admirably by the parent, sufficient and only sufficient, to nourish the young grub through all the stages in its existence where food is requisite, to that final stage when there is neither any left nor any wanted. The matured larva, now that there remains no food to corrupt within the cell, passes excreta for the first time, thus showing the nutritious nature of the food supplied to it, that none is wasted, all being appropriated to its structure during its growth ; when that is completed, nature adopts the means of conveying any waste material to the exterior which must necessarily accumulate through the waste of tissue consequent upon the action of life. Then spinning round itself a close brown fibrous cocoon it prepares itself for that final change, the last that intervenes between it and that glorious imago state when it can wing its way through the atmosphere. Remaining in this dense cocoon almost motionless, and without food, the immature organs develope, appropriating to themselves the material accumulated in the tissues of the less important parts of the organism, until it gradually assumes the pupa state, in which condition the general form of the coming insect may be observed, the antennæ and legs gracefully curved upon the ventral side of the body and the various parts of the mouth folded in their position, the divisions of the head, thorax, and abdomen ; while in more advanced specimens the outline of the wings may be traced.

By the middle of July the egg that was deposited in May has gone through those series of changes it was destined to pass before arriving at that perfect state of organisation which characterises the perfect insect, the suppressed hum of whose trembling wings may be heard as it gnaws its exit through the roof of its cell ; then burrowing through the thin crust of earth that covered all it appears in daylight. After pluming the bright fresh hairs of its new coat for a few moments it wings its way (untaught though it be) with an unerring flight from its subterranean home to revel for a while among the flowers that clothe our hedgerows with open and opening petals. And then the instinct that ensures the continuity of its species in the following year originates, and it begins to construct a nest for its eggs in a similar manner to that pursued by its parent. Then either perishing with the first frost, or hibernating through the winter, it continues its existence into another summer, its eggs the while pursuing their development mature, and the perfected progeny appear in the following May.

HENRY W. KING.

A BOTANICAL RAMBLE ROUND BATH.

No. II.

CONKWELL, &c.

[*Continued from page* 230.]

WE had been waiting patiently, day by day, for a change in the weather, in order that we might set out on a voyage of discovery to Conkwell. At last, a fine day having dawned, we started off with our collecting case, and having journeyed by the Great Western Railway to Timpley Stoke, started from that point for Conkwell on foot. Though for the most part conversant with the locality lying between Stoke and Freshford, and Freshford and Bradford-on-Avon, we unfortunately had not paid in former years sufficient attention to the intricacies of Conkwell, which place brought more before our minds the merry picnic parties at which we had been present in its sylvan retreats, than rambles in search of botanical specimens.

Unfortunately, through ignorance of a short cut, which is we believe to be found by the canal side, we had to do ourselves the penance of climbing Winsley Hill, never a pleasant task; arriving after much labour at its summit, we branched off to the left, through a lane, which from its length bid fair to be an exception to most, which, however long, are declared to have a turning somewhere or other. Trudging along this lane, known in the neighbourhood as "Blackberry Lane," we suddenly beheld at some distance in a field on our left, a very curious appearance ; in fact it can only be described as the aspect that a number of sticks coloured blue might present closely crowded together when viewed at a distance. Of course we were anxious to discover what it was. When we came up to the field, we were delighted at the sight spread out before us, so beautiful was it. It consisted of nothing less than a large field almost entirely covered as far as the eye could reach with plants of

Echium vulgare, in all the splendour of full flower. Never having seen such a multitude of these plants before, it can be imagined with what pleasure we gazed upon them with their beautiful blue flowers; they were to be noted of all heights, from 2½ to 3 feet down to plants of but a few inches. Throughout our walk we met with patches of this plant, but in no place so abundant as the field we mentioned. In the lane we found on each side an abundance of *Valeriana officinalis* presenting a pleasing appearance, with its stately upright mode of growth. Here, too, we found thick beds of *Circæa lutetiana.* Emerging on the plain or table land of Conkwell, we found a bed of *Reseda Luteola.* There, too, we encountered *Crepis virens*, *Senecio Jacobæa*, *Thymus Serpyllum*, and of course any amount of *Stachys sylvatica.* Walking on a little farther, and descending a slight incline, and again ascending on the opposite side, we came to another open piece of ground, known I believe as "No Man's Land;" here we found *Galium Mollugo*, *Knautia arvensis*, numerous plants of *Lithospermum officinale*, a specimen of *Orobanche major*, specimens of *Linaria Elatine*, *Prunella vulgaris*, *Orchis pyramidalis*, *Bryonia dioica*, *Sedum acre*, *Malva sylvestris*, *M. rotundifolia*, large patches of the pretty *Geranium pratense*, and numbers of the flowers I noted in my former paper. We next took a path leading through a copse of some size, and here we found *Hypericum perforatum*, *Epilobium hirsutum*, *E. parviflorum*, *E. montanum*, *Hippocrepis comosa*, *Rosa canina*, and *Listera ovata.* At Conkwell, as also in most localities through which we passed, we met with the pretty *Ornithogalum Pyrenaicum*, which though by no means a common flower, is very abundant in the neighbourhood of Bath, in fact I meet with it in nearly all my country rambles. By the time we had obtained the above specimens we had traversed a good deal of ground, though we fear that through ignorance of the locality, the best hunting ground (that beneath the Conkwell cottages) was left unexplored. On our way by the road through Winsley to the hospitable retreat of Furleigh Villa, we gathered *Centaurea nigra*, *Papaver dubium* and *P. Rhœas.*

We were not so fortunate in our ramble to Wick Rocks as we could have wished, owing to the lateness of the season. A variety of things had prevented our starting off till summer had given place to the decay and sadness of a late autumn morning.

Many of the plants whose names we give here have been found by various friends, but not by ourselves, for the reason above stated, and in our own case those plants which we did come across were in seed.

There are no doubt a very great many people living in the neighbourhood of Bath, who though they may have heard of Wick Rocks still have no idea how to get to them; for the benefit of such, then, I will describe what seems to be the easiest route either from Bath or Bristol. A rambler should take the train to Warmley, which is on the branch line of the Midland Railway from Mangotsfield to Bath. Warmley is a village with a population chiefly occupied in the coal mines there. On arriving at Warmley you take the road to the village of Wick, which is about two miles from Warmley. Juse after passing the church, you turn off down a lant to the left, and this takes you completely through the gorges to the very foot of the lake. In summer time we could well imagine that the scenery must be of a most picturesque nature. The rocks, like the more renowned Cheddar Cliffs, are of mountain limestone, but few rocks are visible, owing to the immense amount of foliage of all kinds which grows upon them, and on the slopes in each side of what may be termed the pass.

Following the road we have mentioned through the rocks, we come across *Tussilago Farfara.* Of course only the leaves of this plant were found, but it grows here in great abundance, so much so that large tracts are covered with it, most of the leaves were covered with *Coleosporium Tussilaginis*, the scars of *Æcidium Tussilaginis* being well marked. Here too we found many plants of *Arctium Lappa*, also some fine specimens of *Spiræa Ulmaria* still in full flower. Farther on we met with plants of *Viola canina*, and *V. odorata*, *Malva sylvestris*, *Agrimonia Eupatoria*, *Mercurialis perennis*, and *Stachys sylvatica.* Among other plants to be found on the rocks are:—*Clematis vitalba*, *Papaver dubium*, *Arabis hirsuta*, *Geranium columbinum*, *Hippocrepis comosa*, *Orobus tuberosus*, *Sedum telephium*, *S. album*; (at the top of the rocks) *Sherardia arvensis*, *Scabiosa succisa*, *Erigeron acris*, *Hieracium sylvaticum*, *Gentiana amarella*, *Digitalis purpurea*, and *Scrophularia nodosa.*

These latter plants, however, I did not find myself, with but one or two exceptions. The many fine specimens of Quercus, and *Pyrus aucuparia* are very striking features of the locality. The lake which I have before mentioned runs up between the rocks for some way, and serves to work the machinery of a mill at one end. I was indebted to a mill hand for a good view of this sheet of water, and he gave it as his opinion that the chasm in the limestone had been formed by "a hearthquake." The day chosen for this ramble turned out very wet; we were not sorry to wend our way back to Warmley and take the train for Bath, determined not to be so late next season in exploring the rocks, so that we may be enabled to give a more detailed account of what we ourselves really see there. Most of the plants found in the Wick district are different from those found in the Bath district, and this has been accounted for by the fact that while the new red sandstone and lias are found in the valleys of the district and the great oolite on the tops of the hills, at Wick the mountain limestone, coral rag, and old red sandstone formation appear in a nearly vertical position, through the horizontal strata of the sandstone and lias.

In conclusion let me say that if I shall have stimulated any reader to go over the various hunting grounds I have described, and he should find pleasure and instruction in his walks, I shall feel more than repaid for the pleasant task I have with this paper, at any rate for the present, finished.

CHARLES F. W. T. WILLIAMS.

LIST OF ASSISTING NATURALISTS.

[*Continued from p.* 182.]

SCOTLAND.

Berwick. Charles Stuart, M.D. Edin., Hillside, Chirnside, N.B. *Botany and Natural History of the County.*

Wick. James Grant, High Street. *Botany* of "Ultima Thule."

MICROSCOPY.

HOW TO MAKE ZOOPHYTE TROUGHS.—Perhaps the following will give some idea how easy and rapidly the zoophyte troughs I use are to make, and how quickly ready for use. Having brought home some weed from a stone in a running stream, I wished to examine it. Having no cistern at liberty I placed a piece in one I was using and saw diatoms. Wishing to ascertain if they came from the weed I made a fifth cistern in less time than it takes me to tell you how to do it, and had it under observation, looking on diatoms in number on the principle of the stars in the heaven and the sand on the sea shore. Materials: back, plate glass 3 inch × 2; sides and bottom, slips of glass $\frac{1}{4}$ inch wide, $\frac{1}{8}$ or $\frac{1}{16}$ (or $\frac{1}{4}$ if liked) thick; covers, thin glass 2 inch × $1\frac{1}{2}$; marine glue (soluble), obtained from any tool maker (Buck, Holborn Viaduct, 1*s.* per lb.); spirit lamp (mounting table recommended); dissecting needle. Directions: place the cover on the back in the middle touching the bottom; mark round its sides and bottom thus:

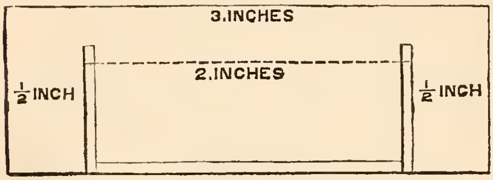

Fig. 164.—Outline of new Zoophyte Trough.

take the cover off, heat the back. Take a small piece of glue (size of pea, or smaller) on end of needle, heat in flame until it lights, then place on glass on line—so on until line is covered with glue $\frac{1}{8}$ inch wide. Heat back over flame, and with finger damp (not wet) press the glue until it sticks on back well. Take two strips of glass—length of sides of cover—again heat back; turn back over so that glue comes in contact with flame; when glue in a half-liquid state press the sides into it. Then cut a piece for the bottom and do the same; then clean interior. The sides and bottom are glued in the same way to receive the cover, and when the glue on the sides and bottom is in a half-liquid state, gently heat the cover, and gently press it on to the glue. *Note.*—You cannot heat the glue too often. It should be constantly placed in the flame and the back constantly heated during the operation (heat gently). It is ready for use *immediately.* Objects can be kept in these tanks for a long time, provided the water is not allowed to evaporate and a piece of weed placed in it. I have, in rather a large one, kept fleas and larvæ of gnats for over a month, fleas three months. I have seen some sold in shops, but none I like so well as my own, as they never leak.—*John Alex. Ollard.*

MICROSCOPICAL SOCIETY OF LIVERPOOL.—At the last meeting of this society a communication was read from Mr. G. E. Massee of Scarborough, on Myxomycetous Fungi. Mr. Massee has succeeded in growing spores of *Spumaria alba*, and found that threads of different kinds appear in two or three points of the surface of the spore. One kind is of a mycelioid character, the other consists of oval cells multiplying by gemmation until a torula-like chain is formed, which divides, becoming nucleated, each cell increasing rapidly in size and remaining as a resting spore for nearly a year, and not taking any Amœba-like form. After this some immature spumaria appeared in a pulpy homogeneous mass, in which were numerous bright specks, each being a focus round which the plasma formed naked cells of Amœboid character or Plasmodium. After three days all movement ceased, the cells assumed a spherical shape, bright nuclei appeared, and within twenty-four hours the cell wall was absorbed, and the mature spirulose spores set free. A paper was read by Mr. F. J. Paul, F.R.C.S., on "The Structure, Growth, and Development of Bone," in which the author gave a short sketch of the comparative anatomy of the skeleton, alluding to the supporting framework of the lowest forms of life, the calcareous and horny exoskeletons of intermediate forms, and the cartilaginous, dentinal, and osseous endoskeletons of the vertebrata. A minute description was given of the microscopical characters of bone, showing it to consist of layers of hardened fibres and bone-cells arranged in peculiar concentric circles, called Haversian systems. Blood-vessels occur at intervals, but the nourishing fluid was brought in intimate contact with the tissue by means of the bone-cells. Bone was classed as a connective tissue, and its origin was traced from the first appearance of this tissue in the embryo to the formation of membrane on one hand and cartilage on the other. Ossification in membrane and ossification in cartilage were then separately described. Following this was the process of growth, which varied in different bones. The paper was freely illustrated by diagrams and microscope specimens.

THE MICROSCOPICAL SOCIETY OF VICTORIA.—It is with much pleasure we welcome the appearance of the first three numbers of the "Journal" of this society. The members are evidently well aware of the wealth of new material by which they are surrounded. The present numbers contain the address of the president (Mr. T. S. Ralph), and excellent practical papers by Mr. F. Barnard, J. R. Y. Goldstein, and W. M. Bale; descriptions of new species of Polyzoa are given by C. M. Maplestone, J. R. Y. Goldstein (hon. sec.), and J. B. Wilson, and one on the Radula of Australian Mollusca, by J. E. Tenison-Woods. The illustrations of the latter papers are surprisingly good.

THE HIGHBURY MICROSCOPICAL AND SCIENTIFIC SOCIETY.—This Society has opened its fourth session with the Annual Soirée, held at Harecourt Hall on the 14th October, which was numerously attended; and many new and interesting objects and instruments were exhibited. On the 28th the president (Mr. Frederick Fitch, F.R.M.S.) read his annual address, giving a "History of the Microscope and Microscopic Research." Amongst the papers promised for the coming year, we notice "How a Plant grows," by Mr. Worsley-Benion, F.L.S.; "Corals," by the hon. sec. (Mr. B. H. Woodward); "Flints," by Mr. C. W. Blackman, &c. &c. Several excursions are as usual arranged to places in the neighbourhood of London.

THE DONCASTER MICROSCOPICAL SOCIETY.—We are glad to see, from the programme just issued for 1880–81, that this newly-formed society shows evidences of active life. Some very interesting papers are down for reading.

ZOOLOGY.

WHITE BEAKED DOLPHIN.— A fine young male specimen of the white-beaked dolphin (*Delphinus albirostris*) was caught in a net off the Bell Rock, east coast of Scotland, on the 7th of September last. The animal has been presented to the Kelvingrove Museum, Glasgow. This is the first record of its capture in Scotch seas.—*J. M. Campbell.*

PORBEAGLE.—A specimen of this shark (*Lamna cornubica*) was taken in a net off Blairmon in the Firth of Clyde on the 8th of October. It has been preserved, and is now in Kelvingrove Museum where also its mate (the male) found its way a few days afterwards, having been captured in the same place. —*J. M. C.*

LIMNÆA STAGNALIS, var. fragilis, in river Froom, Stapleton, Bristol.—I beg to inform you of an additional habitat of this variety, to those noted in Mr. Rimmer's recently published "Land and Freshwater Shells."—*Jas. W. Cundall.*

VAR. OF SUCCINEA ELEGANS.—A few months ago I took at Beverley several specimens of a white variety of *Succinea elegans.* I shall be glad of information respecting its occurrence in any other locality.

A PARASITE OF THE HONEY BEE.—Mr. Pettitt the well-known apiarian of this town, recently brought me a queen bee of the ordinary English variety—dead, and infested with a parasite. It appears to be the bee louse (*Braula cæca*) figured in Mr. Packards' paper on "Bee Parasites" in SCIENCE-GOSSIP for January, 1870. As described there it is neither a "louse" nor a "tick," but a wingless fly, belonging to the order Diptera, and allied to the so-called "sheeptick" (Malophagus). Mr. Pettitt tells me that in the course of his forty years' experience as a bee master, during which time hundreds of stacks both of English and Ligurian bees have passed through his hands, he has never seen it before; it would therefore appear not to be common. The most curious circumstance is that although the unfortunate queen had some thirty of these hungry little wretches on her, not one was to be seen on any of the workers of the same stock. The queen was perfectly fresh when brought me, and appeared to be in good condition. The stock was obtained from a farm a few miles from Dover. Can any of your readers say whether the parasites would be likely to cause the death of the queen—or whether their presence may be accepted as a proof that she was already diseased or weakly.—*Edward Horsnaill, Dover.*

THE NORFOLK AND NORWICH NATURALISTS' SOCIETY.—Part I of vol. iii. of the "Transactions" of this vigorous and practical society has just appeared. It contains the address of the president (Thos. Southwell, F.Z.S.), which turns upon the interesting subject of the extinction of animals by civilised man. The chief papers of the present part are the following:—"On Collecting Lepidoptera in Norfolk," by F. D. Wheeler, M.A. (hon. sec.); "On Hawking near Yarmouth," by Professor Newton; "Discovery of *Emys lutraria* in the Mundesley River-bed," by H. B. Woodward, F.G.S.; "Natural History Notes," by Frank Norgate; "Notes on Hawking as Formerly Practised in Norfolk," by J. E. Harting, F.L.S.; "On the Occurrence of the Deal Fish on the Norfolk Coast," by Thos. Southwell, F.Z.S. (president); "On the Abundance of the Pomatorhine and Smaller Skuas on the Norfolk Coast in October and November, 1879," by H. Stevenson, F.L.S. &c.

Luminous Insects.—Dr. J. L. Leconte's paper on "Lightning Bugs," read before the recent meeting of the American Association for the Advancement of Science, is reprinted in the September number of the "Canadian Entomologist." We commend it to our entomological readers as the clearest and most suggestive contribution we know on this interesting subject.

Leptodera hyalina.—In the November number of the "Midland Naturalist," Mr. John Boyd gives Lake Derwentwater as a new locality for this rare and beautiful entomostracan.

Eastbourne Natural History Society.—Under the title of "Additions to the Fauna and Flora of the Cuckmere District during the past year," Mr. F. C. S. Roper, F.L.S., gives a review of the work done by this society. The additions to the Fauna are as follows: Coleoptera, 47 species; Aphides, 27 species; to the Flora: Dicotyledons, 10 species; Monocotyledons, 2 species; Filices, 1 species; besides a list of varieties.

The Smithsonian Institution.—The Annual Report of this useful American Society for 1878 has recently appeared. In addition to the usual formal reports, it contains a "Biographical Memory of Joseph Henry," biographies of Condorcet, Louis Agassiz, papers on "Henry and the Telegraph," "The Effects of Irritation of a Polarised Nerve," "Ornithological Explorations of the Caribbee Islands," "Researches in Sound," &c.

BOTANY.

"Developed Primulas."—I suspect Mr. W. K. McGhie must refer to *Primula scotica* (Hook.) when he speaks of having collected "*Primula farinosa*" at "Holborn Head, near Thurso." So far as I am aware the latter species has never been found North of the Firth of Forth, its place being occupied by *P. scotica*, which my friend Dr. Johnstone informs me he saw in large quantity near Thurso a short time ago. As regards *P. farinosa* the sessile umbel seems to be very rare; in many hundreds of plants seen by me in Yorkshire this season I did not see one example. It seems to be rare also in our Scotch specimens.—*A. Craig Christie, Edinburgh.*

Flora of Deal, &c.—There is a very full and good list of the coast plants for Dover to Sandwich in Cowel's "Flora of Faversham."—My own experience is that Deal is very rich in rare plants. On the Sandhills I have gathered *Hippophae rhamnoides*, *Silene conica*, *Juncus acutus*, *Medicago minima*. On the shore from Deal to Walmer and Kingsdown, *Trifolium suffocatum*, *Trigonella ornithopodioides*, *Lathyrus maritimus*, *Crepis fœtida*. On the undercliff and shore beyond Kingsdown, *Orobanche amethystea*, *O. Picridis*, *Ophrys aranifera*, *Crambe maritima*, &c. I should be very much obliged to Mr. Habben for a specimen of *Astragalus hypoglottis* from the sandhills. —*A. Bennett.*

A new British Carex.—At first, sparingly in July, later more abundantly in August, I observed a species of sedge exceedingly graceful in appearance, growing in tufts in deep shade, out of crannies of the old moss-grown sandstones at Plumpton Rocks near Knaresborough. At first, from its narrow deep green leaves as long as its flowering stem, from its interrupted spike with oval spikelets, its pointed dark glumes and its remarkably developed leafy bract, I thought it the variety *nemorosa* (Lumnitz) of *Carex muricata*. Not feeling satisfied, however, I sent examples to Mr. H. C. Watson. He pronounced them at first *C. polyrhiza* (Hoppe), but expressed doubt. Specimens went from him to Kew Herbarium, where Mr. Baller (I believe) detected their affinity rather with *C. pilulifera*, but diverging so distinctly from that type, having such long bracts, a straight not arcuate rachis, and not a couple of round pill-like female spikelets, that Mr. Watson wrote me the plant was new, and quite sufficiently distinct to merit a varietal if not a specific name. I have therefore bestowed upon my sedge of shady rocks the name of *C. Saxumbra*. I hope soon to describe and figure it.—*F. A. L.*

A Dictionary of Plant Names.—We have received the second part of this highly useful and important work, compiled by Messrs. James Britten, F.L.S., and Robert Holland, and published by Trübner & Co., for the Early English Text Society. As we remarked when called upon to notice the first part, the authors are the only men we know of (who are good botanists) capable of carrying out such a difficult and pains-requiring work as the present. They are doing their work well, as the abundant references to every common plant-name sufficiently indicates. And they are doing the work just in time, for in the course of a few years most, if not all, of our ancient plant-names and their folk-lore will have become extinct. The present part extends from "Fuzz" to "Ozier." No botanical library should be without this work.

Hawthorn Bloom.—R. W., in August number of Science-Gossip, asks if any of your readers have observed the scarcity of the hawthorn bloom of which he speaks. I am sorry to say that in this, the central part of the county Fermanagh, our experience has been exactly similar to his. The entire absence of bloom on the hawthorn hedges and trees, usually well covered, has this year been the subject of general remark, and many inferences as to the expected mildness of the coming winter have been drawn in consequence.—*J. H. H.*

GEOLOGY.

Sargodon Tomicus.—We have received some beautiful sections of the teeth of this fossil fish from Mr. Thomas D. Russell, 48 Essex Street, Strand. The fossil teeth from which these interesting sections are made are obtained from a bone breccia or conglomerate in a group of rocks known as the Penarth Beds, a term employed by the English Geological Survey to designate the passage beds that lie between the Trias and Lias, from their typical development at Penarth in Glamorganshire; the series are also known as the Rhætic beds, St. Cassian beds, and Zone of *Avicula contorta*. These strata are but sparingly represented in Great Britain, in the typical district the entire thickness is one hundred feet, whereas in the Rhætian Alps bounding the northern plain of Lombardy they attain a thickness of over three thousand feet. The breccia or conglomerate is of inconsiderable thickness, rarely exceeding one inch. It consists of pebbles and subangular fragments of quartz, and is exceedingly rich in disintegrated fish remains. The forms in which the teeth of this genus occur are so varied that it is not surprising that they were originally considered to have belonged to distinct families, and it was not until a comparatively recent date they were supposed to belong to one species only; the microscope has however satisfactorily decided the question, definitive identity of structure being exhibited notwithstanding the diversity of external forms. The teeth originally known as *Sargodon Tomicus* may be described as chisel or wedge-shaped, while associated with them were other forms which were referred to the genus Sphærodus; an examination of a large number disclosed the fact that by almost imperceptible gradations they passed from the original known form to bulbous, hemispherical, and subangular, while the proportion they bore to each other appeared to elucidate the obscurity thus apparently set up. The inference is that the chisel-shaped teeth occupied the fore part of the mouth and were used for cropping the algæ on which it is supposed the creature fed, while the other forms covered the interior of the mouth like an enamelled pavement, and were employed in crushing the food; at the present time there exists a fish in the rivers of British Guiana possessing similar characteristics. It is impossible to convey an adequate idea of the beautiful structure of the fossil teeth; they must be seen to do justice to them. They possess the advantage of being equally good objects with ordinary or polarised light; when the latter means of illumination is adopted, the large quantity of ganoine or transparent enamel produces a most pleasing effect; while with the former means the calcigerous tubules forming the centre and ramifying towards the exterior of the tooth are exceedingly interesting.

Notes on Scottish Carboniferous Microzoa and the methods by which they may be collected and mounted.—Mr. John Young, F.G.S., has contributed a capital paper on this subject to the Edinburgh Geological Society, which cannot fail to lead microscopists to investigate the almost unknown field of the Carboniferous microzoa, to be obtained from the soft, weathered, fossiliferous shales which alternate with the Limestone strata.

Fossil Snakes.—Dr. Sauvage is said to have discovered the remains of a reptile allied to serpents in the upper Greensand formation of Charente. Hitherto fossil serpents have not been met with in strata older than the Eocene. The above reptile is stated to be quite a new form.

NOTES AND QUERIES.

Commensalism.—On the 3rd of September last, while sitting in a field at Wick, near Christchurch, Hants, I observed a water-wagtail following the nose of a grazing pony most closely, nothing daunted by its munching and moving; the farmer with whom I was in company remarked he had often noticed the same thing, but had never discovered the reason why. In a few moments we both saw the bird fly up, and unmistakably help himself to a fly from the pony's forehead. This action was repeated, and we afterwards saw the water-wagtail following the snout of pigs, with evidently the same design. Such mutual accommodation was very pleasant to witness.—*A. B.*

Sphinx Ligustri.—I can say in answer to G. W. C.'s question on p. 236, that I have a *Sphinx Ligustri* which was in the pupal state for two winters: it is much smaller than usual, viz. $3\frac{1}{8}''$ only from tip to tip of wings and a very pale colour, otherwise as other specimens.—*Henry Ward.*

Can a Parrot reason?—From observations of mine, a grey, brought to me by a friend, young, from West Coast, Africa, I should certainly say, yes, to a small extent. A favourite expression of mine is, "Ask for it," but it does not utter the words till it sees food on the table. It may be in the room all day, see the table cloth spread, but until we sit down to eat, Polly is quiet, and then the bird will "Ask for it!" "Ask for it!" until it gets something. The most curious coincidency of speech at least sometimes occur. A medical gentleman and myself were looking at and talking about some geological specimens, when Polly, previously silent, called out "That's a beauty!" The Dr. remarked, "Why that bird seems to know what it says." Another day a friend was deploring the revelations connected with a recent divorce case when Polly exclaimed "Shocking, shocking, that's shocking!" In both of these cases I cannot but think that though Polly did not understand what was being said, yet it did appreciate something in the tone and manner of the speakers with "beauty" and "shocking." If it hears us call our servant, Kate! Kate! the parrot will almost invariably call out "Yes, sir!" mentally associating the girl's name which it does not repeat, with her reply, which it imitates in "yes, sir!" as it never utters those words unless in association with her name. Once while a number of friends were singing grace before meat, the parrot whistled in harmony with the tune, and then apparently knowing that it was time for supper, immediately began its "Ask for it;" and once at family worship while only one voice was speaking Polly suddenly called out "stop, short!" which good advice perhaps I had better follow.—*William Budden, Ipswich.*

Sheet Lightning is supposed to be produced in the cloud itself illuminating the whole mass, and to be formed of brush discharges between clouds, while zigzag lightning is a true electrical discharge between the clouds and the earth. Brush discharges, analogous to sheet lightning, may be seen on the projecting parts of the conductors of a machine worked in the dark. The reason that "fork lightning" takes a zigzag direction is supposed to be due to the increasing resistance of the atmosphere as the spark proceeds, so that having got to one point of its course, the resistance is so great that it follows the path of least resistance, which is a path lying to one side of its previous course.—*Walter G. Woollcombe.*

Sheet Lightning.—The common explanation of sheet lightning, that it is the reflection of forked lightning, has misled C. B. by his naturally supposing the word reflection to mean reflection as in a mirror. This term reflection is a misnomer. The generally received theory of sheet lightning is that it is the illumination of the clouds, &c., by a rapid, a vivid flash of forked lightning which has not acted strongly enough upon our retinas to produce a visible image of the fork; so that, the only intimation we receive of the flash is the image on our retinas of the momentarily illuminated cloudscape.—*Edward B. Parfitt.*

Dragon-fly.—The description given by your correspondent J. A. Wheldon of the dragon-fly he caught is very indefinite, and is hardly sufficient to enable one to identify the species. It may perhaps belong to the genus of slender-bodied dragon-flies Agrion. In *A. minium*, for example, the predominating colour is a beautiful vermilion-red, but on the thorax are conspicuous streaks of yellow; the "stigma" (or the thickened portion of that strong nervine which runs along the upper part of the wing) is in both pairs clearly rhomboidal in shape.—*C. Francis Young.*

Dragon-flies.—Since capturing the dragon-fly mentioned in the last Science-Gossip, I have seen several more like it. They appear to be pretty numerous here, which goes a considerable way to disprove the supposition of H. E. Watney, that they have been accidentally introduced. I saw several pairs in cop. but am uncertain as to whether both, or only one were possessed of a scarlet coat. The body of the one I caught has since faded, but the spots in the corners of the wings are as bright as ever. I intend restoring the colour of the body with paint.—*J. A. Wheldon.*

Preservation of Fungi.—I should feel very much obliged if any of your correspondents could inform me of any good plan of drying, or otherwise preserving fungi for the herbarium. Is it possible to dry such species as *Agaricus procerus*, *Coprinus comatus*, &c., so as to make decent and recognisable herbarium specimens?—*J. A. Wheldon.*

Spider-killing Wasps.—I was very much interested with the letter on South African "spider-killing wasps" which appeared in the September number of Science-Gossip. At Heidelberg this year, I saw a hymenopterous insect dragging a dead or stupefied spider along a bank in one of the woods, but unfortunately I frightened it away, so I could neither observe what it was going to do nor preserve it for future identification. From the situation, however, I think its nest would be subterranean. Can you, or any of your readers, give me the name of the European or African or any other hymenopterous insect-killing spiders? A great many predacious Hymenoptera were observed by M. Fabre at Orange (near Avignon), and are described by him in a most charming little book called "Souvenirs Entomologiques" (Paris, Librairie Delagrave, 15 Rue Soufflot, 1879, price not more than four francs), a book which has received a good deal of notice among foreign entomologists. But no spider-killing Hymenoptera are mentioned in this work, although the habits of two species of Cerceris and three of Sphex are described minutely. These insects in paralysing their prey act as if they had a perfect knowledge of their anatomy, they insert their stings into the centres of the nervous systems of their prey in a most scientific manner. The Cerceris kills beetles in which the nervous centres are collected nearly at one point and stings them once; for a similar reason, one kind of Sphex stings grasshoppers three times. And yet we cannot believe these Hymenoptera know why they do so, as the Sphex will, if its grasshoppers are removed from the nest, cover it up as carefully as if it contained grasshoppers and eggs, although doing so is perfectly useless. Such cleverness on one hand and stupidity on the other prevent our attributing these acts to reason, it must be instinct. With other Hymenoptera M. Fabre has proved it to be the same. Observe them under ordinary circumstances and you will be astounded at their wisdom. Observe them under artificial conditions, and they will go through the same routine as before, although it may be highly inconvenient. They have learnt the part they must play in the world by heart, and can only go through it in one way! The Bembex fearlessly attacks and kills large Tabanidæ, and yet it is terrified by a little dipterous insect which it could at once destroy. The latter lays its eggs on the food the Bembex is taking to its larva, and the larva, of this intruder eats the food of the Bembex larva leaving the latter to starve. The wasp mentioned by your correspondent as capturing caterpillars is probably a species of Ammophila or sand wasp, and her observations agree exactly with those of M. Fabre. This subject is a very interesting one, and further observations would no doubt reveal many new and curious facts.—*G. H. Bryan.*

Preserving Crustacea.—I have set up several small crabs and other crustaceans, after the manner described by Mr. Lovett in the April number of Science-Gossip, and find to answer excellently. One operation, not mentioned by him, I find very advantageous, viz. a wash of corrosive sublimate and spirits of wine, applied internally and outside.—*J. A. Wheldon.*

Scarcity of Bee Orchis, &c.—I can quite bear out J. S.'s experience with *Ophrys apifera* this season. I had promised to procure a friend living specimens, having no doubt of my ability to obtain them, but though, with other friends, I made a careful search in the former habitat of the plant and found chlora as usual, we could not see a specimen of its companion. I should be glad to hear other correspondents' experience, and to know to what causes they consider the scarcity of the plant may be referred.—*R. F. Towndrow.*

SCARCITY OF BEE ORCHIS, &c.—Like your correspondent J. S. in SCIENCE-GOSSIP for November, I have noticed the scarcity of *Ophrys apifera* this season, not having once seen it in three of the chalk districts of Surrey. On the 30th of June last year I found it on one of the slopes of Box Hill facing the Brighton Railway, and, at the same time, *Aceras anthropophora*, but neither was in abundance. The former had then only just commenced to flower; concluding therefore that I was too early in the season to see it in perfection, I this year visited the same locality on the 31st of July, but was surprised and disappointed at not being able to discover a trace of either plant. I also searched other parts of the hill without success, but in several places saw *Chlora perfoliata* in profusion. During the last two years I have taken occasional botanical excursions to Box Hill, and when I have seen *Ophrys apifera* it was not associated with *Chlora perfoliata* as referred to by a former correspondent. My opportunities for observation are too few to enable me to form an opinion as to the cause of the scarcity of the Orchidaceæ mentioned above, but I hope some of your correspondents may be able to answer the inquiry of J. S. on this point. We all know that there are good years, and unfortunately bad ones also, for the more necessary fruits of the earth, and the same seems to be the case with wild flowers. In the neighbourhood from which I write, I remark each year that some of even the commonest plants do not appear in their usual abundance; for example, in 1879, *Lamium album*, though by no means scarce, yet had to be sought for if wanted in flower, whereas this year it thrusts itself upon one's observation along every roadside all through the season.—*S. Tait.*

WASPS AND SILK-WORMS.—In answer to S. B., I write to say that I once had a tray full of silk-worms, attacked by a number of wasps. They were all stung to death, and many of them partially devoured. The silk-worms were full grown, and just about to spin. It struck me as a very extraordinary event.—*L. H.*

MOUNTING MOSSES.—I have found the following method of mounting the capsules of mosses for the microscope to answer very well for low powers. I take a small pill-box (the sizes known by chemists as one drachm and half drachm are the best) and cut it down to the required depth. It is then to be blackened thoroughly inside, and fastened securely to a glass slide with diamond cement. Thin wood slides would answer as well. In the bottom of the box I fasten a capsule in an upright position, to show the peristome *in situ*; and around it I arrange the calyptra, operculum, and a portion of the seta. The name may be written on the lid, with the locality and date.—*J. A. Wheldon.*

BLOTCHED FERNS.—When moisture remains on the fronds of ferns in a strong light they readily become blotched with white. I find, however, that in a well-shaded house with the moisture sponged off some such as *Lomaria chilensis* and *Lastrea hispida* become so. Can any of your correspondents satisfactorily account for this?—*C. H. G.*

SECTIONS OF FOSSILS.—Can you, or any of your correspondents, give me any information as to the best way of making sections of fossils? In the case of an ammonite for instance it is a wasteful proceeding to "rub down" one half in order to get a good section showing internal structure. Lapidary's charges are too high to be frequently incurred by —*Fossil-hunter.*

ANAGALLIS CÆRULEA.—I found the blue pimpernel in my garden at Pembroke Dockyard in 1876–7, and also in 1879 at Blackheath in a garden, but I have never seen it elsewhere.—*R. Hamilton, Rear Admiral, Queenstown.*

AVERAGE DURATION OF LEPIDOPTERA, &c.—Will some one kindly inform me of the average duration of life of Lepidoptera and Coleoptera? Do nocturnal fliers (Lepidoptera) in general live longer than the diurnal?—*Henry C. Wilkie.*

AGE OF COCKATOO.—Can any of your readers inform me of a certain method of telling the age of a cockatoo?—*H. C. Wilkie.*

BORAGE (BORAGO)—Has been cultivated for ages in this country. It has become naturalised and it may be found now and for the last "forty years" growing wild on waste ground. It came originally from the Levant.—*H. E. Watney.*

THE ST. MARY, LAMBETH, FIELD CLUB intend holding their annual soirée at St. Philip's Schools, Kennington Road, on Monday the 3rd of January next, when we have no doubt the members of other London clubs would be welcome.

SEA ANEMONES, &c.—The pair of shrimp-like animals described by "Minnie" (p. 236) inside an anemone were probably some of the sessile-eyed crustacea (such as *Idotea tricuspidata*, &c.), which are frequently found clasped together among tufts of seaweed between tide-levels. The fact of their being found alive in the position described would strongly tend to prove (what has been denied) that anemones do not or cannot in any degree paralyse other animals. Anemones have a certain stinging power; but many naturalists deny that they possess poison vesicles, or that the little elliptical capsules wherewith their skin or tentacle is furnished are endowed with any function of urtication or prehension.—*P. Q. K.*

LAPWING (*Vanellus cristatus*).—The eggs are of a deep oil-green colour, blotched and irregularly marked with brownish-black. When repeatedly robbed of its eggs the bird continues laying until exhausted nature can no longer produce the strong eggs in natural colours. Your correspondent's description of the eggs is good, and proves the weakness of the bird; he says the eggs are of a pale milky-blue tint, not exactly white and but one degree removed from soft eggs, *i.e.* eggs laid before a membrane is strengthened by a shell; in short they are an abortion, and this is the true cause of the peculiar colours described. For twenty years I have had lapwing eggs in my cabinet bearing the description given by R. Standen, and got them in the same way as he did; my dealer became bankrupt, he disappeared; and I was glad when he was out of sight. Last year I sent on a few such eggs to one of your correspondents; he wrote back saying that I must have made a mistake and sent rare valuable eggs, and he honestly wanted to return them.—*James G. Coutts, Glasgow.*

CIRL BUNTING, &c.—I believe the cirl bunting is considered as only an accidental summer visitor to this country. I have seen several in winter in this locality (N. Hants) and one in the summer 1877, drinking at a pond. Another bird which ornithologists consider as only a summer visitor is the yellow-wagtail, but in the severe winter of 1878, I saw one searching for insects along the bank of a frozen stream.—*G. Dewar.*

Birds and Arum Berries.—I have seen it stated that birds eat these berries, and that pheasants are partial to the roots of the water robin, but although the plant was very plentiful in the sedges of a field adjoining the house I was staying at last year, and I watched most carefully, I never could see any bird eating the berries.—*H. E. Watney.*

Sudden Death of Swine.—Can any of the readers of Science-Gossip explain the following fact which unexpectedly occurred some days ago in a farm near here? Seven valuable swine died in less than two hours after their morning meal. The latter was composed in part, as usual, of uncooked lettuce, cabbages, potatoes, &c. The animals had never been sick with that; the potatoes were more or less rotten. I have seen many of the latter covered by fungi growing on. Can the fungi cause a sudden death? What is the species of fungi which bring forth so violent effects?—I can only state that among the fungi there was a great diversity of colour, red, roseate, green, blackish, &c.—*Fr. M., Morbihan, France.*

Query about Books.—I should feel greatly obliged if some of your readers would advise me as to what good reliable books there are on the following subjects of both an elementary and an advanced character, and, if possible, giving the authors, publishers, date of publication, and the prices:—1. General Biology, taking in the whole of the animal kingdom; Huxley and Martin's is too practical for my use. 2. Vegetable Anatomy and Physiology. 3. Protozoans. 4. Lepidoptera; 5. Hymenoptera; 6. Coleoptera; 7. Arachnida—of the Insecta. 8. Land and Freshwater shells. 9. Diatomaceæ; 10. Confervaceæ—of the Algales. 11. Fungi. 12. Lichens. 13. Mosses. 14. Microscopical work. I only want the most recent of them.—*W. G. Woollcombe, Trinity College, Oxford.*

Collecting Vertebrates.—I am forming a collection of British Vertebrates, and should be glad of any information on the subject. What gun is used for smaller birds, and where could I get one? What books are there on preserving and procuring specimens?—*W. G. Woollcombe.*

Notes on Ravens.—Ravens are now never seen in this neighbourhood, though they are said to have been quite numerous about thirty years ago. I have frequently heard that they disappeared at the outbreak of the Crimean war (having presumably gone to assist at the obsequies of the slain in that conflict), and popular tradition also assigns the date of their first appearance in the country to the time of the Irish rebellion; but why they remained in Ireland during the Peninsular and other wars, when they might have employed themselves abroad, is a question nobody attempts to solve. Have any of the readers of Science-Gossip heard anything of a like nature about the raven?—*James H. Henderson, Lisbellaw.*

Notes on Silk-worms.—In the July number, on page 166, Mr. F. M. Habben writes about the larvæ of silk-worms scrambling off the leaves to white paper when the former are placed on the paper, ending his notice by stating that "even these humble worms prefer light to darkness." It may interest that gentleman and others perhaps to know that other varieties of silk-worms show the same preference. As manager and proprietor of the "Wild Silk Agency" of this place, I have hundreds and thousands of Tussur, Atlas, and Cricula, breeding; and at one time my assistant used to place white discs of paper on the mouths of jars on which artificial hedges are raised for feeding. In a short time after the papers were placed the worms would crawl down to the paper and remain on it. I would also mention that I have noticed the tussur worms when first hatched turn round and insert their minute black heads into the broken shell of the egg and bite at the rugged edges. What do they do? The wormlings, if I may so term them, do not eat for twenty-four hours and more; do they derive any nourishment from the egg shells? Another thing, does the tussur worm devour its cast-off skin in the early and later stages of its existence. It has been remarked by all of us that very rarely is a dead skin picked up. The last batch of 250 hatched have now approached the fourth stage, and yet all this time we have failed to find more than three dead at least cast-off skins. Perhaps some of your readers will be able to throw some light on these points. In continuation of my communication of the above notes (despatched last mail), and with reference to the inquiry in its last paragraph regarding the devouring of their cast-off skins by tussur worms, I beg to inclose herein two specimens of such skins which have been partially devoured by worms after completion of moulting. Examination under a microscope will show, I dare say, marks of the nibbling. The worms were carefully watched, and we have found that all do not eat off the skins, and then of those who do so it is not always the whole that is consumed. Some moult, looking upwards; others with their heads hanging down. The latter as a rule moult very much more readily, and more frequently turn round, hold the rejected skin with their claw-like fore-feet, and nibble away at it. If the skin is by accident dropped, the worm does not go after it, but remains stationary for a long time, after which it begins feeding on leaves. The *Cricula trifenestra*, another cocoon-spinner, has also some interesting habits of which I hope to send information shortly. It would be interesting to know what produces the varieties of tussur; for there are no less than four or five in my collection just now—one species, a dull white, small cocoon; another a dark grey, very large; another a yellow one; a fourth, a silky grey, another a pure white. How come these varieties, and are these varieties of the Atlas and other wild silk spinners?—*R. A. Manuel, Rangoon.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip a week earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 9th of the previous month.

To Anonymous Querists.—We receive so many queries which do not bear the writers' names that we are forced to adhere to our rule of not noticing them.

To Dealers and others.—We are always glad to treat dealers in natural history objects on the same fair and general ground as amateurs, in so far as the "exchanges" offered are fair exchanges. But it is evident that, when their offers are simply disguised advertisements, for the purpose of evading the cost of advertising, an advantage is taken of our *gratuitous* insertion of "exchanges" which cannot be tolerated.

H. C. Waddell.—We should think the insects you mention are not "sheep-ticks" at all, for their habits are nothing like those you describe, but "harvest-bugs" *(Leptus autumnalis)*. See Science-Gossip, vol. for 1877, page 228, for description and illustration (magnified) of latter.

Edward Lovett.—Accept our best thanks for slide of young of pipe-fish. It is an excellent and interesting mount.

G. T. Harris.—You will find full instructions as to the preservation, &c., of fungi in Mr. Worthington Smith's chapter in "Notes on Collecting and Preserving."

E. Wagstaff.—Your "excrescences" on back of oak-leaf are "oak-spangle galls," formed by an insect. See "Half Hours in the Green Lanes," page 197, for figures and descriptions of the same.

W. D.—You cannot do better than procure the sixpenny monthly parts (now issuing) of Kirby's "European Butterflies and Moths." For tropical insects get Drury's "Exotic Entomology" (3 vols.), or Westwood's "Oriental Entomology." Perhaps Mr. J. G. Wood's "Insects Abroad" would answer your purpose.

G. H. Guest.—The two birds are quite different. The ornithological name of the crow is *Corvus corona*; that of the rook, *Corvus frugilegus*.

L. M. B.—Some of your objects found in pond water are species of diatoms, but we cannot tell which from the drawings sent. The moving object was some species of Amœba. No. 1 appears to consist of Cocconema and No. 2 of Pinnularia.

G. C. Churchill.—We are considering your valuable suggestion as to placing the members of the Science-Gossip Botanical Exchange Club with the Silesian Botanical Exchange Club.

B. J. W.—Your tank is evidently full of Oscillatoria judging from your rough sketch. We know of no plan for getting rid of them except cleaning out the vessel.

W. E. (Brighton).—Your excellently mounted specimens were as follows: No. 1, *Gentiana campestris* (L.); No. 2, *Phyteuma orbiculare* (L.); No. 3, *Jasione montana*; No. 4, *Scabiosa columbaria* (L.) You will find them fully described, under the above names, in Babington's "Botany."

R. H. (Queenstown).—It is a species of Maurandia, probably *M. antirrhiniflora*, a Mexican plant.

H. Berney.—We are sorry to be obliged to pass over your question. Put it to the editor of the "Antiquary." We only deal with natural history subjects, not with coins.

R. Verrill.—The "American Monthly Microscopical Journal" is published by Thompson & Moreau, New York; price 5*s.* per annum for Great Britain. The address of the "American Journal of Microscopy" is P. O. Box, 2852, New York. The subscription is one dollar a year.

Hugh Richardson.—The fern is *Polystichum aculeatum*. The cluster of little ferns show that it is a proliferous variety.

J. H. Henderson.—Your variety of *Blechnum spicant* is termed *multifidum*. It is not of common occurrence.

R. W. Brierley.—You had better consult the Curator of the Sheffield Museum as to your collection of shells.

John Lambert.—Thanks for the slide. Your note on *Trichodectes subrostratus* stands over to our next number.

G. F. L.—We only know of the Geologists' Association (which holds its meetings at University College, Gower Street). This useful society has excursions to various places of geological note near London, and others of longer duration to localities further afield. Write to the hon. sec.

A. G. Wright (Newmarket).—Your specimen No. 1 is too small to decide what it really is. No. 2 is a pebble of Mica schist. Write to the authorities of the Geological Dept., British Museum, about your bones; and to the secretary of the Numismatical Society about your Roman coins.

C. F.—Dr. Cooke's "Fern-book for Everybody," published by Warne & Co., price 1*s.*, is one of the best popular works we know on this subject. Smith's "Ferns, British and Foreign," price 7*s.* 6*d.*, published by D. Bogue, 3 St. Martin's Place, Trafalgar Square, is full of illustrations, and is the completest work of its kind yet issued.

W. H. G. would feel obliged if some correspondent would let him know if there is any published account (and where) of the Land and Freshwater Mollusca of the County of Middlesex.

W. Penn.—Your specimens are the leaves of the Wood Betony (*Stachys Betonica*, Sm.).

T. B.—Thanks for your valuable hint.

J. Sinel.—Your Coralline is *Sertularia operculata*. The "little ovate bodies" on it are reproductive capsules.

J. J. Morgan.—Your specimen tube of gutta percha (with contents) arrived safely. Accept our thanks for it. Your note was too late for insertion this month.

EXCHANGES.

Side-blown eggs of grasshopper, warbler, sedge warbler, curlew, O. catcher, redshank, dunlin, lesser tern, Arctic tern, wild duck, &c., for other side-blown eggs. Unaccepted offers not answered.—Tom Duckworth, 58 Scotch Street, Carlisle.

Wanted to exchange Barbadoes chalk from Cambridge Estate for any of the following plants: *Erica cinerea*, *E. mediterranea*, *E. vagans*, *E. tetralix*, *E. ciliaris*, *Orchis morio*, *Aceras anthropophora*, *Ophrys aranifera*, *O. muscifera*.—R. B. Lindsay, St. Ann's Terrace, Stamford Hill, N.

Lepidoptera in exchange for larvæ and living pupæ and preserved larvæ.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

Twenty 6*d.* numbers of Kirby's "European Butterflies and Moths," Cassell, &c., in exchange for first-class slides; also two valuable old engravings, after R. Westall, R.A., size 28 × 21, exchange for best ground-edged slips.—E. Edwards, St. John's Cottages, Penge, S.E.

Monocular microscope, by Harris & Sons, Museum Street, three objectives $\frac{3}{4}$, $\frac{1}{4}$, $\frac{1}{8}$, condenser, living-box, &c., in handsome mahogany case, cost £8. Wanted geological specimens, especially bronze and flint implements.—Scott White, 99 Waterloo Crescent, Nottingham.

Duplicates: *Paphia*, *sibylla*, *blandina*, *miniata*, *quadra*, *meliloti*, *bidentata*, *plumaria*, *blandiata*, *tristata*, *russata*, *plagiata*, *perochracella*, *radiatella*, *bicostella*. Desiderata: British Lepidoptera, and Neuroptera.—Jas. J. King, 207 Sauchiehall Street, Glasgow.

Mounted and unmounted micro-fungi, about twenty-five varieties, and gorgonia spicules, for other fungi, picked diatoms, or pure gatherings of them.—P. Z., Lilly Villa, Victoria Park, Manchester.

Crustacea.—*Thia polita*, *Lithodes arcticus*, *Axius*, *Polybius Henslowii*, and many others, prepared for the cabinet, offered for species not in collection, either prepared or in a fresh or living state. Northern specimens more particularly desired, and correspondence on this subject wanted.—John T. Carrington, F.L.S., Royal Aquarium, Westminster, London, S.W.; or, E. Lovett, Holly Mount, Croydon.

Wanted, one or two specimens of fossil crustacea; a good exchange in fluid slides of ova, or in specimens of various kinds.—E. Lovett, Holly Mount, Croydon.

Wanted to exchange British birds' eggs, for others not in collection: kestrel, razor-bill, green plover, landrail, rook, starling, blackbird, song-thrush, lesser white throat, and wren.—R. Bell, 15 Dundee Street, Belfast.

Polarising objects, crystals of the alkaloids, and others, beautifully mounted, ground edge slips, blue and white rings, in exchange for other good mounted objects; also microscopic fungi wanted; slides given in exchange.—A. Smith, The Laboratory, Essex Road, Islington, London.

Offered.—*Pisidium pusillum*, *P. fontinale*, and *P. fontinale* var. *cinerea*. Also mounted or unmounted odontophores of several species of land shells. Wanted, good named varieties of British shells.—J. D. Burterell, 2 St. John Street, Beverley.

Collection of over 200 coins, including 40 old British and Irish, and a few silver. Wanted, British birds' eggs, or offers.—R. McAldowie, 82 Bonaccord St., Aberdeen.

A quantity of British seaweed for exchange. What offers?—Edward Oliver, 46 Mildmay Grove, London, N.

Some rare eggs side-blown, and otherwise, to exchange for others not in collection. Also a splendid boar's tusk from the red Crag. What offers in eggs, &c.? Also a good achromatic microscope 1 and 2-inch powers, live box, trough, &c., and several accessories for mounting, for eggs or cash.—Sidney E. W. Duvall, 4 Butter Market, Ipswich, Suffolk.

Wanted, a material cleansed of crustaceans, entomostraca, mollusca, and hymenoptera, for mounting, in exchange for snake skins; purchase preferred to exchange.—T. S. Morten, 40 Haverstock Hill, London, N.W.

Wanted, an excellent student's microscope. Will give in exchange first-class books (new) including Sowerby's "British Wild Flowers" £3 3*s.*, Smiles' "Lives of Edward and Dick," &c. Apply for particulars, with description and original cost of instrument, to Frank O. Taylor, 5 Affleck Place, Aberdeen.

Wanted, Science-Gossip Nos. 170, 171, 172, 173, 174, 175, 178, 179, or any of them, for Nos. 176, 177, 180, 181, 182, 183, 190.—B. Hobson, Tapton Elms, Sheffield.

Twelve varieties of beautiful seeds (not the common species of the florists' shops) in exchange for interesting material or slides.—M. Medhurst, 2a Dell Street, Holt Road, Liverpool.

Eggs of cormorant, curlew, C. snipe, red grouse, king ousel, &c., for other British birds' eggs. Some chipped flints, small collection of land and freshwater shells. What offers?—Jas. Ingleby, Eaveston, Ripon.

A large cylinder electrical machine for induction coil, or anything useful.—F. Howorth, Rose Bank, Heaton Moor, Stockport.

Good shower-bath in exchange for valuable foreign shells, or open to offers.—Miss F. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

Micro-chemical preparations: salicine, murexide, hippuric acid, narcotine, brucia, and many others, to exchange; all beautiful polariscopic objects. Wanted fossils, minerals, or other micro-slides (not botanical).—A. H. Scott-White, 99 Waterloo Crescent, Nottingham.

Good binocular field glass, leather sling case, also cycloscope, for micro apparatus, or books.—"Naturalist," W. Jones, Grocer, Church Street, Welshpool.

Duplicates—Machaon, galathea, edusa, semele, paniscus, salicis, taminata. Exchange for this year's cratægi, sinapis, hyale, betulæ, pruni, sibylla, *C. album*.—Alfred Jones, jun., Cambridge.

L. C. 1877.—A variety of duplicates. Lists exchanged.—Rev. H. H. Slater, Sharow Cottage, Ripon.

FIRST-class anatomical and pathological sections, or mounted slides, in exchange for "bone sections."—Henry Vial, Crediton.

DIATOMS in situ *(Isthmia enervis)*, beautifully mounted, red and white rings on ground edge slides. Exchange for good mounted objects.—A. Smith, The Laboratory, Essex Road, London.

FOR slide of hop mould send other slide of interest to John Boggust, junior, Alton, Hants.

WELL-MOUNTED slides of Diatomacea from genuine Peruvian guano, in exchange for other good slides. Send lists to W. Hamilton Reid, Eaglescliffe, Yarm-on-Tees.

WANTED, L. C. B. Mosses. Nos. 2, 5, 6, 7, 8, 10, 12, 15, 57, 58, 148, 149, 150, 171, 178, 179, 225, 233, 275, 276, 277, 357, 358, 367, 368, 397, 425, 476, 477, 553, 554, 559.—J. A. Wheldon, 9 South Street, Scarborough.

FOSSILS and recent Foraminifera, mounted and named, offered for similar objects or other scientific exchange by E. Wilson, 18 Low Pavement, Nottingham.

WANTED, L. C. 7th ed. 600, 826, 1028, 1177c, 1186, 1187, 1188, 1221, 1243, 1369. Send lists of desiderata required.—F. H. Arnold, Emsworth.

WANTED, Huxley's "Anatomy of Invertebrates"; Gegenbaur's "Elements of Comparative Anatomy" (F. J. Bell's translation), and Nicholson's "Manual of Zoology" (5th edit.). Secondhand, in fair condition.—Fredk. James, Museum, Maidstone.

SEVERAL surplus pieces of carboniferous shale, containing numerous specimens of the bivalve *Anthracomya Phillipsii*. What offers?—A. Woodward, Whitfield Mount, Upton, Macclesfield.

LARGE binocular microscope, with latest improvements, polariscope, &c., value ten guineas. Exchange astronomical telescope.—S., 364 Kennington Road, S.E.

SET of 12 polarising objects with tourmaline, in mahogany case, cost £2 10*s*. Exchange physiological micro objects.—S., 364 Kennington Road, S.E.

FINE slides of crystallised silver to exchange for other micro slides. Send list to R. Alexander, 100 Brockley Road, New Cross, S.E.

WANTED, good specimens of minerals, in exchange for American land and freshwater shells.—D. W., 98 Cranworth Street, Brunswick Street, Chalton-upon-Medlock, Manchester.

PINE tray case to hold 100 microscope slides flat; ditto, to hold 150 on edge, and 50 flat. Also solid brass mechanical stage, new design. Wanted, microscope glasses, or what offers?—J. Bennett, John Street, Stroud.

WANTED, butterflies and moths: purple emperor, white admiral, large copper, large blue, Apollo, death's head, gipsy, Kentish glory, lappet, also Brazilian butterflies.—J. Bates, 10 Orchard Terrace, Wellingborough.

ABSORPTION tubes for micro spectroscope, in exchange for other tubes, or for first-class objects or material.—H. W., 10 Evering Villas, Upper Clapton, E.

EUROPEAN mosses, particularly of the genus Andreæa, or any foreign Andreæa, wanted. British mosses in exchange.—J. C., 33 Plymouth Avenue, Longsight, Manchester.

LIVING *Bacillaria paradoxa*, associated with several species of Pleurosigma, offered for first-class slides.—W. H. Shrubsole, F.G.S., Sheerness-on-Sea.

THREE vols. "Astronomical Register," a set of new diagrams, well mounted, suitable for illustrating lecture on astronomy, also ship's quadrant, in good condition, in oak box; exchange for magic lantern, or other useful exchange.—W. D. Tiddel, 37 Greenhough Street, Wigan.

WANTED to exchange a few of the Myxomycetes for others. *Arcyria punicea*, and several species of Trichias offered.—Thomas Whitelegge, 64 Curzon Road, Hurst, near Ashton-under-Lyne.

PINE cabinet, suitable for fossils, shells, minerals, &c., height 20 inches, breadth 18 inches, depth 11 inches, 6 drawers ranging from 2¼ to 3 inches deep, in exchange for good eye-piece boy's own microscope, French or German, achromatic object glasses, or offers. Also for exchange a pine tray cabinet, to hold 300 microscope objects. Will give both cabinets for good object glass for microscope, Kelner's achromatic eye-piece, or offers.—Harold W. Wager, Middle Street, Stroud, Gloucestershire.

A SLIDE of either of the following injected tissues, viz. liver, tuberculous lung, porpoise kidney, offered in exchange for rare micro-fungi (mounted or unmounted) or rare animal parasites (mounted). Send list (not returnable) of offers first.—James Simpson, 48 Arthur Street, Queen's Park, Edinburgh.

NEARLY 100 specimens (50 species) of North American Coleoptera, in exchange for books, microscopic slides, or British Lepidoptera, and pupæ.—Joseph Anderson, jun., Alve Villa, Chichester, Sussex.

A CYLINDER electric machine in good condition, cylinder 10 inches in diameter, mounted on mahogany stand, height 24 inches, with prime conductor, with brass fittings and screw adjustments, &c., 3 Leyden jars varying from one quart to a gallon. Will exchange for one ¼-inch achromatic object glass and one B. eye-piece, or a single nose-piece of three powers achromatic.—F. W. S., 3 Western Buildings, London Road, Stroud, Gloucestershire.

WANTED, British and foreign Coleoptera. Exchange books, &c., or would give cash.—J. H. P., 29 Great Coram Street, Brunswick Square, London, W.C.

PENNING'S "Field Geology" 2nd edit., new, for "Half Hours among English Antiquities," new edition.—A. G. Wright, Newmarket.

WHAT offers for good three-draw telescope (cost 12*s*. 6*d*.)? Wanted good diatomaceous material and slides, or cash.—T., 1 Harleyford Road, Vauxhall, S.E.

OFFERS wanted for a collection of 1800 fossils (900 species), SCIENCE-GOSSIP, 1876 to 1880 inclusive, "Quarterly Science Review," 1877 to 1878, bound in cloth.—Arthur Floyd, Alcester, Warwickshire.

VERY rare (English) *Trigonia pulchella*, from upper lias shale, in exchange for other rare specimens.—W. D. Carr, St. Edmonds, Silver Street, Lincoln.

WANTED, "Tenby," or other works by P. H. Gosse, in exchange for Tandon's "World of the Sea," best edition, coloured illustrations (cloth, gilt edges), published at one guinea, quite new.—C. A. Gwines, 7 Crafford Street, Dover.

RED Crag Fossils, about twenty different species, in exchange for trilobites, or other fossils—or cash.—W. P., 65 Cricket-field Road, Lower Clapton, London, N.E.

POWERFUL microscope, fitted to pair of oxy-hydrogen lanterns, also aphingescope fitted to same, for throwing small objects, flowers, shells, photographs, &c., on the screen powerfully magnified. With complete accompanying apparatus, gas-bags, &c., all packed in strong box. Will exchange for large drawer-cabinet or other useful offer, or will take cash.—W. P., 65 Cricket-field Road, Lower Clapton, London, N.E.

IN exchange for cash: SCIENCE-GOSSIP for twelve years, 1868 to 1879; complete, in good condition, but not bound.—Mrs. William Hill, Bearalston, Roborough, Devon.

FOR exchange, eggs of blackcap, G. warbler, lesser white-throat, carrion crow, long-tailed tit, cock tit, tree-creeper, jay, &c. for others not in collection, or for Lepidoptera.—G. Dewar, Doles, Andover, Hants.

BOOKS, ETC., RECEIVED.

"Steam and the Steam Engine," revised and enlarged edition. By H. Evers, LL.D. Glasgow: W. Collins & Sons.

"A Simple Treatise on Heat." By M. Mathieu Williams. London: Chatto & Windus.

"Unconscious Memory." By Samuel Butler. London: David Bogue.

"History of North American Pinnipedes." By Joel Asaph Allen. Washington: Government Printing Office.

"Ferns and Ferneries." London: Marshall Japp.

"The American Naturalist." November.

"Science." October.

"Canadian Entomologist." October.

"American Entomologist." October.

"Good Health." (New York.) October.

"The American Monthly Microscopical Journal." October.

"The American Journal of Microscopy." October.

"The Boston Journal of Chemistry." October.

"The Scottish Naturalist." October.

"The Journal of Science." November.

"Annual Report of the West London Scientific Association."

"The Young Naturalist."

"The Midland Naturalist." November.

"Journal of the Microscopical Society of Victoria." Nos. 1, 2 and 3, vol. i.

"Transactions of the Norfolk and Norwich Naturalists' Society." Vol. iii. part 1.

"La Science pour Tous."

"Feuille des Jeunes Naturalistes."

"Land and Water."

&c. &c. &c.

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