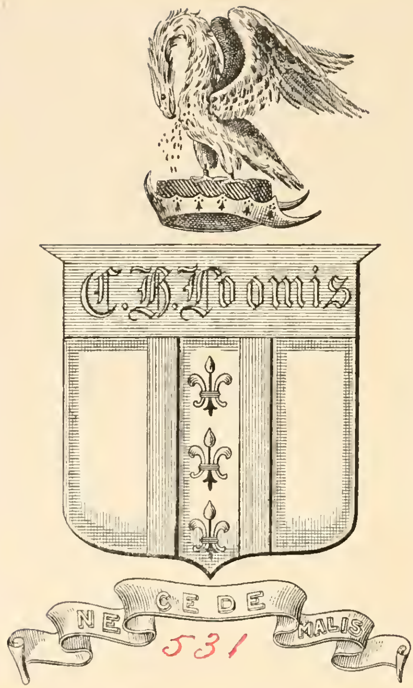
SCIENCE GOSSIP.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HARDWICKE'S

SCIENCE-GOSSIP:

1883.

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.

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PREFACE.

TO few people does the flight of Time seem more rapid than to a magazine editor, and at no period does it appear so rapid as when he is called upon to indite the annual Preface to the yearly volume. It seems but as yesterday since he last addressed his readers, and the very words he uttered echo in his ears. What can he say this year that he did not say last? He has the same story to tell, but he must tell it in different words.

This is all the more difficult when the thoughts to be expressed are sincere—when he really *does* wish to express his deep sense of gratitude all round—to the kindly forbearance of his readers, and particularly to the help-meets who so readily and generously spring up all round, to answer questions, solve difficulties, help the less informed, and give us the result, ofttimes of a life-long experience and hard work, in original papers and notes—and all for the genuine love of it!

These are the things which make the editorial burden easy and the task light—long may the same pleasant spirit of friendship exist between Editor, readers and contributors!

The present is the Nineteenth Annual Volume of SCIENCE-GOSSIP. Within the period of its literary life it has seen many *confrères* spring up and die down. It was never surrounded by so many as at present, for never before was inquiry and scientific research half so widely diffused and active. The principle of natural selection operates among magazines as it does in the organic world. The weakest goes to the wall; and when SCIENCE-GOSSIP loses its vigour it must submit to the general law.

Of course, no magazine can be in existence for so long a period without undergoing vicissitudes. One of these has been experienced within the last twelve months—the publication of SCIENCE-GOSSIP has changed hands.

It is, therefore, with the greatest pleasure the Editor has to announce the increased vigour about to be put into his journal. The new publishers fully recognise the scope of SCIENCE-GOSSIP, and they propose at once practically to raise its tone and character.

In addition to articles now lying in the Editor's Box for use next year—of which the least he can say is that in scientific and literary merit they are in no way behind those which have hitherto appeared—it is intended to illustrate each number with a full-page and highly-finished Coloured Plate of some object drawn from Nature under the Camera by a well-known Microscopist, whose papers on Microscopic Fine Art have been the subject of discussion in our last two volumes, and whose work will now be put to the test of practical criticism.

This additional element of interest and attraction will not be at the expense of the high-class woodcuts which our artist has constantly turned out. Rather, we expect the latter will increase both in number and merit.

It remains for the Editor, whilst wishing all his readers and helpers a HAPPY NEW YEAR, to beg their hearty co-operation in extending the circulation of SCIENCE-GOSSIP. If every reader secures a new subscriber, the Editor's power for good will be extended to his utmost desire, and his success in inducing the outlay of a larger expenditure will be complete.

LIST OF ILLUSTRATIONS.

AN INQUIRY INTO THE ALLEGED HABIT OF HIBERNATION AMONG NORTH AMERICAN SWALLOWS.

By CHARLES C. ABBOTT, M.D.

IN the year 1750, Peter Kalm, the Swedish naturalist, while travelling in America, made the following entry in his journal, during a brief sojourn in Southern New Jersey: "I observed the barn swallows for the first time on the 10th of April (new style); the next day in the morning, I saw great numbers of them sitting on posts and planks, and they were as wet as if they had been just come out of the sea." On a subsequent page, he remarks: "The people differed here in their opinions about the abode of swallows in winter; most of the Swedes thought that they lay at the bottom of the sea; some, with the English and the French in Canada, thought that they migrate to the southward in autumn, and return in spring. I have likewise been credibly informed in Albany, that they have been found sleeping in deep holes and clefts of rocks, during winter." Furthermore, it is well to add that John Reinhold Forster, the accomplished translator of Kalm's travels, adds, in a foot-note, a series of well-attested instances of swallows having been found hibernating in the mud at the bottoms of lakes: among these instances he mentions Dr. Wallerius, a celebrated Swedish chemist, who affirmed that he had "seen more than once, swallows assembling on a reed, till they were all immersed and went to the bottom; this being preceded by a dirge of a quarter of an hour's length." Commenting upon the above and like instances, Mr. Forster is led to conclude that in countries as cold as Sweden "swallows immerse in the sea, in lakes and rivers, and remain in a torpid state, under ice, during winter;" and that some English swallows, and some in Germany, "retire into clefts and holes in rocks," while in Spain, Italy, and France, that they are strictly migratory birds.

That our American swallows are strictly migratory birds, I have no doubt; and it would never have occurred to me to consider otherwise than as a mere fancy the subject of hibernation of our swallows, had not an excellent American ornithologist stated recently the opinion that this alleged submarine hibernation of swallows was physically and physiologically feasible. This is a too hasty assertion, and has no warranty from known laws of life. Such an assertion having been made, however, and a semi-assent to the alleged habit of hibernation thus given by an authority in ornithological science; it behoves the naturalist to determine, if opportunity permits, how great an amount of truth there is in the statements so frequently and forcibly made, of the persons claiming to have witnessed actions on the part of swallows, indicative of hibernation commenced; and of the discovery of swallows in conditions indicative of hibernation in progress.

Believing this supposed habit to be really a misconception of movements on the parts of swallows, and to be likened, in a measure, to the rolling habit of the mythical hoop snake, I have taken every available opportunity, since 1878, to observe the movements of the several species of swallows that frequent my neighbourhood, with the hopes of determining what habits obtained among them, that might possibly have given rise to the world-wide impression on the part of many people, that swallows not only hibernate, but even deliberately bury themselves in mud at the bottoms of lakes and rivers.

The species of swallow that I have had opportunity of carefully studying for the past three years, are the bank swallow (*Cotyle riparia*), the cliff swallow (*Petrochelidon lunifrons*), the barn swallow (*Hirundo horreorum*), and lastly the swallow-like swift (*Chætura pelagica*), universally known as the chimney swallow.

I do not propose to give you an extended account of the habits of these four species of well-known birds; but relate such occurrences as I have witnessed, as seemed to bear upon the question. These birds I will treat of in the order named.

Probably the most abundant of all our swallows is that known as the bank swallow, a name derived from the habit of building nests in the steep faces of earth banks, when of such composition or structure that these birds can burrow into them with safety to a depth of several feet. I say "with safety," for if the earth be too yielding, and the sides liable to crumble, then the bank will be abandoned. In every instance that has come under my notice the chosen banks or escarpments occupied by a colony of bank swallows had a southern exposure, and directly fronting it, and never so far distant as to be out of sight, there was either a pond, a creek with some current, or the river itself. Now this association of water and the colonies of bank swallows is important.

Least susceptible to changes of weather, and dependent upon food more than temperature, the bank swallow is the earliest of the family to appear in spring, and the latest to disappear late in autumn. The alleged hibernation is a habit that concerns us only at such times of year—in early spring—when they leave their muddy couches after prolonged slumber;—in autumn when they seek these submarine retreats.

Like all, or nearly all, migratory birds, the bank swallows return in early spring to their haunts of the preceding summer. When I have first noted their return, often as early as the 10th of March, they were either flying to and fro over the water in front of the site of their nests of last year, or flying in and out of the old burrows of the preceding summer; inspecting their condition, but not preparing for the coming duties of incubation. Thus early in the spring, their flight is not as continued as it is a month later, as though they had not recovered from the fatigue of their migratorial journey, which I believe to be the case; and they rest in small companies, not upon trees, but, I may say, exclusively either at the openings of the subterranean nests, or upon sticks, dead trees, and vegetation projecting from the water. Now let me add another very important fact; that the amount of food to be found by these swallows, thus early in the season, is limited; and largely confined to a few hardy species of insects that are then astir, if the sun is shining, therefore their vigorous flight power of midsummer is visibly affected. Add to this, the depressing influences of cold rain-storms, which they do not endeavour to avoid, and we have causes sufficient to explain the well-attested fact, that these swallows are at this time of year often to be seen, as Kalm described those he saw in 1750, "as wet as if they had been just come out of the sea."

Let me now give you the details of an incident of this kind. On the 17th of March, 1878, the weather for a week previously having been fairly pleasant for the time of year, and a few swallows seen; it rained very hard until about noon, when it cleared suddenly, the wind shifting to the north-west. I started out for a short ramble in search of Indian relics, and passing by the bluff that for years has been frequented by bank swallows, I was attracted by the incessant but feeble twitterings of numbers of these birds, but none were to be seen. I looked for them for some time, and finally found a hundred or more sitting upon the top rail of a section of half submerged fence in the marshy meadow facing the cliff. Approaching as near as I could, I found them unable, or, at least, indisposed to fly; and finally, getting to them, found them thoroughly soaked, and readily taken by the hand. Those that endeavoured to escape, fell into the water, and were lost in the dead bulrushes that projected above its surface. I presume that many were drowned. My explanation of the occurrence is this, they were insect hunting when the storm commenced, and taking refuge by perching upon the fence, were awaiting the slow process of the drying of their feathers, by exposure to the wind and then fitful sunshine. This accomplished, they would have been themselves again. On the other hand, had I not seen these swallows previously, there was every reason to lead one to suppose that they had suddenly appeared from some near-at-hand hiding-place, where they had been quietly at rest, during the winter just closed; and had any one following in my footsteps found the poor struggling birds that I had caused to fall into the water, then natural, indeed, to suppose that from the water itself had emerged these chilled and helpless birds at the first breath of spring!

Now, on the 19th of March, 1880, there was a cold storm, with both snow and rain. Two days previously I had seen two bank swallows. Thinking that others might be about, and desirous of seeing them during a rain, I went to the cliff, near my house, and saw nothing of these birds. Lingering about the place for some time, I finally saw three emerge from holes in the cliff, and after fluttering about a short time (the rain had then stopped) they alighted on a stake projecting from the water, and remained fully ten minutes. The rain commencing again to fall, one flew away, and I think to the cliff, the others flew to the same fence, where I had seen scores of them the year previously, and sat near together facing the wind; just as pigeons will arrange themselves on the peak of the roof of a barn during a rain-storm in summer.

In this case, these two swallows certainly became thoroughly wetted, and had they been found later, when the storm was over, would certainly have presented the appearance of being "as wet as if they had been just come out of the sea."

How easy it is to be misled by appearances, in this matter of studying bird-life! Had I not known that swallows had been flying for days before I found these wet, bedraggled, storm-beaten birds, I could fairly have claimed, that my own experience fully confirmed the opinions of others, that swallows not only migrate, but remain in mud-encased beds at the bottoms of our ponds, creeks and rivers; but until swallows are first heard singing their farewell dirge, as Dr. Wallerius describes, then seen to sink into the mud, and are then promptly resurrected, before a cloud of witnesses, it will be safe to assert that what others have seen is susceptible of other explanation than voluntary submergence in the mud of our water-courses. Furthermore, it can be safely asserted, I think, that bank swallows return year after year to their haunts of previous summers. A New York, or Connecticut, or Massachusetts colony of these birds, will not reach its haunt of last summer as early as will the New Jersey colonies reach theirs.

Although the recent observations of Mr. Scott at Princeton, New Jersey, conclusively show that migration at any night, when it is moonlight, customarily takes place, it does not necessarily show that migration at night is the common habit of all birds that migrate. Indeed, it is impossible to believe that however brilliant the moonlight may be, any bird could distinguish, at the elevation of a mile or more, the limited area of its former summer haunts, the particular thicket in which it nested the foregoing summer; or, in the case of swallows, the little bluff, wherein a colony had had their subterranean summer homes. The most that can be claimed, is their recognition of the particular river valley wherein they have been accustomed to spend the summer. Granting this, if they migrated at night, then it is early in the morning after their arrival that we should expect to see them, resting, in scattered numbers, after their journey; and when thus wearied from a protracted flight, and damped with the dews that have bathed surrounding Nature, they might well present the appearance of having arisen from the waters beneath, rather than fallen from the clouds above.

(*To be continued.*)

Buttercup.—On December 2nd, I found a buttercup (*Ranunculus repens*) in flower, and it was covered with ice. It was growing on an exposed bank beween two streams.—*F. H. Parrott, Aylesbury.*

MOLLUSCAN JAWS; THEIR VARIATION IN *HELIX NEMORALIS, H. HORTENSIS,* AND VAR. *HYBRIDA.*

Any one watching a snail as it crawls along, cropping the algæ off the glass of a fresh-water aquarium, will notice that the shorn track is distinctly narrower than the foot of the animal. The lateral portions of this organ describe graceful contours, whilst this track has a jagged margin, and median interruptions of uncropped algæ. It is evident that the motion of the foot has not caused that silvery streak on the inner part of the glass, for, running our eye along the muscular foot, from the posterior pointed portion which joins the path, the so-called tail of the snail, we shall see, however accomplished, whether by the elongation of the anterior portion, or drawing of hinder part forwards, by the alternate progressive movements of the sides, or any other movement common to special groups, that the use of the foot is for locomotion, and that it presents no cutting organ whatever.

Anteriorly however, we find the foot of our gastropod, if it be a Limnæa, becoming very broad and ending abruptly, and that there is differentiated dorsally a head possessing tentacles, eyes, &c., and having a mouth more or less ventral.

Here, were we merely looking for the cause of that track, our quest would end; for the combined movements of the head and the external organs of the mouth, whilst in search of and procuring food in these fields confervoid, pushed forwards by the foot, give rise to the complicated tortuous Molluscan tracks so common in some aquaria. A more careful examination of this mouth movement through the glass will reveal, in some genera more than others, a dark brown or chocolate-coloured crescentic boundary, the jaw, which is during life being brought constantly into opposition with the more ventral portion, which presents a muscular strap, on which are developed hundreds of carbonate of lime denticles, the radula. To the action of these organs, assisted by certain muscles, is due the seizure of the food, its comminution and its passage to the œsophagus. The whole form the buccal mass.

In this hasty examination we have localised and functionised an organ, whose action has at all times excited the admiration of observers of Molluscan habits. By its aid those of the snails and slugs of our canals, ponds, and country lanes can be found. The colour of the jaw varies from a light yellow to a deep chocolate. The cuticle of the common cockroach presents the general colour sought to be described.

Generally speaking, the jaw may be said to consist of a crescentic base, with or without accessory pieces, on which are developed transverse ridges or ribs of the same material. Neither the curvature of the base, nor the number or position of the ridges is constant. Their use is to assist the odontophore in triturating the food. The whole jaw assumes, however, a characteristic form peculiar to its own genera. In a common black slug (*Arion ater*) of this neighbourhood, I found a semi-oval jaw, with numerous ribs of varying breadths, smooth on the concave and crenulated on the outer aspect, and barely projecting beyond the edge of the base (fig. 1). Whilst in a jaw of *Succinea putris*, from the towing-path of the canal in the centre of Leeds, we have a central tooth and a quadrate plate behind (fig. 2).

Very little seems to have been done in determining the composition of Molluscan jaws, and books on zoology, microscopy, anatomy and conchology, seem content to share in the stereotyped and often

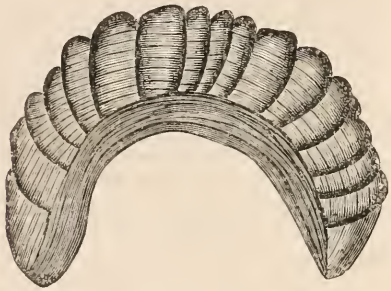


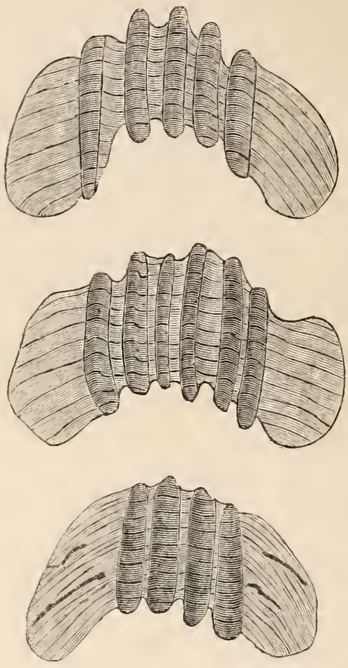
Fig. 1.—Jaw of *Arion ater*, Leeds.

Fig. 2.—*Succinea putris*, Leeds.

synonymous terms, composition corneus, horny, cartilaginous, calcareous.

Through the microscope they have every appearance of being chitin (C_{15}, H_{26}, N_2, O_{22}) a substance particularly familiar to the worker with this instrument. Chitin might aptly be called invertebrate bone, for it enters into the composition of the endo- and exo-skeleton, locomotory (aerial, terrestrial, and aquatic), digestive, generative, and respiratory organs, &c., of various members of that great division. The Molluscan jaw and the serrated teeth of leeches (Hirudo), are but modifications of the same substance to suit divergent habits. On testing chemically the jaws of *Helix nemoralis* and *hortensis* and portions of the gladius of *Loligo vulgaris* with hydrochloric, sulphuric, and acetic acids, potassic hydrate, Schultze's syrup, &c., I found that they were chitinous and not corneous or horny.

Keratine, the basis of horn, hairs, feathers, &c., has a different chemical composition to chitin, and behaves unlike it under the same tests. The methods pursued in determining chitin and keratine are too familiar to be more than alluded to here. Cartilage, as is well known, is only found amongst invertebrates in Cephalopoda. The nucleated appearance of cartilage and the laminar structure of chitin under the microscope are so dissimilar, that the cartilaginous nature of jaws must have been a guess and never tested. That they are not calcareous needs no contradiction, although salts of lime are deposited on



Figs. 3–5.—*Helix nemoralis*, Whitby.

them occasionally. In my cabinet I have a jaw of *Helix arbustorum* on which are three star-like clusters of crystals, which polarise beautifully.

Chitin, being a derivative product, does not involve the consequent destruction of its constructive cells; whilst the opposite obtains in keratinous substances, their original cells having been transformed into horny matter. In vol. iii. pt. 8 of the "Journal of Conchology," the editor in an article on *Helix arbustorum* takes us a step further. He states that the jaw "is composed of indurated or hardened mucus and is of a horn colour; the minute sculpture is formed of longitudinal wavy lines which follow the exterior outline." These lines of sculpture are the lines of deposition of the chitin; the alternate hard and soft portions arising during chemical metamorphosis of the cells into that substance. The laminæ are here, as in Nature everywhere, the indications of formation and of transformation or change. The epiphragm may be formed of "hardened or indurated mucus," but certainly not the jaw. The presence too of chitin in Mollusca is conceded by all embryologists. It is the first hard substance met with. The shell gland, when first formed, is a chitinous plug in the posterior and dorsal portion in all normal, and in most abnormal forms; whilst a depression on the dorsal surface of the foot of some Molluscs gives rise to a chitinous plate, the operculum. The whole of these chitinous substances are formed of epiblastic cells, and from similar cells are developed the buccal cavity and œsophagus. The anterior portion of the buccal mass is the jaw, its posterior attachment the œsophagus.

tion has convinced me that, though a generic idea might be easily set up, yet as a specific classification it would be useless. The variations seem endless.

In this article I merely treat of one group of land molluscs, *Helix nemoralis*, *H. hortensis*, and some of their varieties. As their specific relationship has never been satisfactorily settled, I trust the following notes on the shells and jaws will be a definite step towards that end.

The group comprised under the above names are, as most naturalists know, those beautifully coloured shells found commonly throughout this country along hedgerows, especially nettle-yielding ones — plain yellow, red, or brown, or encircled with one to six bands. Those with dark coloured mouths are the *H. nemoralis*; with white lip and rib, *H. hortensis*; and those with a pink lip or rib, *H. hortensis*, var. *hybrida*. Amongst the *H. nemoralis*, characterised as

Figs. 6 and 7.—*H. nemoralis*, Leeds (¼ grown).

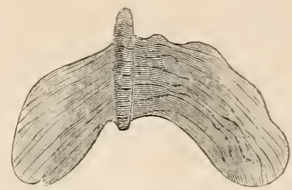


Fig. 8.—*H. hortensis*, var. *hybrida*, Malton.

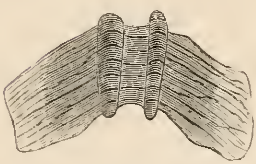


Fig. 9.—*H. hortensis*, Malton.

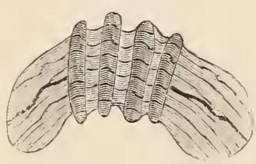


Fig. 10.—*H. hortensis*, Driffield.

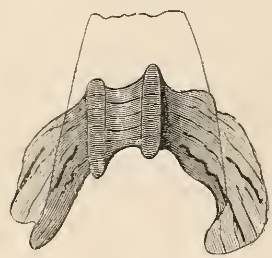


Fig. 11.—*H. hortensis*, near Leeds.

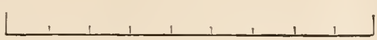


Fig. 12.—Divisions of 1-100 of an inch.

It will (I trust) be clear, that the primitive epidermis or epiblast gives rise in Mollusca to the chitinous parts, and that these are in no case differentiations of mucus. I think we might safely say :—

That no true horn is found in Mollusca;

That cartilage is not found in any of the invertebrates, except in Cephalopoda, as a support for certain nervous organs in the head, &c.;

That chitin forms the shell glands and opercular plates of true Mollusca, the shell valves of articulate Brachiopods, the jaws, &c., of Gastropods, the gill supports and ligaments of Lamellibranchiates (Anodonta), the gladius and acetabula of the squid (Loligo) and other Cephalopoda.

It struck me, as far back as 1879, that if the cross-bars of the jaws of snails could be mapped, as the chemist does his spectra bands, one might, by working at a group, make some headway, but micro-examina-

we have learned by the dark mouth, are sometimes found specimens which agree in every particular with typical *nemoralis*, except that they possess a white mouth and rib. Every conchologist must have specimens of this kind in his cabinet. For it I propose the name of *H. nemoralis*, var. *albo-labris*; no mention of this, by no means rare variety, being made in "British Conchology." This variety occurs in the Leeds district.

The varieties *hortensis* and *hybrida* of *H. nemoralis*, as given by Dr. Jeffreys in his "British Conchology," are to my mind a distinct species and its variety. No conchologist yet confused the two. The care with which he handles *hortensis*, and the admiration that its smaller, delicate, and more graceful form excites, is, to the practical specialist, an intuitive distinction. Perhaps, when the subject becomes better worked, we shall look upon the colour of the lip and rib of var.

hybrida as homotypical of the lip colour of *nemoralis*, for its robust shells are provided with white and all shades of red, chocolate, and dark brown lips and ribs. The jaws, too, of *H. nemoralis* are larger, stronger, and deeper coloured than *hortensis*. Dr. Jeffreys remarks, too, that no two of these forms live together. I may add that *hybrida* is usually sought for and found amongst *hortensis;* the two-score specimens I possess of this variety were all found thus. I was, along with many others, a believer that *nemoralis*, *hortensis* and *hybrida* were not found together in any locality, but quite recently, and within a few miles of Leeds, I have, in the company of friends, taken the three forms associated. From the stems of a large cow parsnip (Heracleum) I took two *nemoralis*, three *hortensis*, and one *hybrida ;* whilst, amongst forty or fifty *hortensis*, two miles away, I procured one *nemoralis* and one *hybrida*. The *hortensis* from this, to me, new locality are very interesting. There are four or five sets which show the gradations of *hortensis* to *hybrida* very clearly, we have 1st, white ; 2nd, bright yellow ; 3rd, paler yellow, large whorl tinged with reddish-purple ; 4th, reddish salmon-colour ; 5th, *hybrida*. Var. or set 3 shows what Mr. Norman denies, a coloured deposit on the columella. Some four or five years ago, I had the honour of describing a new variety to this country of *H. hortensis ;* this var. *umbilicata*, Crthr., had an umbilicus. I collected it at Tadcaster. An examination of the large collections which are made of these ever-varying shells clearly shows that *H. nemoralis* and *H. hortensis* are distinct species, and *hybrida* to be a variety of the latter form, and I and many conchologists adopting this classification go with Müller, Dr. Grey and Mr. Norman and against Forbes and Hanley and Dr. Jeffreys.

Briefly, and generally, we might classify them thus :—

Helix nemoralis, L.—Shell subglobose, usually opaque and solid, imperforate; periostracum white, yellow, brown, chocolate, red, &c., either plain or encircled with one to five or six bands of varying widths and colours. Outer lip and rib deep pink, red, chocolate and black. On the inner lip the bands are usually hidden by a coloured deposit.

Var. *albo-labris*, Crthr.—Form and colour as in type. Lip and rib white.

Helix hortensis, Müll.—Shell one-third smaller and a little more globular than *nemoralis*, similarly coloured and banded, imperforate, thin, often translucent. Rib and outer lip white. Inner lip usually shows bands.

Var. *hybrida*, Poiret.—Shell as in type in size and markings, somewhat solider. Outer lip and rib tinged or coloured pink.

Var. *umbilicata*, Crthr.—Shell like *hortensis*, translucent, banded, possessing an umbilicus.

Fuller descriptions will be found in books on British conchology of most of the above, also of the vars. *major* and *minor* of *Helix nemoralis*. The above classification is newer, more definite, and perhaps more accurate, as it is founded on later observations.

On bringing home the specimens gathered, it is better to clean them at once. The animals are extracted after treatment with hot water. The shells should be assorted as to colours, species and varieties, and mounted in pairs on small millboard tablets $2\frac{1}{2}$ by $1\frac{1}{4}$-in. by $\frac{1}{8}$-in. thick, covered on one side with tinted paper for coloured, and steel blue, or black paper for white shells. On the label affixed to one end should be written genus, species, locality and collector.

For the method of dissecting odontophores, jaws, &c., of Mollusca, which should be done under water, in a white shallow dish, refer to books on the microscope, &c. I would strongly advise the simple method of dissecting the animal thus, with forceps and needles, to the common one resorted to by so many conchologists, of boiling the animal if small, or parts if large, in sodic or potassic hydrates, on purpose to procure the jaws or lingual ribbons. The attachments are often appended, and the object has a more natural appearance under the microscope. The jaws of small *H. virgata* can be seen with the naked eye in the dissecting trough, and the smallest species may be crushed and washed in the sunken cell of a micro-slip using a 2-inch objective for detection.

As the jaws are found, place the different kinds in watch glasses, or small colour saucers, until so dry that they can be transferred to small pill-boxes, without any risk of their sticking to the bottom or sides, and so carrying foreign matter. Here they are dust free, and can be stored any length of time. On its lid should be written such information as is required for the micro-slide label. This method of preparation is not applicable to odontophores. In a day or two the jaws will be thoroughly dry. After soaking in turpentine, they may be mounted on micro-slips in any soluble form of Canada balsam, and without a cell ; a wire clip will hold in position for a few days, until there is a little set in the medium. As evaporation takes place, fill up with fresh balsam ; when dry ring twice with a thick solution of dammar in benzole and varnish. Any number of jaws of Mollusca agreeing in characters or shell colour may be mounted on one slip, three or more are very easily treated, and with a little care in balancing the clip directly over the specimen or specimens, it will be found practical to mount one or two jaws without a cell. Canada balsam is much better for this work than glycerine or similar fluids ; it is more easily manipulated, requires no extra care in fastening up, and is handy for polariscopic work.

Such a slide may be numbered, named, examined and mapped as below :—

Slide No.	Locality.	Kind.	Map.	Species.	No. of Ribs.						
					1	2	3	4	5	6	7
5	Tadcaster .	Reddish . .		*nemoralis*	..	..	..	..	1	..	1
23	Whitby .	Yellow . .		*hortensis*.	..	..	1	..	..	..	..
29	Driffield .	Plain reddish		*hybrida* .	..	4	..	..	..	..	..

The arc ⌢ represents the base, and the cross lines the transverse bars of the jaws. By this method any number of jaws can be diagrammatically presented, and by thickening, thinning, or lengthening the strokes, the variations we find on the real specimens may be represented. It follows, that if in such a tabulation it had been found that *H. nemoralis*, *hortensis* or *hybrida* had always a certain proportion of cross-bars, or that these ribs were differently placed, a classification might have been built up on these characters ; but although I long ago learned that the *nemoralis* had larger jaws, and was generally better ribbed, yet the number of bars varies so much that specimens with two bars occur, and rarely we find five bars in *hortensis* and *hybrida.*

The examination of one hundred and forty-two jaws gives the following results :—

Specimens examined.	Species.	Number of Ribs.							
		0	1	2	3	4	5	6	7
67	*Helix nemoralis*	..	..	5	7	23	22	7	3
51	*Helix hortensis* .	..	..	19	22	9	1	..	..
24	Var. *hybrida* .	..	1	5	4	13	1	..	..

A glance at this table shows that *H. hortensis* has the lowest average of bars 2·8, *hybrida* 3·3, and *nemoralis* 4·4. A reference to my remarks on the shells, shows that this order is borne out in them too, *hortensis* thin, *hybrida* stronger, and *nemoralis* a solid and more compact shell than either.

In a district near Leeds, out of twenty-eight specimens (see table below), I find the proportion slightly increased, *nemoralis* averaging five bars per jaw, and *hortensis* barely three. Of *hybrida* I only took two specimens.

Specimens examined.	Species.	Number of Ribs.							
		0	1	2	3	4	5	6	7
6	*Helix nemoralis*	..	..	..	..	2	3	..	1
22	*Helix hortensis* .	..	..	6	11	5	..	..	..

An opinion which I have formed after much reflection on this jaw variation from tables and observations may be presented in a few words. The ribs being auxiliaries of the odontophore, and abounding especially in terrestrial forms, vary in different situations to suit food plants.

In a set made up of specimens collected by myself at Driffield, and from its neighbourhood by kind donors, I find the *nemoralis* have generally two to four, and rarely five cross-bars, and the *hortensis* the same. These specimens were not near roads, but under walls and along wood sides. Specimens of *nemoralis* which I gathered on the sea cliffs at Whitby, very exposed situation, herbage rank, hard and dry, had all, with one exception, a four-ribbed specimen, five or six bars to each jaw.

The *nemoralis* gathered on a road-side in Leeds, Carboniferous formation, are very strong and have dense jaws. Twenty-three full-grown specimens yield on examination ten with 4, ten with 5, two with 6, and one with 7 bars. I have two other examples of jaws with 7 ribs, from two different localities and limestone formation, but each were from hard herbage and dusty road-sides. Four quarter-grown specimens from a road-side in Leeds give one 4, one 5, and two 6 ribbed-jaws, and three half-grown ones, two 4, and one 6 barred jaw.

In four 5 banded *nemoralis* taken in a damp situation near Tadcaster, near to which I have procured *hortensis*, *hybrida* and *H. arbustorum*, I find two with 2, one with 3, and one with 4 ribs, which are particularly acute and narrow ; two hundred yards away on the dry dusty road-side, the *nemoralis* yield a high average of jaw-ribs, one having 7 ribs. A slide from the river-side, and this locality compare thus :—

No. of Specimens.	Appearance.	Species.	Locality.	No. of Ribs.				
				2	3	4	5	6
4	{Yellow, 5 banded}	*H. nemoralis*	River-side	2	1	1	..	..
4	,,	,,	{Roadside, Tadcaster}	..	..	1	2	1

The specimens taken where the herbage is strong and hard, yield jaws which are deeper in colour. The largest specimens from each of the slides last mentioned give for the river-side a jaw $\frac{6}{100}$ in. long (across), and $\frac{3}{100}$ in. broad in the centre, the road-side one being $\frac{9}{100} \times \frac{4}{100}$ in. The most distortious of jaws are in *hortensis* and *hybrida*, from road-sides, probably due to softer jaws and harder foods.

In the article on *H. arbustorum* mentioned above, the writer says, when speaking of jaws, "In old specimens there are sometimes six ribs." Here is inferred that age adds the ribs ; if this were so my idea, of variation to suit nature of food would not be tenable. For this reason I examined adult specimens of *H. arbustorum* which I had gathered from the base of a waterfall (Hydraw Scar), where the herbage is moist and tender; the specimens did not develope a single well-formed rib, being mere chitinous crenulations. Some very young specimens taken on an exposed situation last year by myself in Derbyshire (High Tor, Matlock), yield 2, 3, and 4 bars. Two half-grown specimens from Tadcaster yield 3 ribs each. An examination of twenty full grown specimens from different localities gives plain bases (no ribs), and 1 up to 8 ribs. It is evident that the assertion has not been practically taken up.

An examination of some young specimens is appended:—

State of growth.	Species.	Locality.	No. of Ribs.				
			2	3	4	5	6
$\frac{1}{4}$ grown	*nemoralis* .	Roadside, Leeds . .	..	..	1	1	2
$\frac{1}{2}$,,	,, .	,, ,, . .	..	..	2	..	1
$\frac{1}{2}$,,	*hortensis* .	,, near Leeds	1	..	..	1	..
$\frac{1}{2}$,,	,, .	,, ,, ,,	..	..	1	..	..
$\frac{1}{4}$,,	,, .	,, ,, ,,	..	..	1	..	..
$\frac{1}{4}$,,	,, .	,, ,, ,,	1	..	..	..	..
$\frac{1}{4}$,,	*arbustorum*	High Tor, Matlock .	1	1	1	..	..
$\frac{1}{2}$,,	,,	River-side, Tadcaster	..	2	..	..	..

From this table it is evident that the ribs on the jaws have no relationship whatever with the age of the Molluscs, and specimens which I have collected on Arthur's Seat, Edinburgh, and in Fifeshire, clearly support both in very young and adult forms this view.

There is much matter that could be presented to the naturalist from these examinations. We see that an exposed situation on a Carboniferous formation gives the greatest percentage of ribs; an exposed area on a limestone formation a moderate; whilst a protected or humid situation on the same formation gives a minimum number of ribs.

With two deductions, new (I trust) to science, I conclude:—

First. That the slight difference that exists between the jaws of *Helix nemoralis* and *H. hortensis* is due to relational connection, and their specific divergence not being of long date.

Second. That the rib-variation of the jaws of these types is due to the nature of their food, its modifying influence involving formation (geological), locality, situation (protected or not), and kind; but having no connection whatever with age.

Beeston Hill, Leeds. HENRY CROWTHER.

BRAZILIAN BIRDS.—In reply to G. A. K.'s query, there is a work extant on the birds of Brazil published just thirty years ago. The figures are life-size, or nearly so, and beautifully coloured, although not so highly finished as the figures in Gould's works. It is in the French language, and was, I think, published in Rio de Janeiro; title, "Ornithologie Brésilienne, par le Dr. J. T. Descourtilz."

SUBMERGED FORESTS ON THE SUFFOLK COAST.

THE "Geological Magazine" for December contains the following communication from Dr. J. E. Taylor, on submerged forests which he has investigated in the Orwell and at the mouth of the Deben. Dr. Taylor writes:—

In 1874–5, whilst the river Orwell was being deepened, and a new channel cut, a bed of peat was discovered. This was carefully examined and worked by myself and Mr. Thomas Miller, C.E., the Ipswich Dock Engineer, and the published results appear in the report of the British Association (Bristol) meeting 1875. This peat bed was as much as nine feet thick, full of the trunks of trees, and from it we obtained several grinders of the Mammoth. It was traced down towards Harwich for a distance of six miles, and, at the time, I pointed out that this ancient forest could only have grown when the land stood relatively so much higher than the present sea-level that the bed of the German Ocean must have been marshy land, probably characterised by similar extensive shallow lakes to those which are so abundant in the flat eastern parts of Norfolk, where they are known as "Broads."

Fishermen off the Norfolk and Suffolk coasts frequently bring up lumps of peat in their trawl nets, and that the bed of the German Ocean off these parts must be occupied by extensive deposits of this kind is shown by the unfailing supplies. Bones and teeth of elephant, ox, deer, &c., are strewn over the area, and are often dredged up. Those who are acquainted with the magnificent collection of these remains made by Mr. Owles, of Great Yarmouth, nearly all of which were dredged up by Yarmouth fishermen, will be prepared to substantiate the statement that the floor of the German Ocean is occupied by extensive post-glacial deposits, with their characteristic organic remains. A post-glacial forest-bed occurs at Holm Scarf, off the Norfolk coast, and may plainly be seen at low water. It is a bed of peat, in which trunks of trees are imbedded. It was in one of these trunks that Mr. Edwards found a flint implement sticking.

Within the last few days I have come upon the remains of another submerged forest or peat-bed at Bawdsey, near Felixstowe. It is only visible and accessible at low-water spring-tides, and even then it is seen sloping down into the sea. The cliffs at Bawdsey are formed of London clay, capped by Red Crag, and they do not waste so rapidly as many other parts of this coast. The London clay forms the bed of the sea, except near the northern side of the estuary of the Deben. There we find the peat-bed, resting directly on the London clay. It is about four or five feet thick at its thickest part, but it has evidently been much denuded, and is now merely a relic of what it once was. Remains of trees are not plentiful in it, and the peat contains an abundance of fresh-water and marsh plants, but I found no fresh-water shells. The only animal remains I obtained are the upper part of the skully and horn-cores of *Bos longifrons*, but I was told that bones had frequently been washed out of it. Among the plants a species of Cyperus was abundant, and Sphagnum was also plentiful. Indeed the nature of the peat-bed indicates its formation under just such marshy conditions as geologists have assumed the bed of the German Ocean to have been in before the submergence took place which brought the sea-water over it, and so converted England into an island.

The discovery of this remnant of a once extensive peat-bed, uncovered only in part even at extreme low water spring-tides, is therefore interesting as confirming the geological speculations concerning the old marshy plain over which the German Ocean now extends.

A LIST OF LAND AND FRESHWATER SHELLS OCCURRING NEAR LONDON.

As there have been so many queries in SCIENCE-GOSSIP lately, about localities for land and freshwater shells, I thought it might interest your readers to know that I have observed the following near London.

AQUATIC.—*Sphærium corneum*, Chislehurst, &c.; *S. lacustre*, Chislehurst and Enfield; *Pisidium amnicum*, Enfield (Middlesex); *P. fontinale*, St. Mary Cray; *P. pusillum*, in a ditch at Bickley; *P. nitidum*, in a pond on Chislehurst Common; *Unio tumidus*, Enfield, very abundant; *U. pictorum*, Enfield; *Anodonta cygnea*, Beckenham, Kent (the form I have found is exceedingly large and swollen, and is probably the var. *incrassata*); *A. anatina*, plentiful at Enfield; *Neritina fluviatilis*, Enfield; *Paludina vivipara*, Enfield; *Bithynia tentaculata*, St. Mary Cray; *Valvata piscinalis*, St. Mary Cray; *Valvata cristata*, occasionally at St. Mary Cray; *Planorbis nitidus*, Chislehurst Common; *P. nautileus*, Chislehurst Common; *P. albus*, St. Mary Cray and Enfield; *P. spirorbis*, Chislehurst Common; *P. vortex*, St. Mary Cray; *P. carinatus*, Enfield, scarce; *P. complanatus*, St. Mary Cray; *P. corneus*, Enfield; *P. contortus*, Chislehurst and Enfield; *Physa hypnorum*, ditch at Bickley; *P. fontinalis*, St. Mary Cray; *Limnæa peregra*, St. Mary Cray, &c.; *L. peregra*, var. *ovata*, Bromley; *L. peregra*, var. *labiosa*, Bromley; *L. auricularia*, Enfield; *L. stagnalis*, Enfield and Chislehurst; *L. stagnalis*, var. *fragilis*, Enfield; *L. palustris*, St. Mary Cray and Enfield; *L. truncatula*, in ditch at Bickley; *Ancylus lacustris*, Chislehurst.

TERRESTRIAL.—*Arion ater*, Chislehurst, &c.; *Limax agrestis*, Chislehurst, &c.; *L. maximus*, Chislehurst, &c.; *Succinea putris*, St. Mary Cray; *S. elegans*, St. Mary Cray; *Vitrina pellucida*, Chislehurst, &c.; *Zonites cellarius*, Chislehurst, &c.; *Z. nitidulus*, Chislehurst, &c.; *Z. crystallinus*, Chislehurst, &c.; *Z. fulvus*, Chislehurst, scarce; *Z. nitidus*, Enfield; *Helix pomatia*, Caterham, Surrey; *H. aspersa*, Chislehurst, &c.; *H. nemoralis*, Chislehurst, &c.; *H. nemoralis*, var. *hortensis*, Chislehurst, &c.; *H. Cantiana*, Chislehurst, &c.; *H. rufescens*, Chislehurst, &c.; *H. hispida*, Chislehurst, &c.; *H. virgata*, Caterham and St. Mary Cray; *H. caperata*, Chislehurst and Caterham; *caperata*, var. *ornata*, Chislehurst and Caterham; *H. ericetorum*, Caterham and St. Mary Cray; *H. rotundata*, Chislehurst, &c.; *H. rotundata*, var. *alba*, Chislehurst, two specimens; *H. pulchella*, var. *costata*, Chislehurst and St. Mary Cray; *H. lapicida*, Caterham; *Bulimus obscurus*, Chislehurst, &c.; *B. obscurus*, var. *alba*, Chislehurst; *Pupa umbilicata*, Chislehurst and St. Mary Cray; *Clausilia rugosa*, Chislehurst and St. Mary Cray; *C. laminata*, Caterham; *Cochlicopa lubrica*, Chislehurst, &c.; *Carychium minimum*, St. Mary Cray; *Cyclostoma elegans*, Caterham and St. Mary Cray.

It may be worth while to say that I have collected all the above during last year (1882), and that all those mentioned as occurring at Enfield were obtained in the course of two days.

Glen Druid, Chislehurst. S. C. C.

ON THE DISCRIMINATION OF DIFFERENT SPECIES OF WOOD BY A MICROSCOPICAL EXAMINATION OF SECTIONS OF BRANCHES.

In the course of seeking for microscopical fungi in the woods, I often picked up sticks which I was at a loss to assign to their true origin. This induced me to make sections of the branches of commonly occurring trees, with a view to make myself familiar with the structure of the wood.

I was somewhat surprised at the differences exhibited in the sections, and, pursuing the subject, I have endeavoured to classify the differences of structure, in the hope that this may prove useful to others similarly situated to myself.

It is not put forth that the classification here alluded to, with the verbal descriptions attached, will answer the purpose completely, but I think that it will assist a person greatly in the determination of a species of wood. Take, for instance, beech and birch, lime and poplar. The differences are striking when the internal structure is examined, not so when merely the external aspect is observed.

For the perfect determination of a species of wood, authentic sections or accurate drawings of such sections are needed for comparison.

The character of the pith mass of the medullary rays, of the ducts in the woody tissue, and of the bark, are important elements in the determination of the plant, and will serve as a good guide to the enquirer, and facilitate reference to authentic sections.

C. J. MULLER.

ON BRITISH FRESHWATER MITES.

By C. F. George.

No. IV.

THE species of Arrenurus described so far, have all of them the peculiar development of the last joint but two of the hind leg; and I believe and extraordinary-looking mite; has a very wide and rather short tail, of a bright yellow; the cœcal markings are dark brown, the central part white, and the posterior part of the body, where it joins the tail, is of a beautiful blue; the impressed line does not extend so far forward on the body as usual, and the last joint but two of the hind legs is without the peculiar process described in *A. globator*, *A. buccinator*,

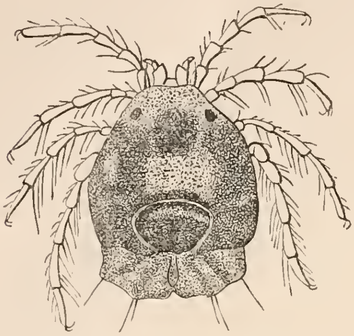


Fig. 13.—*Arrenurus sinuator*, ♀.

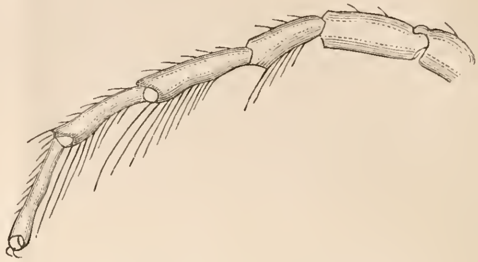


Fig. 14.—Hind leg of *Arrenurus sinuator*, ♂.

Fig. 15.—Second leg of *Arrenurus sinuator*.

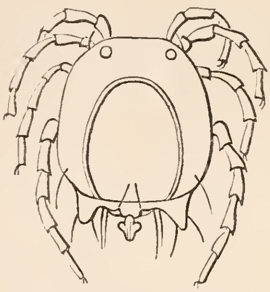


Fig. 16.—*Arrenurus albator*, ♂.

Fig. 17.—Tail of *Arrenurus albator*, ♂.

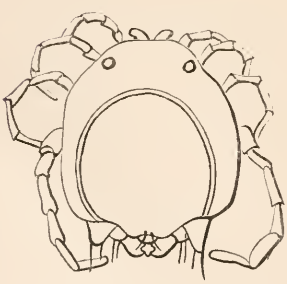


Fig. 18.—*Arrenurus crassicaudatus*.

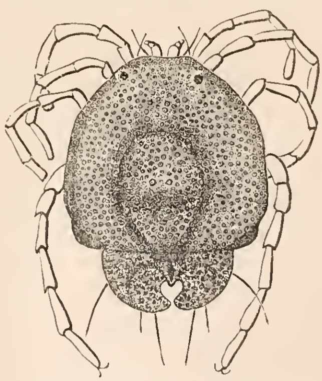


Fig. 19.—*Arrenurus perforatus*, ♂.

there are several more species described by Koch, which possess this peculiar process, such as *Arrenurus tubulator;* these species, however, have not yet fallen into my net, and I shall now mention some in which this process is absent.

Arrenurus sinuator (Müller).—This very pretty *A. maculator* and *A. viridis* (see figure of hind leg); the claws are double, and each claw is also divided. This claw is not peculiar to Arrenurus, but will be found in other water mites.

Arrenurus albator (Müller).—This mite is in many respects like the preceding one, but it is lighter in colour, and is provided with a very different tail; indeed, the tail is the part by which we distinguish one male Arrenurus from another, and it is very wonderful that it should differ so greatly in every species of the same family. I shall not attempt to describe this difference, as I think the figures will do this in a better, quicker, and more pleasant manner, and I trust many of my readers will be induced to search for, and examine the creatures for themselves.

Arrenurus crassicaudatus (Kramer).—This mite much resembles in size and colour the mite just described, but differs in having the central part of the tail shaped like the head of a spear, and scarcely projecting beyond the general contour of the tail. I think I am right in considering it to be the mite described by Kramer under the name of "crassicaudatus."

Arrenurus perforatus (mihi).—This beautiful mite was described and figured by me in SCIENCE-GOSSIP for December, 1881 (p. 269). The tail, as will be seen by the figures, is very different from those of any of the other tailed mites; the hind legs, like those of the three preceding species, do not possess the spur, which is so marked a character in some of the male mites of this family.

Fig. 20.—*Arrenurus perforatus*, ♂ (under side).

THE NORWICH NATURAL SCIENCE CLUB has lately changed its name to that of the "Norwich Naturalists' Field Club." The meetings are held in the Parochial Hall, South Higham, every Friday evening at 8 o'clock, at which papers are read by the members on natural history subjects. The officers for the present year are: chairman, H. J. Thouless, Esq.; treasurer, A. Notley; secretary, G. H. Perris.

ON THE BRITISH BRAMBLE PHRAGMIDIA.

PHRAGMIDIUM BULBOSUM is a fungus well known to the British microscopists, and as a microscopic object it owes not a little of its popularity to SCIENCE-GOSSIP, in the pages of which many years ago Dr. Cooke gave a figure of its spores, which, doubtless, many readers still remember. Like many other fungi, the phragmidia suffer from a plethora of synonyms; there are only eight European species, yet they have had some thirty or more names given to them by various authors! Two well-marked species occur in this county upon living bramble leaves. These species are generally confounded under the one name, namely *P. bulbosum.* My attention was recently drawn to them by my friend Mr. Soppitt, who kindly sent me specimens of both kinds from Yorkshire. The accompanying figures are drawn to scale of 450 diameters by the camera from Mr. Soppitt's specimens, and serve to show the difference between two typical teleutospores, one of each species. The first, *P. rubi*, Pers., is rather the more slender of the two, it has a larger number of septa, and the papilla surmounting the body of the spore is the longer and more pointed. The sori are smaller, more compact, and generally do not spring from discoloured spots. The other species, *P. violaceum*, Schultz, is probably the more common. It has normally triseptate teleutospores, with smaller and more blunt papillæ, and the upper surface of the leaf from which they spring is marked with purplish-violet spots. It may be worth while to remark that these phragmidia have not only uredospores, but also æcidiospores. The former are well known, but the latter have been hitherto, in this

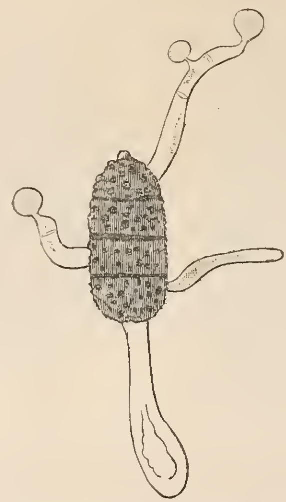


Fig. 21.—Teleutospore of *Phragmidium violaceum* germinating.

county, overlooked almost entirely by fungologists. The æcidium stage of these fungi does not consist of cluster cups in the ordinary acceptation of the term, for the æcidiospores are not surrounded by peridia, but they are æcidiospores none the less, being produced in chains, and not borne singly on the ends of separate mycelial branches as the uredospores are. Last April I found the æcidiospores growing in company (*i.e.*, on the same leaves) with the previous year's teleutospores on a large bush of *Rubus fruticosus* near King's Lynn, which by reason of the very mild winter still retained the bulk of its foliage. These æcidiospores are ripe, they in their turn germinate and protrude germ-tubes (fig. 23) which enter the stomata of the bramble leaves and give rise to the uredospores. I was fortunate enough to watch these germinations last April, and would suggest that some of the readers of SCIENCE-GOSSIP might be interested in doing the same next spring. The most striking feature is to observe the orange endochrome pass into the hyaline promycelium from a dark almost black teleutospore. It is obvious that the æcidiospores are only produced once in the life history of the fungus, so that they are necessarily less frequently

Fig. 22.—*Phragmidium rubi*, Pers.

Fig. 23.—*Phragmidium violaceum*, Schultz.

Fig. 24.—Æcidiospores of *Phragmidium violaceum* germinating.

æcidiospores are produced as follows: The last year's teleutospores germinate by throwing out from each segment of the spore a promycelial tube, into which the contents of the spore are passed as orange granules; in a few hours the promycelium has given off one or more short branches, at the extremities of which the spores are formed. Into these spores all the orange granules collect. These spores soon fall off, and under favourable circumstances, in a few hours germinate by throwing out delicate germ-tubes. If this takes place upon a bramble leaf the germ-tubes bore through the epidermis, enter the leaf, and in due time produce the æcidiospores. When the

met with than the uredospores, which are to be found all through the summer months.

For the benefit of those interested, descriptions of these two phragmidia, with their synonyms* are appended.

Phragmidium rubi, Pers. (*Puccinia mucronata*, β. *rubi*, Pers. *Uredo bulbosa*, Strauss. *Phragmidium incrassatum*, var. 2 Link; *P. microsorum*, Sacc.)

I. Æcidiospores in heaps, often confluent, elongated and following the venation of the leaf, orange-yellow, roundish polygonal, 18 to 22 mk.

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* Rabenhorst's "Kryptogamen Flora," edit. 1881, pp. 230, 231.

II. Uredospores in small roundish, scattered or subconfluent sori, pale yellow, roundish elliptical or ovate, delicately echinulate, 17 to 32 mk. long, by 12 to 20 mk. wide.

III. Teleutospores in small round, often confluent, black sori, borne on long stalks which are thickened below, 3 to 8- mostly 5 to 6-celled, warty, with a more or less elongate conical paler papilla or point, attaining a length of 110 mk. On *Rubus fruticosus*, L., *caesius*, L., and *saxatilis*, L.

Phragmidium violaceum, Schultz. (*Puccina violacea*, Schultz. *Phragmidium asperum*, Wallr. *Uredo vepris*, Rob.)

I. Æcidiospores in roundish or elongated, scattered or irregular masses. Spores in short chains, round or elliptical, echinulate, orange-yellow 19 to 30 by 17 to 24 mk.

II. Uredospores in rather large, roundish, cushion-shaped, discrete, rarely confluent sori. Spores yellow, round, seldom elliptical or ovate, with a thick, coarsely echinulate epispore 17 to 32 by 17 to 24 mk.

III. Teleutospores with 3 to 5, mostly 4 cells, warty, having a paler subglobose or conical papilla, borne on very long dilated stalks, 105 mk. long by 35 mk. thick. On *Rubus fruticosus*, *L.*

CHARLES B. PLOWRIGHT.

NOTES ON NEW BOOKS.

CHAPTERS ON EVOLUTION, by Dr. Andrew Wilson (London: Chatto & Windus). Dr. Wilson's pen has turned out much good and useful work, but never better than this volume contains. It may be regarded as a very full and complete "Manual" of the new philosophy of biology. The author marshals his facts in the plainest and most telling manner, his explanations of them none can misunderstand, and occasionally his descriptive style rises to something like eloquence. He is not quite free from what Herbert Spencer calls the "Anti-theological Bias," but there is only just enough of it to flavour the book, although we notice several reviewers who are affected by the opposite, or "Theological bias," have taken unnecessary alarm. This volume is crowded with biological facts, which alone would have rendered it a valuable work, apart from its discussion of the philosophy the facts are intended to illustrate. We cordially recommend its perusal to all naturalists, or people fond of natural history literature, for here they will find many old truths mounted in new settings.

Winners in Life's Race, or the Great Backboned Family, by Arabella B. Buckley (London: Edward Stanford). Like all of Miss Buckley's books on natural history, the present work is charmingly and attractively written. It is a work for general readers rather than students, and an admirable book to put into the hands of young people. The author has gleaned in every department of natural science, geology, embryology, anatomy, physiology, morphology, &c., and her facts include the latest discoveries. These she has made use of to trace the influence of the law of natural selection in its operation upon vertebrate animals, from their first appearance on the earth to the present time. She concludes as follows:—"It is most interesting to trace the gradual evolution of numberless different forms, and see how each has become fitted for the life it has to live. It gives us courage to struggle on under difficulties, when we see how patiently the lower animals meet the dangers and anxieties of their lives, and conquer or die in the struggle for existence. But, far beyond all these, is the great moral lesson taught at every step in the history of the development of the animal world, that, amidst toil and suffering, struggle and death, the supreme law of life is the law of Self Devotion and Love."

Siberia in Asia, by Henry Seebohm (London: John Murray). Those who read Mr. Seebohm's book on "Siberia in Europe," published about two years ago, will make all haste to procure this volume before us. Like its predecessor, it is beautifully got up, the woodcuts are gems of the art, the letter-press is clear and pleasant to the eyes. The author carries the reader with him to the very end, interesting him in all his own successes or mishaps, his hopes and fears; for, in addition to an animated style of writing, Mr. Seebohm is in earnest, and has no time to waste, and we unconsciously feel it. Moreover, he is not a mere sportsman. His description of the birds he observes or takes, and his comparisons with representative species, as well as his generalised remarks on their distribution, migration, &c., are most philosophical, and may be regarded as valuable contributions to the advanced thoughts of the day on all these subjects.

Zoological Notes, by Arthur Nicols, F.G.S. (London: L. Upcott Gill). Some time ago we had the pleasure of favourably noticing a little work on geology by Mr. Nicol, and we are reminded of the fact by the handsome volume before us, devoted to general natural history. It is a pleasant repertory of anecdotes and facts bearing on the lives and habits of animals, but chiefly on snakes, birds, and marsupials. The author is well read in the latest literature, bearing on all these subjects, and his readers will find themselves treated to the best and most philosophical views held on all that he discourses. The full page illustrations are excellent, especially that showing the platypus in its native haunts.

Science in Short Chapters, by W. Mattieu Williams (London: Chatto & Windus). There are few writers on the subjects which Mr. Mattieu Williams selects, whose fertility and originality are equal to his own. We read all he has to say with pleasure, and very rarely without profit. The book before us is a reprint of many good things that would have been hidden away in the columns of newspapers, or the pages of extinct magazines. The subjects discussed are astronomical, geological, chemical, physical, and technological. All the papers are short and lively. The reader is plunged into the subject at once, and immediately sees with the author how the case stands. Altogether there are forty-four short chapters. The longest and perhaps the best of them is that which gives us a clear digest of the author's work on "The Fuel of the Sun."

The Sun, its Planets, and their Satellites, by the Rev. Edmund Ledger, M.A. (London: Edward Stanford). Thanks to several popular and able writers, such as Messrs. Proctor, Williams, and others, astronomy has once more become attractive to general readers, and the present work will maintain the position thus gained. It is in reality the publication of the course of lectures upon the Solar System read in Gresham College, London. We have often thought it a pity the Gresham lectures had to be got up for so slender an audience, and we are therefore glad to find Mr. Ledger seeking a larger circle of students. We hardly need say these lectures are exceedingly full. The latest information afforded by astronomical observation all over the world is packed away in handy and available compass, and the author skilfully arranges his matter so that it comes in where it is most telling. Two lectures are devoted to the sun, and two to the moon, the planets having a chapter devoted generally to each of them, and one to the minor planets. There are nearly one hundred illustrations, besides coloured plates, photographs and charts, and altogether these lectures make up a very handsome volume which will be found a very useful manual to all students of astronomy.

Ancient Battle-fields of Lancashire, by Charles Hardwick (Manchester: Abel Heywood & Son). Mr. Hardwick is well known as an ardent and enthusiastic archæologist, and the subject discussed in this little volume is one he has pre-eminently made his own, so that all he has to say will be listened to attentively by antiquaries all over England. But Mr. Hardwick is no mere local chronicler—he is well read in all the literature of comparative mythology and anthropology, and he has a keen eye for detecting traditions and local myths which have been separated from the great stream. In consequence, we have a most attractive and delightfully fresh book, in which the author's crisp and natural style is not the least of its claims to public attention.

Diseases of Memory, by M. Ribot (London: Kegan Paul & Co.). This is one of the latest published volumes of the invaluable "International Scientific Series." The author discusses a subject he has made his own by years of study, and we have in the present volume a psychological monograph upon the diseases of memory. The chief subjects discussed are memory considered as a biological fact, general amnesia, partial amnesia, exaltations of memory, &c. The student will find in this volume (as in all others of the series) a very helpful book.

Water and its Teaching, by C. Lloyd Morgan (London: Edward Stanford). Here is a nicely got up and most suggestive little handbook, in which all that relates to water and its work, chemical, physical, geological, and geographical, is tersely arranged under properly classified heads. We have already found it very handy as a reference to the subjects it professes to deal with, and we are pleased to find so useful a little book contributed to English Science from South Africa, where the author resides.

Footprints, by Sarah Tytler (London: T. Fisher Unwin). Those who are acquainted with this author's style will readily understand that a book by her on Nature, as seen from the human side, must be peculiarly attractive. Such is the present; natural history objects form the texts from which charming sermons are preached, and about which pleasant anecdotes cluster. It will make a very welcome gift-book to young people.

A Picture Book of Country Life, by James Western (London: T. Fisher Unwin). Indirectly this work proves how rapidly natural science is progressing, for it is a book competing as a seasonal volume with ordinary Christmas books. It is beautifully got up, with large type of print, and abundance of wood-cuts, and from the way in which a young lady of the adult age of eight years has been absorbed in it (and we made her its critic) we safely prophesy the book will be generally successful. Boys will be particularly pleased with the fishing, boating, tricycling, and rambling parts of it, and the author will succeed in interesting them in natural history objects before they are aware of it.

THE DANISH FOREST.

By John Wager.

No. I.—The Prehistoric Forest.

THE Danes, like most other good people, have an affection for their country; and the affection is well deserved, even though we Englanders may dispute with them the right to consider their country the most beautiful in the world. Nevertheless, after having, as in duty bound, claimed precedence for our own, we will readily admit that we scarcely know where else to find such a concentration of sweet and gentle scenes—so rich and varied a commingling and interchange of wood and water, snug thatched cottages, and quaint tree-embosomed homesteads—as may be seen to nestle among the Danish Isles. Denmark is entirely wanting in the grandeur which characterises the scenery of the other two chief divisions of Scandinavia, that of Norway especially; but it has a compensating beauty of a character which, with peculiarities of its own, often forcibly suggests the quieter portions of our purely English landscape, where its streams are untainted, and its woods are brightly green; thus agreeably associating a trace of home feeling with our enjoyment of another land. It has no grim mountains weighted with desolation of fractured rock and everlasting snow; but its gentle hills and sunny slopes are loaded with richer grain. Its fjords are open to the day, mirroring the broad heavens, instead of hiding in the darkness of deep and sinuous ravines; its streams are never impatient of life, rushing madly down to the sea; but they saunter quietly through the green meadows, brimful of contentment with all around them, and with themselves; and if it has no vast stretches of gloomy pine forest, interspersed with wide mosses and dismal swamps, it has its solemn groves of oak, and its genial woods of beech—often overhanging the beetling sea-cliffs, or sloping gently to the edge of the rolling or rippling waves. Very pleasant to the writer are the recollections of their grateful shade, and of the lovely scenes to which they largely contribute in summer time when the sheltered bays, and friths, and narrow sounds, and more open seas of this fragmentary land are blue as the clear and often cloudless skies. The beechwoods of Denmark form indeed one of the most distinguishing features of its landscape; Denmark is peculiarly the home of the beech; nowhere else perhaps in the world does it grow, within the same limits, so abundantly and with such luxuriance. No wonder the kind-hearted and genial Danes love this noble and graceful tree, and have adopted it as the symbol of their nationality; agreeing doubtless with our Gilbert White, who knowing the beech as it grew upon its favourite chalk soil, pronounced it "the most lovely of all forest trees, whether we consider its smooth rind or bark, its glossy foliage, or graceful pendulous boughs." No wonder that Danish painters delight in the beech wood, depicting with sympathetic care and Nature's truth, the brilliance of golden light upon its extended leafage, and the depth of contrasting shade its denser masses cast upon the ground. How charmingly too, as may be seen in the National Gallery at Copenhagen, their pencils luxuriate among the anemones which in early spring disport in fairy troops around the great purply trunks—fluttering their gay attire in the breeze upon a sunny bank that slopes down to still waters, where they see themselves reflected along with the beech-trees' pendent twigs and quivering leaves.

This predominance of the beech is however an occurrence of comparatively recent times, the result, mainly, of natural causes which have also effected other changes in the Danish forest. These causes and their effects have been studiously investigated by the late Dr. Vaupell, a Danish author, whose exposition of the subject, especially as regards the suppression of the oak by the beech, I will shortly endeavour to present in a summarised form. Meantime let us glance at the forest as it existed during prehistoric ages, though probably after man had migrated into the land. Professor Stenstrup is, I believe, the chief original authority on this subject, but the information which follows is derived from Erslev's "Danske Stat," and the "Jordbeskrivelse" of Ludwig Daa.

Observations made in the peat mosses of Denmark have shown that during the long course of ages four successive changes have taken place in its forest-growths; that in the far distant past, the gloomy Scotch fir, which long ago ceased to be indigenous, ruled like a heavy Saturn over wide domains where now the graceful and lively beech-tree, youngest-born of the forest-gods, holds undisputed sway. Denmark abounds with peat-mosses, the several varieties being known as forest-moses, carr-mosses, and ling-mosses; the first only containing the remains of trees, whose branches and leaves have contributed to the formation of the peat. They are situated in tracks which either are or have been wooded, within roundish or elongated hollows among hills of gravel and rolled stones; though of less extension than the other kinds, they are usually deeper, and several of them have not unfrequently a linked connection. Originally they were lakes, and while passing by slow degrees, in consequence of the growth and decay of successive generations of water-plants and moss, from the watery state to that of consolidated peat, branches and even whole trees were blown into them by violent storms from the surrounding hills; trees too which grew along their margins, and upon the mosses themselves, fell, and also become imbedded in the slowly but constantly increasing mass. Some of the trees which grew upon the moss yet retain their erect position, others lie about in every direction; but all those blown from the hills and the margins have their roots directed outwards, and their tops towards the centre of the moss. Fragments of charcoal, and charred stems, often found in the mosses, are probably a result of fires kindled by lighting.

Of the more distinctive trees found in the mosses, the aspen (*Populus tremula*) occupies the lowest place; next comes the Scotch fir; then the oak; and finally the alder and the beech. The birch is found throughout the whole mass of peat, but being of a light loose texture is, like the alder, also more frequently denoted by bark filled with peat-earth than by stems and branches. Some of the forest-mosses appear to have been formed after the aspen tree's period, as they contain no remains of it; while in their deepest layer there are many remains of the Scotch fir, considerable traces of which appear in the forest-mosses generally, though nowhere any trace of the spruce. Remains of the oak, always above the fir, are also numerous in the mosses; but, according to Dr. Vaupell, the species, or variety, found there is the *Quercus Robur pedunculata*, now common in Denmark, and not, as others have stated, the *Q. R. sessiliflora* which is very rare. Hazel and willow are frequent in the layer of the alder, and occasionally found in that of the oak.

There is a slight discrepancy between my two authorities as regards the beech; Daa states that it is not found even in the uppermost layer of the mosses; but Erslev mentions its presence there along with the alder, stating that north of the Eider it is found only in the most recent layers, and that even in Holstein, south of that boundary, its presence in any of the older ones is doubtful. That the Scotch fir, once the prevailing aborigine of the Danish forest, should have so completely lost its inheritance that a century ago not a single specimen existed in all Denmark which had not been planted, is a remarkable fact; it has been said also that when planted it does not thrive, while, on the other hand, plantations of the spruce fir, an exotic quite unknown in the primeval forest of Denmark, are in a flourishing state. Stone implements found in the peat-mosses, together with the remains of Scotch firs, afford presumptive evidence that man was here coeval with them; and Stenstrup has also shown that place-names derived from this tree, such as Fur and Fureby, render probable the continuance of its growth after the present Gothic or Teutonic race had possessed themselves of the land. In the western districts of Jutland and some parts of Funen, the intermixture of leaves of Scotch fir in its composition has produced a light-coloured, fattish kind of peat, which the peasants use for light, by placing successive portions of it upon the hearth; where it burns with a clear flame, and with a smell like that of burning amber. They also use splinters of the fossil tree to carry about the house, instead of candles.

Amongst other conjectures to account for these successive changes of forest-growths, is that of changed conditions of the soil; arising in part, at least, from the exhaustion by one species of the peculiar aliment necessary for its vigorous life, and for the lack of which it dies out, and gives place to another for which the condition of the soil has become more favourable.

Prognostications of Winter.—With reference to Mr. W. Ellis's, Enfield, remarks on abundance of hips, haws, and holly berries, foretelling a severe winter—there are none this year in this vicinity, while last autumn they were most abundant. Yet the winter was a very mild one. The previous winter was very severe, but the before-mentioned berries were scarce. I have frequently remarked an abundance of berries in autumn followed by a mild winter. I believe that abundance or the contrary is like that of most fruits (it very rarely happens there are two consecutive good fruit seasons), and that it has no connection with the severity or mildness of the ensuing winter.—*W. Hamilton.*

MICROSCOPY.

Mourne Diatoms.—In Dr. Carpenter on the "Microscope," Davies on "Mounting Microscopic Objects," and other works, mention is made of Diatomaceous Fossil Deposit of Mourne Mountain and South Mourne, in Ireland, and in several catalogues the dealers in material offer slides of Diatoms from Lough Mourne. There is a Lough Mourne in co. Antrim, near Carrickfergus, where there is a deposit of fossil Diatoms well known to Belfast microscopists, who are unacquainted with any in the Mourne Mountains. Can any one give the precise locality in the mountain range of Mourne in S.W. of co. Down, and date of the discovery?—*H. W. Lett, M.A.*

"The Micrographic Dictionary."—We have received Parts 14, 15, 16, and 17 of the fourth edition of this admirable work, now being issued by Van Voorst, bringing the subject-matter up to *Salicornaria*, in alphabetical order of arrangement.

Obituary.—Our microsophical readers will be sorry to hear of the death of Mr. Andrew Pritchard, author of the well-known "Manual of the Infusoria," published in 1841, and which has been long remarkable for the high price a copy fetched. Mr. Pritchard lived through the most important period of the development of microscopical research, and has now died at the ripe age of 78 years.

Forms of Heliopelta.—I have just seen for the first time Science-Gossip for 1877, vol. 13; and I notice, p. 37, the query of Mr. G. M. Gowan. Probably the information he has sought for has been obtained long ago, but if not it will be useful even at this late day. Ralfs in Pritchard, 4th edition, 1861, seems to have been the first to introduce confusion in the nomenclature of Ehrenberg's Heliopelta. R. gives:—*Heliopelta Metii*, 6 rays; *H. Leuwenhoeckii*, 8 rays; *H. Eulerii*; 12 rays; *H. Selligurii*, not specified. The original specimen of the so-called "Bermuda" earth was sent to E. by the late Professor J. W. Bailey. In Am. Jour. Sci., vol. 48, 1845, B. gives a lengthy report of what he and E. found, with a fine figure of *H. Leuwenhoeckii*, with 8 rays, copied from E. I have not the microgeology at hand, but the species as originally named were:—*H. Metii*, 6 rays; *H. Leuwenhoeckii*, 8 rays; *H. Eulerii*, 10 rays; *H. Selligurii*, 12 rays. I have one frustule found by Mr. E. Samuels with 18 rays, and one sent to me by Mr. T. Christian with 14 rays. These are all the true Heliopeltas I have ever seen or read of. The genus seemed until very recently to have been limited to the valley of the Pantuxtent River in Maryland, at and in the vicinity of Nottingham, unquestionably the original locality of the Bermuda. I once found a single specimen in a Virginia deposit. Quite recently I received from Mr. T. Christian numerous specimens of true Heliopeltas that he found in California deposits. I have not found one in the same material. Still more recently Mr. Christian informed me that he has found the genus living. These I have not seen. Mr. Gowan mentioned a double frustule that came apart, that the number of rays differed in the two parts. (I suppose by "double" he means a whole frustule, both valves). Precisely the same thing happened to a friend, who was mounting an *Aulacodiscus Oreganus*, Bail. These instances prove the worthlessness of the number of rays alone as specific characters, as was specified by Bailey, thirty years ago.—*Charles Stodder*, *Boston*, *U.S.A.*

STANDARD SIZES FOR EYE-PIECES.—In the December number of SCIENCE-GOSSIP, p. 276, in an American notice of "Practical Microscopy," by Mr. G. E. Davis, the inconvenience of the want of a universal gauge for eye-pieces and sub-stages is called attention to. The Royal Microscopical Society have certainly done their best to remove the difficulty. After considerable trouble in ascertaining the amount of variation in gauge, they recommend "that the standards for eye-pieces should be two in number, with a single standard for sub-stages. That the two standard gauges for eye-pieces should be: for the No. 1, 1·35 inch, and for the No. 2, ·92 inch, (external diameter), and that the gauge for the sub-stages should be 1·5 inch (internal diameter). The No. 1 gauge is generally used for the larger instruments in England, whilst No. 2 is that adopted by many Continental makers." This report of the committee appointed to investigate the subject was presented to the Council, November 9, 1881, and since published in the Transactions of the Society, vol. ii. p. 595, 1882. By calling attention to the subject in SCIENCE-GOSSIP you will greatly facilitate the adoption of these standard sizes.—*W. T. Suffolk, F.R.M.S.*

"STUDIES IN MICROSCOPICAL SCIENCE."—It gives us much pleasure to call attention to the following of these "Studies" recently sent out weekly, and illustrated with slides, &c.: "Human Thyroid Body," "Structure of the Sporocarp of Pilularia," "Thymus Gland of Calf," "Thallus of *Sticta pulmonacea*," "Human Pancreas," and "Thallus of *Sticta aurata*." The list is so varied that every class of workers is sure to be interested in these "Studies."

THE GUILLEMOT.—From remarks in Mr. Kermode's paper on the guillemot (in the number for November) any one unacquainted with the habits of the bird would imagine that it was unable to fly, and had to climb from the water to its nest in the rocks. But this is not the case, for it rises (when unhurt, as the one described by Mr. Kermode must have been) with ease from the water, and flies well, and with great swiftness.—*P.*

ZOOLOGY.

A WORK ON THE BUTTERFLIES OF INDIA, BURMAH, AND CEYLON, by Major Marshall and M. Lionel de Nicéville, which promises to be a valuable addition to entomology, is being issued in parts by the Calcutta Central Press Co. I have seen Part I. and perhaps the only objection to it, and that in a beginner's eyes, is that it should have more coloured plates. They would no doubt enhance its price, and the descriptive letter-press appears to be sufficiently full to aid any one in the identification of species; but where every spot and streak on a butterfly's wing is important, coloured plates would be a welcome, as well as a useful addition.—*W. J. S.*, *Calcutta.*

SPHINX PINASTRI.—The following notes relate to some English specimens of this rare moth, taken last summer:—Nine eggs hatched out August 7, and took to Scotch pine freely. Two died at first casting of skins—in two days. One egg added from the same female—making eight altogether—of which two have since died—leaving six. These have cast their skins twice, and are now something like one inch long, and feeding freely (August 20). August 23, 24. Larvæ have changed their skins for the third time. September 14. Larvæ grown very much; have now changed six times. October 10. The last of the larvæ has now gone to earth. Unfortunately, September 15, I was called away, and did not return in time to see the last stage of the larvæ. I have placed them in a large glass vessel, with plenty of light soil and turf, and have every hope they will emerge next July. —*F. H.*

THE GREAT GREY SHRIKE (*Lanius excubitor*).—I had a fine specimen of this bird brought me by Mr. J. A. Smith, of Akenham Rise Hall, near Ipswich, who shot on Saturday, December 2. Three days afterwards, another specimen was shot in the neighbourhood of the same town.—*J. E. Taylor.*

THE BLACK STORK IN IRELAND.—A very fine specimen of the black stork (*Ciconia nigra*), was shot last spring, near Killyleagh, on the shore of Strangford Lough, in co. Down. It has been preserved by the veteran taxidermist, Mr. Wm. Darragh, at the Belfast Museum, and is now a valuable object in the collection of R. Loyd Patterson, Esq. Thompson (Nat. Hist. vol. ii. p. 178) says, that this bird "is unknown as a visitant to the island." Dr. Scouler included it in a 'Notice of Animals which have disappeared from Ireland' (Journ. Geolog. Soc. of Dublin, vol. i. p. 227), on the authority of the following words from Giraldus:—'Ciconiæ vero per totam insulam rarissimæ sunt illæ nigræ' (Top. Hib. 707). Four only of these birds have been recorded as obtained in England (Yarr. B. B. 2nd ed. 1845), none in Scotland; the first in May, 1814 Although they migrate so far northward in summer as Sweden, their line of flight is still more easterly than that of the white stork ; even Holland being very rarely visited by them."—*H. W. Lett, M.A.*

RED-THROATED DIVER IN CAMBRIDGESHIRE.—Two specimens of this bird were captured in this county last November. I am not sure as to the exact locality, but I think it was Isleham fen.—*Albert H. Waters, B.A., Cambridge.*

THE SKUA GULL.—A specimen of this bird was also taken in the Cambridgeshire fens about the same date [November, 1882].—*Albert H. Waters, B.A., Cambridge.*

PRUSSIC ACID IN MYRIOPODS.—Many vegetable substances have recently been found also to be secreted by animals, such as cellulose, chlorophyll, and even starch in certain Planarians. Now we hear from Holland of a peculiar species of Myriopod found in greenhouses, which gave out a strong smell of bitter almonds, and from which, by distilling a few specimens with water, prussic acid was actually obtained.

EMBRYOGENY OF THE BRYOZOA.—Dr. Jules Barrois thinks the Entoprocta should be regarded as the original type of the "sea-mats," and that we may conceive of the original formation of a bryozoan at the expense of its larva as resulting from a simple change of life in a creature resembling a rotifer. He concludes that our "sea-mats" may have been derived originally from free-swimming creatures analogous to rotifers.

WATER-SNAILS.—The author of the articles upon this subject, which appeared in the last volume of SCIENCE-GOSSIP, writes to us as follows :—In reply to Mr. B. B. Woodward's friendly criticism of my paper, I fear I must plead guilty to the charge of having repeated an old and exploded statement of the formation of shells. Curiously enough Mr. Woodward himself seems to have only recently formed a decided opinion upon the subject, for a friend calls my attention to "Science for All," 1880, wherein Mr. Woodward thus expresses himself : "Each layer of the shell was really, some maintain, once a portion of the mantle itself, which became calcified, that is, hardened with carbonate of lime, and was then thrown off to unite with those previously formed. Professor Huxley, however, believes that shell-growth is not a case of conversion, but one of excretion, and that the shell is built up of successive excretions of membranous laminæ, in which granules of carbonate of lime are deposited. . . . Whichever theory be adopted, the result remains the same." With reference to the other point I must take shelter behind my authority. In the "Quarterly Journal of Microscopical Science" for October, 1874, Professor E. Ray Lankester described a series of minute and careful observations on the embryonic development of *Limnæa stagnalis.* In this article, which should be seen by all interested in the subject, he states "the foot is essentially a greatly developed lower lip" (page 367). This was my authority, but in a paper which distinctly aimed at being popular, and creating an interest in the subject, names and references were purposely excluded. For the same reason a detailed statement of the homology of the "foot" in gasteropoda would have been out of place, had my knowledge of comparative anatomy allowed me to give it.

CAPTURE OF APOLLO BUTTERFLY IN DEVONSHIRE.—In reply to Mr. W. J. V. Vandenbergh, I am happy to give all the information I can regarding my lucky capture. I forget the exact date, but it was towards the end of summer, I think in August, about three years ago. I was on a walking tour through Devonshire, and the locality was Clovelly. Shortly after quitting the village, I went along a narrow path winding up a hill ; one side of the path was guarded by steep sandy rocks, and the other by a deep precipital descent. I had not got my insect net with me, and, as usually happens in such cases, butterflies were literally swarming. Clouded yellows, peacocks, and scarlet admirals were flying in every direction, and occasionally the white admiral was to be seen. But these I had no means of catching. Suddenly a wild rose flower gave a sort of plunge, and on looking around for the cause, I saw an unmistakeable male Apollo butterfly sitting there. I cautiously put my hand over it, and enclosed it : it made not the slightest resistance, and, not having box or bottle, I transferred it uninjured to a bag I was carrying. It is in perfect condition, and has safely passed the ordeal of mites, which have destroyed some good specimens during my absence. It is impossible to mistake its identity ; and if the editor thinks fit, I will send him a sketch of it, that he may see there is no mistake.—*H. C. Brooke.*

BOTANY.

"THE BRITISH MOSS-FLORA."—Dr. Braithwaite has just issued Part VI. (price four shillings) of this splendid work, devoted to the family Dicranaceæ, illustrated by figures and details of structures of twenty-eight species.

TRIFOLIUM STELLATUM, L. (SCIENCE-GOSSIP, 1882, p. 279).—Your correspondent H. E. W. will be glad to hear that *Trifolium stellatum* is still in fair quantity in its old station at Shoreham, Sussex, where I gathered it in August, 1881. At that time of the year it was of course not in good condition. As I am known to H. E. W. she can have specimens if wished for.—*Arthur Bennett, Croydon.*

"A NEW POTAMOGETON" (SCIENCE-GOSSIP, 1882, p. 259).—I should like to supplement Mr. Jackson's observations on his interesting find, by a few notes. Specimens in this genus devoid of fruit may be roughly separated into two classes: *i.e.* those easy to name, and those very difficult to name (without fruit). Mr. Jackson's specimens belong to the latter. Since I wrote to him I have received from the Rev. Ottley specimens gathered in the river Soar, Leicestershire, that come about halfway between Mr. J.'s and typical *perfoliatus.* And last year specimens "near Mr. Jackson's" were gathered in the neighbourhood of the Great Lakes in North America, by my friend the Rev. T. Morong. I have not yet seen these, but he writes me they much resemble the Wetherly plant, of which I sent him a scrap and drawing. He, like the finder and others, asks "can they be abnormal *prælongus* or *perfoliatus?*" I feel sure that when fruit is found it will prove to come under *perfoliatus* as a variety, and it may well bear the name given in the "Botanical Record Club Report," by Dr. Lees, "*P. perfoliatus*, var. *Jacksoni*" (name only). I need not say I shall be very glad to receive many more such puzzles in the genus. —*Arthur Bennett, Croydon.*

Plants and the Snow-Line.—On some hills there is a snow-line as on Slieve Snaght (*Anglice* the Snow Mountain), Inisowen, co. Donegal. Has any one else ever specially examined a hill with this idea in his head, to see if this snow-line could be traced out by the plants? This seems to have a connection with the subject of Dr. Taylor's paper in "Nature." It would be interesting to know if on such a hill the plants are lower than on the neighbouring hills where the snow only rarely lies. On Snaght the snow will lie, while on neighbouring peaks higher than the snow-line there will be none.—*G. H. K.*

GEOLOGY.

The Drift-Beds of the North-West of England and North Wales.—This is the title of a paper just read before the Geological Society by Mr. Mellard Reade, C.E., F.G.S. The author stated that the first part of this paper, read in 1873, treated of the low-level Boulder-clay and sands, specially in relation to the contained shells. Since that time he has been diligently collecting information to enable him to treat of the nature, origin, and stratigraphy of the Drift lying between Liverpool and St. Bees and Liverpool and Carnarvonshire. He finds that, in the basin of the River Mersey, the Triassic rocks underlying the low-level Boulder-clay and sands are cut up by a system of preglacial valleys in some cases, presenting very precipitous sides and not in all cases following the present course of the rivers. If the mantle of clay and sands could be stripped off, we should have scenery differing considerably from the present surface-features. These preglacial valleys are, in parts of their courses, considerably below the present low-water level. Where the rock has been bared, and it is of a nature capable of retaining striations, we almost invariably find it planed and grooved in a direction approximately from north-west; and when the rock is soft, it is broken up into rubble and red sand. Upon this débris of the Trias lie the low-level Boulder-clay and sands of the plains, the clay lying immediately on the rock being frequently, not invariably, of a sandier and harder nature than the upper beds. Lines of erosion of a local nature, but often of considerable extent, often occur at the top of this clay and then die out; or there are thin or thick beds of sand and gravel intercalated at the junction and also dying out. Sometimes sand and gravels underlie this harder clay; but the larger mass of the low-level clay is of a more plastic nature, and is used in brickmaking. Intercalated sand-beds also occur in this, and sometimes the clay gets stonier again near the top. If we trace the drift from the sea up each river-valley to the high lands, we see at once that the nature of the clay gets more intimately connected with the rocks in the basin above. This is specially noticeable in the Ribble valley, where the brown marine Boulder-clay gradually, above Milton Bridge, gets replaced by a drift composed almost wholly of the débris and grindings of the Carboniferous limestone and grits above. In the mountain districts, also, the drift becomes more localised, both in Cumberland and Wales. The author's conclusions are that an ice-sheet, radiating from the mountain-district of the English lakes and the south of Scotland, produced the planing and grooving of the rock and the red sand and rubble débris; then the ice melted back into local glaciers, and the submergence began. The low-level Boulder-clay and sands were, during a slow submergence, laid down probably at depths of from 200 to 300 feet; and the author considers that all the phenomena can be satisfactorily accounted for by ordinary river-action and fraying of the coasts by the sea, combined with frost and ice due to a severer climate bringing down the materials of such river-basins to the sea, while icebergs and coast-ice sailed over, dropping on the sea-bottom their burdens of erratic stones and other materials from the mountain districts of the north. He pointed out, also, that the great majority of the well-glaciated rocks were specially those that could be traced to the highlands. This fact was forced upon his notice after making a large collection of glaciated boulders and pebbles. Among the rocks he had been able to identify, with the help of Professor Bonney and Mr. P. Dudgeon, of Dumfries, Scawfell granite (Eskdale, of Mackintosh) was the most abundant granite; then came great granites from Dumfries; syenite from Buttermere, which occurred all over the area described, and up to 1200 feet on the Macclesfield Hills, and syenite from Carrock-fell. Other probable identifications were also named. The whole series of rocks from the

Silurian to the New Red Marl were represented in the low-level Boulder-clay; a few flints also occurred, and one piece of what was believed to be chalk. The paper concluded with an Appendix by Mr. David Robertson, giving a list of the Foraminifera and other organisms found in the various beds of Boulder-clay in the Atlantic Docks, Liverpool.

Glacial action in South Brecknockshire and East Glamorganshire.—The above paper was read at the same meeting by T. W. Edgeworth David. The area which it included is about 200 square miles, extending north and south from the Brecknockshire Becons to a line between Cowbridge and the mouth of the Rhymney, of which the Cly valley has been more particularly studied. Most of the rocks on this district, and particularly the Millstone Grit, retain traces of glacial markings. The whole area has a *moutonnée* aspect. The evidence of glacial action is classified under the following heads:—(1) erratics; (2) Boulder clay; (3) shattered and contorted rock-surfaces; (4) grooved and striated rock-surfaces. The first three obtain everywhere; but the last is confined to the coal-basin sandstones in certain localities, to the Millstone Grit at its northern outcrop, and to a small extent of Carboniferous Limestone to the north of the latter. (1) The erratics consist of Old Red Sandstone, of various members of the Carboniferous series, of dolomitic conglomerate, Lias, and chalk flints. These, in one district, are derived from Brecknockshire rocks, in another from Glamorganshire. (2) The Boulder-clay contains boulders which are sometimes 5 feet in diameter, generally smoothed, rounded, and striated. It is sometimes 100 feet thick, and is found as high as 1200 feet above the sea. Many sections are described, and percentages of their contents given. (3) In certain districts the rocks are much shattered, so as to resemble a breccia, and Boulder-clay has been forced into this—as, for example, near St. Fagan. (4) Grooved and striated surfaces are preserved under favourable circumstances. A full description is given of a number of instances, the direction of the striæ being recorded, as well as the fall in feet per mile from the summit of the Beacons. The author, in summing up his observations, comes to the conclusion that the erratics in the Eglwysilian and Caevan group were probably, as a rule, transported by floating ice, but that some may be the relics of old moraines; that the Boulder-clay of South Brecknockshire is chiefly the product on land-ice; and that the striated rock-surfaces are in some cases the result of glaciers which have descended existing valleys. In other cases they may have been produced by an ice-sheet, which it is possible may have come from the north-west.

Pothocites not a Flowering Plant.—Our readers will remember that Pothocites, a fossil plant found in the Coal Measures near Edinburgh, has been regarded as a true flowering plant, allied to the aroids. From a specimen which has recently turned up, and been described by Mr. R. Kidston, it appears that the "perianth segments" on the strength of which it was deemed a flowering plant, are in reality the reflected segments of sporangia, and that Pothocites is really related to the Calamites.

NOTES AND QUERIES.

Seasonal Appearance of Animals and Plants in Co. Tyrone, Ireland, made by the Rev. S. A. Brenan.—1873. Bluebell, 7.5; orange lily, 17.6. 1874. Snowflake, 14.2; thorn bursting, 20.2; hive bees clustering, 24.3; laburnum in fl., 1.5; orange tip b., 4.5. 1875. Bees and midges active, 4.1; snowdrops in fl., 12.1; winter aconite, 12.1; orange tip b., 21.4. 1877. Snowdrops in fl., 27.1; dandelion, 27.1; gooseberries bursting, 13.2; crocus in fl., 24.2; *Ficaria verna*, 6.3; *P. fragaria*, 6.3; wood-sorrel, 10.4; fieldfares and redwings seen, 21.4; lilac in fl., 31.5; first horse-fly, 17.6. 1878. Bats flying about, 17.1; *Ficaria verna*, 11.2; white potentilla, 11.2; gadfly on snowdrops, 2.3; daffodils in fl., 3.3; coltsfoot, 11.3; gooseberries in fl., 14.3; wood-sorrel, 5.4; thrush fully fledged, 6.4; orange tip b., 5.5; lilac in fl., 7.5; *Orchis mas.* and bluebells in fl., 7.5; dog-rose in fl., 5.6. 1879. Snowdrops in fl., 12.2; bat flying about, 27.2; signs of growth, 27.2; crocus in fl., 5.3; dandelion, 8.3; coltsfoot in fl., 21.3; daffodils, 27.3; *Ficaria verna*, 31.3; white potentilla, 31.3; vegetation pushing forth as forward as it would be in February, 2.4; sycamore in leaf, 23.4; apple-trees and lilac in fl., 1.6; laburnum, 4.6; yellow flag, 25.6; dog-rose, 5.7; vegetation was six or seven weeks later than usual; very wet summer; no horse-flies first seen, 24.7; hawthorn not out of flower, July 20th; corn-crake calling, 11.8. 1880. Snowdrops appearing, 4.2; signs of vegetation, 13.2; white potentilla, 4.2; dandelion, 21.2; crocus in fl., 28.2; snowflake, 28.2; coltsfoot, 29.2; *Ficaria verna*, 6.3; daffodils, 11.3; gooseberries in fl., 19.3; balsam poplar in leaf, 19.3; white ribes in fl., 19.3; wild anemone, 23.3; larch bursting, 28.3; elm budding, 4.4; horse-chesnut bursting, 5.4; sycamore in leaf, 9.4; goldilocks in fl., 12.4; *Caltha palustris*, 12.4; orange tip b., 30.4; yellow pimpernel, *Orchis mas.* and bluebell in fl., 1.5; swifts appeared, 10.5; lilac in fl., 14.5; wild rose in fl., 9.6; honeysuckle, 10.6; yellow flag, 10.6; swifts left, 14.8; hardly any bloom on hawthorn. 1881. Snowdrops in fl., 9.2; hepatica, 7.3; snowflake, 9.3; coltsfoot, 15.3; visible vegetation in trees and shrubs, 14.3; crocus in fl., 14.3; daffodils in fl., 17.3; *Ficaria verna*, 17.3; gooseberries in fl., 13.4; balsam poplar bursting, 13.4; larch bursting, 13.4; white ribes in fl., 15.4; whitethorn bursting, 15.4; may-flowers, 24.4; swifts appeared, 10.5; the florescence of the hawthorn was very profuse; corncrake heard last time, August 1st, at Allan Rock. 1882. Snowdrops and hepatica in fl. at Ballinderry, 10.1; aconite, 14.1; hepatica, 15.1; dandelion and daisies, 16.1; white potentilla, 18.1; snowdrops, 23.1; crocus and snowflake, 11.2; coltsfoot, 14.2; daffodils, 15.2; *Ficaria verna* in full fl., 20.2; wild strawberry and white ribes in fl., 7.3; wild anemone and wood-sorrel in fl., 9.3; horse-chesnut and sycamore in leaf, 17.3; gooseberries in fl., 17.3; laurel in fl., 17.3; thrush with young, 8.4; bluebottle fly appeared, 10.4; cuckoo flower in fl., 13.4; goldilocks, 13.4; yellow pimpernel, 13.4; bluebell, 14.4; wych elm in fl., 17.4.

Late Flowered Iris.—A few days since (Nov. 6th) a friend brought me a specimen of Iris Pseudacorus (yellow flag) in full flower. This plant seems to have done flowering about here generally by the end of June or July.—*Alfred Waller, York.*

Colouring Skulls.—I lately placed the skull of a rat in a solution of chlorine gas, in the hope that it would blanch it, for it had been imperfectly cleaned. To my surprise it soon began to turn green, and before long it became a brilliant green all over, except some spots which were dyed blue. Now that it is dry it still retains its colour. Only the enamel of the teeth and a portion of one of the premaxillary bones remains white. I should be very glad of any explanation of this phenomenon. Is the green colour of the bones of some fish connected with the presence of chlorine (in the sodium chloride) in the sea?—*R. S. Pattrick.*

A Young Gannet.—I beg to give you a note of a young gannet which I got last spring, and kept for some time. There was nothing very peculiar about it, but it shows how easily these birds may be tamed. I have also had a tame cormorant, which I so far trained that it would come at feeding-time to a large bath (fresh water) and dive for its food. It flew away at last, having climbed from one point to another till it got on to the top of the roof, from which it could not get down without using its wings. I do not think it intended to fly off, but once it was in the air, and fairly using its wings, it—very wisely—did not alight in the yard where I kept it, but made for the harbour. I have had a good many bird pets at different times, and have been much struck with the fact that these wild water-birds seem to grow tame much more easily and quickly than other birds.—*Philip Kermode.*

Nettle-Rash. — In the October number, Mr. F. Warters appears to have had an attack of nettle-rash. Many articles of food such as some kinds of fish, mussels, lobsters, cucumbers, &c., have a poisonous effect at various times upon some persons. The last specimen I saw presented a miserable appearance, for he was covered from head to foot with wheals. On running down the catalogue of possible causes, I found it to be traceable to eating fried-fish. On one occasion, having partaken of one of the above-mentioned substances, I experienced late at night an intolerable irritation of the whole body, accompanied with fever, and, on springing out of bed to a mirror, was seized with such horror at the sight of my face, chest, &c., that if every particular hair did not "stand on end like quills of the fretful porcupine," it should have done, for the skin was of a fiery red, tingling as though stung by nettles, and covered with wheals, which also sprung up wherever I was compelled to rub—even all over the scalp.—*Henry J. Bacon.*

A Devouring Foe becomes an Object of Wonder and Admiration.—The cold breezes of a frosty morning in 1877 suggested the idea of looking into my wardrobe to ascertain what warm clothing could be found available for the coming winter, which was predicted to be a severe one. The first thing turned out was a scarlet cloth chest protector, on which I perceived a tiny something, which I shook off; next came a woollen railway wrapper, which I must describe as dark grey, with check of blue and green, here I saw another tiny something, which a little shake sent to the ground also; a sudden thought, however, made me pick them up, with much care, thinking they might be objects for the microscope. The latter was soon placed upon the study table, and my little friends frolicking in a field in which they had never been before. I found them to be the larvæ of the common clothes moth (*Tinca sarsitella*, Fabricius), within a covering or tube of beautiful workmanship, resembling fine basket-work, in which they had power to turn, putting out the head and body, either end at will. The hero of the cloth of scarlet, had woven itself a covering of this colour; the other, one of green and blue, the colours it had fed upon. The inmates were most active under the microscope, the heads and bodies much resembling that of the goat moth caterpillar. Having discovered life, I put them into a match wood box, carpeted with red cloth, often looking at them at my leisure. The circulation of the blood is clearly discernible on the back, and one day I saw an active little parasite on the covering. A year or more afterwards, to my astonishment, I found, on opening the box, four more little scarlet coats, but half the size, and a wing of the true clothes moth, the rest having been eaten by the larvæ. This interesting family now reduced to two still exist, they are very lively under the microscope, and are often exhibited to admiring friends, and "Lovers of Natural History"—*M. B., Tunbridge Wells.*

Parasitic Fungi.—It may interest some of your readers to know, that in March last, I gathered lots of *Æcidium ranunculacearum* on *Ranunculus gracilis* and *repens;* and a month later I gathered lots of *Æcidium urticæ* on the common nettle, or *Urtica dioica.* I also gathered some leaves of *Rhamnus catharticus*, or common buckthorn, profusely covered with its parasite, or *Æcidium crassum.* I noticed a lot of *Peridermapini*, which grows on *Pinus sylvestris.* It grows on the young shoots of very young trees in the Home Park. I noticed that the beans at times were covered with a minute dust on the leaves. I brought some home, and when I examined them under a microscope, it turned out to be *Trichobasis fabæ.* And the common spurge was covered with a red rust, which turned out to be *Lecythea euphorbiæ.* I might go on all night telling you all my adventures with regard to microscopic fungi. They grow on the white thorn, common groundsel, Dutch carrot, common dandelion, and so on, *ad infinitum.* I will write further, later on.—*Thomas Ogilvy.*

Preserving Butterflies and Moths.—The "Field Naturalists' Hand-Book" by Wood, gives the following method of using the insect preservative solution of corrosive sublimate in spirits of wine. "When your insects are quite dry dip them completely into the solution, and hold them there for a second or two. Take them out, and drain all superfluous moisture back into the vessel. Then *dry them as fast as possible in a current of air*, to prevent delicate hairs and fibres from being melted together. *Waving them backwards and forwards* is perhaps the best plan; and if it be done *in the sunshine, or in front of a hot fire*, the insects will be soon dry." I have found this successful. Possibly Walter A. Pearce did not attend to the portions I have italicised. To be well done is to be quickly done.—*H. W. Lett, M.A.*

Preserving Butterflies and Moths.—I use the same solution Mr. Pearce mentions, but, instead of drying them before the fire, he should stick them on the window-sill, raise the window an inch or so, and leave them there until dry. When the feathers on the thorax get matted, which can hardly be helped in the large moths, he should touch them up with the point of a pin which will put them all right. I have lately tried dropping a spot of the solution on the thorax and on each of the wings, which quickly spreads over the entire insect, before taking them off the setting board and letting them dry on the boards, which I think is even better than the above, as it almost entirely prevents the fringes of the wings getting matted.—*George F. Wheeldon.*

Preserving Butterflies and Moths.—If your correspondent Mr. Pearce will dry his insects in the following manner, the results may be more satisfactory. Pin two setting braces on a piece of cork, and the solutioned insect between them, the braces supporting the wings. The cork may be set before a window, which is opened about two inches, and the door of the room also open, which will cause a good draught. The tails of the insects should point to the open window, in fact come almost under it. The wings of small moths are often broken by the wind in the above method. They are therefore better when dried by the fire. Is it necessary to cover the wings with the solution? I have been told not to do so, and find it answers very well at present.—*I. A. S.*

Preserving Butterflies and Moths.—The best way to use the corrosive sublimate solution for the preservation of moths, &c., is, I think, the following:—Dissolve one part of the sublimate in eight parts of good spirits of wine. Then dip a camel's-hair pencil into the solution, and touch the under side of the insect with it, so as to let the liquor lightly pervade every part of the creature, which it readily does. If a larger portion of the sublimate be used, it will, on drying, cause an unsightly whiteness to appear upon the insect. Before closing the case in which the specimen has been placed, the under side of the board on which the insects are fixed, ought to be slightly warmed by the fire, so that the superfluous moisture may fly off. If this precaution be neglected, the inner surface of the glass will sometimes become obscured by the fumes arising from the mixture. This method of preserving insects was, I think, first used by the great English naturalist, Waterton, and is, if I mistake not, to be found fully described in his book entitled "Wanderings in South America."—*J. A T.*

Preserving Larvæ of Lepidoptera.—In reply to query by C. S. as to above, I think the following is the best way of proceeding. Dry the caterpillar with blotting paper—they can be killed by the ordinary cyanide bottle—make a slit in the end of the abdomen, place it between two fresh pieces of blotting paper, and gently squeeze the contents through the aperture, commencing with the head. When the contents are all out, get an ordinary straight glass blow-pipe, but with a piece of watch-spring tied on the end so as to form a spring. Insert the pipe between the skin, let the spring down so as to prevent the larvæ slipping off. A grass stem will do very well, but then the caterpillar requires laying on with fine cotton. Next get a spirit lamp with piece of wire gauze over it to keep the caterpillar from singeing. Even an ordinary iron, heated and placed in a stand, so as to keep it face up, does very well. Hold the caterpillar over the gauze, and keep blowing until it is thoroughly dry, which will vary from some seconds to a few minutes, according to the species. Care must be taken not to blow too hard, or the caterpillar will be distended out of its natural shape. With practice, a continuous blowing can be kept up by breathing through the nose. When dry, some mount them on pieces of straw, or artificial leaves, with a pin stuck through the stem, but I prefer mounting them on dried leaves of the natural food plant.—*George F. Wheeldon.*

Preserving Insects.—Walter A. Pearce should not immerse his insects in the solution of corrosive sublimate and alcohol, but merely paint his specimens on the under side of the body (not wings) with the solution. This is quite as effective a preventive against mites, as if the insects were wholly immersed. I had the same difficulty, as to the fringes of the wings and hairs on the thorax, becoming clogged and matted together. Even if covered with French chalk, the effect is the same. I attribute it to the weight of the corrosive, and the density of the spirit. I find also that an insect, after immersion, becomes very limp when dried again, in fact thoroughly relaxed.—*W. Finch, jun.*

The Dormouse.—I should be greatly obliged if one of your correspondents would kindly give me some information respecting the dormouse. I wish to know what its most suitable food is; whether it sleeps during the winter when in confinement, if it should be kept in a warm room, and also if it can be taught any tricks.—*Meta.*

The Transit of Venus.—Perhaps the readers of your journal, Science-Gossip, would like to hear what we saw of the Transit of Venus. Telescope used one of Casella's, a terrestrial one, but very good, with unusually large object glass; dark glass over eye-piece so dark that unless directed to bright edge of cloud close to sun, all was a blank. Terrestrial eye-piece used. In my almanack was set down external contact 1.56 p.m., internal contact 2.16. At 1.55 we were ready, but clouds prevented observation. At 2.15 clear view, afterwards no trace of anything on sun's disc. All in despair. Well, I said, taking time in London at 2.16 for first view, we ought to see it at 2.28, so a look at a good clock at hand prepared me. Now, I said, we are three degrees west of Greenwich, and shall see it at 2.28, allowing four minutes for our degree. At 2.29–30, a fair view. When I first saw it, Venus was like this (in a rough sketch), three parts over the line, i.e. the edge of sun; colour, ash gray. Soon after, ☽ seen like the small head you see when dissecting a cauliflower in March with its stalk. Third view and others a good black disc on sun's face, well defined like a pistol shot through a small illuminated target at twelve paces, a clean punch. We had good views at times up to 3.10 p.m., when clouds prevented any observation. When we saw her last, Venus had not covered over half of her path across the sun's disc. Notes.—The cauliflower appearance fined down to a point. Apparent diameter of sun a very large greengage or orange. I will send, if you like, my rough original, but true sketches of what we saw. Direction of stalk, due east: head, due west. Path of transit much higher than I thought.—*A. H. Birkett.*

Extracting Minute Snails.—Can any of your readers inform me how to extract the animal from very minute land shells, and if there is any process that will absorb the animal without injury to the shell.—*G. E. Bishop, Watford.*

Scarcity of Acorns.—The following is, I think, the correct way of accounting for the scarcity of acorns mentioned by A. H. Fisher, in the Nov. number of Science-Gossip:—It is not I think, owing to any deficiency of, or defect in, the construction of the organs of fructification, but rather to some obstruction, perversion, or vitiation of the natural powers. In the case of the oak, the most probable cause of sterility seems to be suspended circulation. This is brought about in the spring months of the year, in the following manner:—The sap having begun to flow, a sharp wind or frost comes, causing at once a cessation of the flow. Owing to this withdrawal of nourishment, the immature germ begins to languish, and if the supply be suspended for any length of time, it perishes completely from want of food. The effect, too, of the suspended circulation at this early period of the year, when the fruit is naturally in such a tender and delicate condition, is of course much more injurious than it would be when the young acorn is more developed.—*J. A. Tooner.*

Wasps and Flies.—It may interest J. P. Smythe and others who have written on this matter, to read the following details, gathered from my own experience, and what I have read:—Often whilst out walking, my attention has been attracted by hearing a peculiar buzzing, as if of some entangled insect; and on searching, I have found it to proceed from a common blue-bottle fly which had fallen into the clutches of a wasp. For my own part, however, I cannot say that I have literally even seen a wasp in the act of feeding on a fly, and in the opinion of some naturalists, this seizure of the house-fly by the wasp, is a mere display of wanton power, and not done for the sake of food. In contradiction, however, to the experience of W. T. Andrews, I believe that the hornet often seizes and devours the wasp, when that insect frequents our orchards to feed on the rich juices of the plum, &c. They have also been seen to hawk after them when on the wing, capture them with facility and bear them to some neighbouring plant where they proceeded to devour them. This operation is accomplished by first snipping off the head; then cutting away the lower part of the waist, and crushing the outer coat of the body in their strong mandibles; and afterwards either devouring it or, more often, only sucking the juices it contained.—*J. A. Tooner.*

Rooks and Starlings.—The partiality which the starling exhibits, for feeding with other birds, is owing to its extreme sociability, and is one of its predominant characters. This sociability extends not only to rooks, but also to pigeons and jackdaws, and sometimes, but not cordially, to the fieldfare.—*J. A. Tooner.*

How Anemones eject their Food.—I have often read about, and seen, the strange contractions which the plumose anemone (*Actinoloba dianthus*) makes in the long column of its body, but not until the other night, when showing one of them (a strange variety with thick coarse tentacles) in my aquarium to a friend, did I know that it was done for a purpose, that of ejecting its food. When we first looked at it, the contraction was just above the base, but after inspecting some other jars we came back to this one, again the contraction had ascended to the middle. We continued to watch its varying from likening it to different articles, a vase, then a bell, and lastly, when the contraction was close to the top, to a flower stand, for a conservatory or garden. To our surprise it now slowly opened its mouth, and the hermit crab I had given it the day before dropped out. We now understood that the contraction in ascending had gradually forced the food upwards, until at last it reached the mouth and was thrown out. The time occupied in this performance could not have been more than twenty minutes, or less than fifteen. Perhaps some of your numerous readers may have noticed the same thing, but I have never seen it mentioned in any book.—*R. McAldowie, Aberdeen.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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. S. (Gourdas Fynie).—You are quite right, it is a very pretty species as a microscopic object, it is the *Mnium punctatum.*

A. Johnson.—Your specimen is a species of Plumularia, allied to our British *P. falcata*, and the "little bladders" you speak of are the gonidial capsules, or empty egg-cases.

O. P. (Cambridge).—The fungus enclosed is the "Candle-snuff" fungus, *Xylaria hypoxylon.*

J. O. K. and others.—We cannot undertake to return specimens sent us to be named.

Urmstornian.—The sun does not put out the fire in summer-time directly. Its heat rarifies the atmosphere locally, and the fire gets a decreased supply of oxygen.

K. O. M.—The white stork (*Ciconia alba*) is an occasional visitor. It may be easily known by its red legs. See description in Yarrell's or Morris's "British Birds."

J. H. Wilson.—See articles on Hairs, etc., of Plants, in the "Micrographic Dictionary," also paper by Mr. Tuffen West in the "Quarterly Microscopical Journal," vol. vii. p. 22. But perhaps the best and most thorough exposition of this subject is contained in Sachs' "Botany," sec. 15, on "Epidermal Tissue," and sec. 22 in "Hairs" or "Trichomes."

William Martin.—We have no doubt you would obtain a copy of Mr. Robert Anslow's "Study of Mosses" from Mr. W. Wesley, bookseller, 28 Essex Street, Strand, or of Mr. W. P. Collins, Scientific Bookseller, 157 Great Portland Street, London.

J. H. M.—You will find full and complete information as to how to obtain and mount Raphides and other plant-crystals in Science-Gossip, vol. x., pp. 141, 162 and 183, and concerning Sphæraphides in Science-Gossip, vol. vi. p. 92.

A. Waller.—The Science-Gossip Botanical Exchange Club is not now in existence. It increased so rapidly that its management and correspondence became quite an occupation, and we found it impossible to continue it, owing to its great demand upon our time.

EXCHANGES.

Offered, L. C., 7th ed., 2, 97, 131, 133, 176, 192, 201, 203, 218, 235, 258, 259, 310b, 326, 361, 398, 452, 453, 476, 495, 521, 539, 541, 609, 626, 634, 681, 750, 824, 825, 831, 832, 841b, 862, 865, 910, 911, 912, 940, 1036, 1040, 1056, 1109, 1193, 1197, 1198, 1263, 1274, 1285, 1288, 1294, 1301, 1310, 1318, 1323, 1349, 1351, 1358, 1359, 1361, 1430, 1436, 1441, 1446, 1458, 1496, 1497, 1501, 1503, 1516, for other plants. Send lists.—J. E. Sunderland, Bank House, Hatherlow, near Stockport.

Offered, L. C., 7th ed., 40, 60, 79, 167, 180, 196, 202, 273b, 374, 404, 490, 556, 557, 584, 594, 611, 626, 715, 723, 810, 878, 1337, 1351, 1375, 1376, 1422, 1470, 1636, and many others. Wanted, 32, 65, 309, 580, 720, 721, 762, 819, 828, 845, 979, 990, 1035, 1042, 1103, 1212, 1245, 1266, 1267, 1417, 1621, 1622, 1659, and many others.—Send lists to A. W. Preston, 20 Queen's Road, Norwich.

Offered, L. C., 7th ed., 14c, 25, 26, 60b, 70, 79, 89, 99, 146, 159, 288 purple, 375, 693, 1340, and many other rare plants, in exchange for good specimens of British ferns.—A. E. Lomax, 56 Vauxhall Road, Liverpool.

Wanted, foreign frogs, toads, and other amphibia in spirit or skin, also skeletons of same, in exchange for rare natural history objects.—G. E. Mason, 6 Park Lane, Piccadilly, London, England.

The following books are offered in exchange for books on natural history: "Ancient Stone Crosses of England," by Rimmer; "The Modern Playmate," by Rev. J. G. Wood; "The Three Commanders," and "The Three Admirals," both by Kingston. All are in excellent condition.—F. H. Parrott, Walton House, Aylesbury, Bucks.

Wanted, Science-Gossip, unbound, for 1877 and all previous years, 1869, 1871, and 1872. Will give British and foreign shells. Correspondence invited.—C. T. Musson, Burton Road, Carlton, near Nottingham.

Duplicates: *Planorbis lacustris, Helix carthusiana, Helix caperata* (var. ornata and major), *Helix ericetorum* (var. minor), *Pupa secale*, and *Clausilia Rolphii*, in exchange for other British land and freshwater shells.—C. H. Morris, School Hill, Lewes, Sussex.

WANTED, unmounted stained and injected histological and pathological sections, also unstained botanical sections of roots, stems, and leaves. Good slides in exchange.—F. R. Martin, Clevedon.

I SHALL be glad to exchange dried plants (European) for others or lepidoptera, &c., Continental preferred. — G. H. Bryan, Thornlea, Trumpington Road, Cambridge.

Peucedanum officinale offered for *Ligusticum Scoticum* or *Peucedanum Ostenthium*. Other Kentish plants on hand for exchange.—Alfred Wheeler, Ashentree Lane, Dover.

PUPÆ of *S. populi*, Coryli, Myrica, *F. urcula*, Vinula, Dictæa, Ziczac. Wanted, living sea anemones or British birds' eggs.—R. McAldowie, 82 Bonaccord Street, Aberdeen.

WANTED, SCIENCE-GOSSIP, Nos. 13–99, 106 & 107, also vols. for 1874–1877. Unbound preferred. Good exchange or cash. —R. C. P., Robin's Nest, Blackburn.

WANTED, a good 3-inch microscope objective. One hundred well-mounted slides given in exchange. — W. A. Hyslop, 22 Palmerston Place, Edinburgh.

WANTED, named living specimens of British anemones, crustacea, or mollusca.—J. Darker-Butterell, 2 St. John Street, Beverley.

EGGS of red-winged starling, whinchat, dipper, sedge warbler, grey wagtail, reed bunting, golden-winged woodpecker, spotted sandpiper, redshank, oystercatcher, dunlin, common tern, moorhen, little grebe, black-headed gull, and lesser black-backed gull, for other eggs or Roman first, second, or third brasses. Desiderata numerous (including wheatear).—E. F. Bell, Botcherby, Carlisle.

FOR tentacles of the barnacle send a stamped directed envelope to W. H. Gomm, The Green, Somerton, Somerset.

"INSECTS AT HOME," by Rev. J. G. Wood; wanted, a copy in good condition, in exchange for eighteen rare and beautiful micro slides. J. G. Patterson, 2 Dalrymple Crescent, Edinburgh.

WANTED, books on the honey bee, bee-keeping, &c. Other books in exchange, or purchase. W. T. Cooper, 16 Earl's Court Road, Kensington.

OFFERED, *Limnæa peregra*, var. Burnetti, from Loch Skene, for *Limnæa involuta*, or for tropical land shells.—F. M. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

SEVENTEEN flint implements for exchange; take fossils from the chalk.—Edmund Tye, Stony Stratford, Bucks.

A quantity of oolite and lias fossils for exchange.—Edmund Tye, Stony Stratford, Bucks.

FOR parasites of grey phalarope and common skua, send stamped envelope to J. Sinel, Bagot, Jersey.

WILL exchange vol. xiii., 1877, of SCIENCE-GOSSIP for British birds' eggs, side-blown.—W. E. Collinge, 68 Springfield Place, Leeds.

WANTED, good lumps of chalk from Gravesend, Brighton, Kent, or washed forams from such; exchange, first class micro slides in every department.—J. Tempère, Storrington, Sussex.

WANTED, large and good micro slides cabinet, to hold at least 500; liberal exchange in first-class slides.—J. Tempère, Storrington, Sussex.

WANTED, "Midland Naturalist" for 1880, unbound; also, unbound, SCIENCE-GOSSIP for 1865, 66, and 67, and Nos. 39 and 40 for 1868; state lowest cash price. — J. R. Murdoch, 24 Blenheim Place, Leeds.

Gomphonema geminatum, remarkably pure gathering of this interesting diatom; sample tube sent in exchange for three microscope slides, or 1 oz. bottle for twelve first-class mounted objects.—J. L. M., 106 Princes Street, Edinburgh.

POLISHED mahogany store box (corked top and bottom), hook and eye, 24 × 18 × 4½, to exchange for facsimiles of seals and medals in any substance.—Tunley, Albert Road, Southsea.

DUPLICATES: Lithoxylea, Carpini, Dispar (bred), Valligera, Graminis, Gamma (bred), Meticulosa (bred), Semele, &c. Desiderata: Antiopa (Continental), Agestis, Æsculi, Irrorella, Complanula, Unguicula, Spinula, Serena, Punctulata, Luteata, Incanaria, Aversaria, Galeata, Gracilis, Libatrix, &c.—J. Smith, Kilwinning, Ayrshire.

WANTED, unmounted, histological, pathological, and botanical sections, either stained or not; also parts of insects, foraminifera, diatoms, spicules of gorgoniæ, sections of horns and hoofs, &c.; also well-mounted slides of the rarer chemicals, such as platino-cyanide of magnesium, chloride of palladium, thalliums alts, &c. First-class slides in exchange.—Frederick Martin, Clevedon.

WILL exchange "Insect Architecture" and "The Architecture of Birds," both well bound, for Rye's "Beetles." Also, duplicates: Salacis, Sambucatæ, Repandata, Pusaria, Amataria, Elutata, Spinula, Batis, Perla, Viminalis, Chrysitis. Desiderata: Aglaia, Selene, Artemis, Athalia, Tages, Tristata, Circellata, Porata, Trilinearia, Omicronaria, Villica, Mendia.—J. Bates, Orchard Terrace, Wellingborough.

FOR exchange, British land and freshwater shells, about 20 species, for others or fossils.—Send lists to A. H. Shepherd, 4 Cathcart Street, Kentish Town, N.W.

FOR exchange, over 160 foreign stamps, all different. What offers in marine or land and freshwater shells, named beetles, dragon flies, Ichneumons, Diptera, &c.? Accepted offers answered only.—P. T. Deakin, 46 Princess Road, Edgbaston, Birmingham.

WANTED, a few sea anemones and madrepores for an aquarium.—J. R. Murdoch, 24 Blenheim Place, Leeds.

WANTED, lantern slides. Exchange, micro slides, material, intensity coil, &c.—F. S. Lyddon, 2 Oakland Villas, Redland, Bristol.

EXOTIC Lepidoptera—Duplicates: *Orn. minos*, *Papilio arcturus*, fine; Capaneus, fine; Merope, *Nereis sesostris;* Dolicaon, fair; *Minetra gambrisius*, fine; *Eurycus cressida*, fair; *Amauris Damocles*, *Heb. glaucippe*, *Diadema bolina*, *Danais alcippus; Urania rhipheus*, fine; *Morpho cypris*, fine; Amathonte, fair; also many others. Desiderata (exotic lepidoptera only), very numerous; please send lists. Wanted particularly, to lend, or keep, exotic butterflies in papers (need not be quite perfect) of the genus Papilio, for the purpose of figuring from nature in water-colours, with a view to a monograph of the genus; 150 species already figured; list of those figured sent on application.—J. C. Hudson, Railway Terrace, Cross Lane, near Manchester.

WILL any reader kindly help me in forming a collection of igneous and metamorphic rocks, named or labelled? Any fossils would be thankfully received. I fear I cannot offer equivalent exchange; would fresh botanical specimens be of use?—Heary Dobbie, Cringleford, Norwich.

WANTED, Cassell's "European Butterflies and Moths," any parts between 16 and 41; will exchange insects, flower seeds, &c.—Robert Laddiman, Hellesdon Road, Norwich.

FOSSILS, a series of splendid specimens of Upper Silurian, including many Trilobites, Encrinites, &c., given in exchange for a good cabinet. State dimensions to F., 106 Finch Road, Handsworth, Birmingham.

WANTED, lichens, mounted or unmounted; also a first-class section-cutter; liberal exchange in slides or material.—Arthur J. Doherty, 25 Boston Street, Moss Side, Manchester.

GOOD mounted slides of selected diatoms, *Arachnoidiscus Ehrenbergii*, *Heliopelta Melii*, *Triceratium favus*, *Pleurosigma attenuatum*, *P. quadratum*, *Strigosum angulatum*, &c., for good gatherings of *P. formosum*, good sponge spicula, or offers. —W. White, 7 Warden Place, Nottingham.

TWENTY-FIVE North American skins, including sparrowhawk, pigeonhawk, rail, red-headed woodpecker, pine, grosbeak, &c., to exchange for side-blown eggs, either British or foreign.—George A. Widdas, Woodsley View, Leeds.

BRITISH MOSSES.—Wanted, south of England species in return for Alpine and sub-Alpine.—J. Cash, Osborne Road, Levenshulme, Manchester.

NEW edition of Davis's "Practical Microscopy," not soiled, for well-mounted slides of micro fungi; also good mesozoic fossils for well-mounted geological slides.—George Ward, 10 Friar Lane, Leicester.

WANTED, a one-eighth or one-tenth inch objective; also, specimens of edible frog, crayfish, freshwater mussel, hydra, amœba, and chara.—T. W. Lockwood, Lobley Street, Heckmondwike, Yorkshire.

BOOKS, ETC., RECEIVED.

"Siberia in Asia." By Henry Seebohm. London: John Murray.

"Zoological Notes." By Arthur Nicols. London: L. Upcott Gill.

"The Sun, its Planets and their Satellites." London: Edward Stanford.

"Water and its Teaching." By C. L. Morgen. London: Edward Stanford.

"A Picture-book of Country Life." By James Weston. London: T. Fisher Unwin.

"Footprints." By Sarah Tytler. London: T. Fisher Unwin.

"Studies in Microscopical Science." Edited by A. C. Cole. Nos. 26, 27, 28, 29, 30, 31, 32.

"Land and Water."

"The Naturalists' Monthly."

"Midland Naturalist."

"Northern Microscopist."

"American Naturalist."

"Cosmos: les Mondes."

"La Feuille des Jeunes Naturalistes."

"Le Monde de la Science."

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 12TH ULT. FROM:—J. F. R.—C. P.—Dr. C. C. A.—F. R.—A. O.—J. E. S.—W. W. W.—C. J. M.—G. E. M.—C. T. M.—W. B.—F. H. P.—F. R. M.—G. J. W.—C. S.—M. B.—F. H.—W. E. C.—A. B.—S. C. C.—A. W.—J. S.—A. T.—G. F. W.—F. H. P.—J. T.—E. T.—J. R. M.—A. W. P.—C. H. M.—J. M.—W. H. T.—F. M. H.—W. T. C.—R. McA.—W. T. G.—J. R. P.—W. H. G.—E. T. R.—E. H. R.—J. S.—H. W. L.—J. E. T.—C. H. B.—W. A. H.—R. C. P.—A. E. L.—A. H. W.—C. F. G.—H. C. B.—J. D. B.—E. H. B.—G. H. K.—F. M.—J. B.—A. J.—K. O. N.—A. H. S.—C. H. G.—J. A. S.—P. T. D.—W. T. S.—R. C.—J. H.—C. L. W.—H. D.—E. S. E. J. B.—F. S. L.—R. H.—E. P. D.—R. L.—G. B.—T. G. F.—M. L.—A. J. D.—W. W.—J. C. T.—J. C.—G. A. W.—G. E. B.—G. W.—A. H. B.—W. F., jun.—J. B.—T. W. L.—G. H. K.—&c.

AN INQUIRY INTO THE ALLEGED HABIT OF HIBERNATION AMONG NORTH AMERICAN SWALLOWS.

By CHARLES C. ABBOTT, M.D.

[*Continued from page* 3.]

CONTINUING our consideration of these bank-swallows, let us now pass to the time of their annual disappearance, late in autumn, or at the onset of winter. Two conditions cause the change of locale, or, at least, the disappearance from their summer haunts; a much lower temperature, and absence of insects, their only food. Now, the onset of severe frosts may be early in October, or delayed until November, but this alone does not decide the movements of the swallows; for often they have wholly disappeared before October, and then a year may pass, with flitting swallows skimming o'er the lea, undaunted by the chill November fogs. The supposed regularity of their comings and goings is not applicable to their New Jersey haunts, howsoever it may be in more northern localities.

What therefore I have seen of their movements in autumn, that has possible bearing upon alleged hibernation, is this: First, the effect of age. Now, it is as evident as that birds grow old, that, in due course of time, these migratory swallows will reach that condition of decrepitude when they can make their migratory journey from south to north, or *vice versâ*, for the last time. In such case, there must necessarily be a large number that are left behind, when the main body depart each year, unless it can be shown that these age-worn birds die in the course of the summer at the north, or during their winter sojourn in the south. Both statements are true. The result of a summer's study of a colony of bank swallows, revealed the fact that a number of old unpaired swallows flitted feebly about the bluff, but never appeared to wander far from it. They were seen, often sitting at the openings of the nests in the cliff, and were taken for young birds. They were not fed by old birds, having young to look after, and fared scantily on such insects as they caught by their own exertions. Early in August I found many lying dead, both in the burrowings and at the foot of the cliff. Examination proved that all were old birds. In autumn, about October 1, the main body of the colony largely frequent the weedy marshes, and seem to be for ever on the wing, insect-catching, as they move in an endless labyrinth of curves over the quiet waters. I have seen thousands of them thus engaged, and far from their nesting haunts. Occasionally they would alight upon tall reeds and objects projecting above the water, and twitter without ceasing. Then as by a signal, these thousands would rise together from their resting places, and rising to an unusual elevation fly away, to return no more that season. These birds were associated colonies on the southern migration; but were the sunny cliffs that so lately were teeming with happy swallow-life now wholly deserted? Was there no trace of the many families that had here spent a joyous, gleesome summer? Yes! There were still a few. The lame, the weak, the blind, and the unburied dead of that avian city still remained; and what a mournful spectacle they offered! painfully so in themselves, and the more impressive when the thoughtless, glittering throng of a few days past was vividly recalled.

Cheered for the time by the mellow sunlight that beamed upon them, the aged, half-helpless swallows, whose wing still responded to the will of their owners, languidly chased the few remaining insects flitting over the weedy waters. Others venturing less far, caught, with what skill they could command, the chilled and drooping flies that sought refuge from the cold winds, in these safe, snug harbours in the cliff. Indeed, this shelter-seeking flight of insect-life, that now teems about these deserted nests of the departed swallows, proves a veritable godsend to those poor birds that, from whatsoever cause, are fated to remain—a blessing, if it be one to prolong a joyless existence during a few brief weeks in autumn. But the importance of this sad phase of swallow-life as bearing upon our subject remains to be stated. Notwithstanding their weakness, the desire or instinct to migrate still remains, and when more pressed than usual by sudden accession of cold, or scarcity of food, numbers of such as remain will collect, as of yore, on the rushes and reeds about the water, and often essay to commence their protracted flight towards their winter haunts. Many straggling swallows doubtless wander miles before finally succumbing to the weakness of age, but never wandering far from water; migrating in their accustomed course, which is always coastwise, down a river valley, when they finally stop to rest. When their course is finished they are found in the track of the hardy multitude that have passed successfully onward; and, yielding to the severity of the increasing cold, they find watery graves beneath the nodding plumes of the russet grasses over which, in days gone by, they had flitted without fatigue, thoughtless of the morrow.

Such swallows I have seen, year after year, and to them do I refer those that were said, by Dr. Wallerius, to have assembled on a reed "till they were all immersed, and went to the bottom; this being preceded by a dirge of a quarter of an hour's length."

Explicable, therefore, as I consider the movements of swallows to be, in so far as these might give the impression of hibernation beneath the water, it is not by the same observations that I have here recorded, that the asserted finding of torpid swallows, during the winter encased in mud, can be explained.

The mere finding of swallows in the mud, is, of itself, nothing strange, although the chances of their escaping the attacks of the turtles and carnivorous fishes, is very small; but to find them alive, in such positions, is a different matter, and at once recalls the probability of the assertion that I have questioned, that it is physically and physiologically feasible for swallows to lie dormant under water. If so, some great constitutional change must take place, for swallows, throughout the summer, are readily drowned, if held for even a minute under water; and if their plumage is well soaked by repeated immersions, they are helpless, until thoroughly dry again. The structure of their feathers, furthermore, is wholly unlike that of aquatic birds, and therefore cannot resist the pervading action of the water, as do the oily, close-set feathers of the ducks and divers.

Again, if torpid swallows are encased in mud, beneath a considerable depth of water, by what means can the reviving influence of returning spring influence them? Whether warm or cold, mid-winter or genial April days, the mud at the bottoms of our ponds is of nearly uniform temperature, and certainly does not vary so much, as to start, by added warmth, the life-pulses of swallows that for five or six long months have ceased to beat; and why should these unfortunates remain thus beneath chilled and often ice-locked waters, when in the mellow sunshine above it, other and wiser swallows of their kind flit and twitter as of yore, having happily chosen migration rather than submergence?

But the testimony on this point is too explicit to warrant one's belief that these witnesses could have been in error. To show how readily people can be mistaken, let me state a case:—

A. B. has testified on oath as follows: "Early in April, 1836, as I was passing on foot down the Bordentown road, near the drawbridge, I heard a loud hissing in the bushes at my left, and turning my head, saw a large, checkered, black and white snake. It held its head well up, and darted its tongue at me. I was a good deal frightened and turned and ran, as I had heard of hoop-snakes, and found I was chased by this snake and that it was one. Luckily, I was running down hill, and covered the ground pretty lively. Near the bridge, I jumped behind a cedar tree, and the snake passed me. It had its tail in its mouth, and rolled along like a child's hoop, only a great deal faster. It turned off at the creek, and rolled into Crosswick's Creek, and then uncoiled, and swam like any other snake."

Now in this statement, made in good faith by a conscientious man, there is a curious admixture of truth and misconception. Mr. A. B. admits that he has heard of hoop-snakes, and as they are reputed to be more deadly than veritable rattle-snakes or copper-heads, it is very natural for such a person to see, not simply think he sees, a snake take its tail in its mouth and roll, hoop-like, down the sandy road. This impression is always the more vivid, when the snake happens to take the same direction in which the poor frightened person may happen to flee. Now, if people are taught to expect to encounter any given form of dangerous animal, in any neighbourhood, when any creature having the similitude of this mythical foe to humanity is seen, it is promptly endowed, by the frightened unfortunate, with all these direful attributes, and his distorted vision converts into horrible monstrosities, and detects impossible capers on the part of, a harmless and inoffensive creature.

Now, I have taken the trouble to question a certain class of people concerning this hoop-snake, and I find it is firmly believed in by hundreds, who affirm that they, their parents, or some one of their friends had seen them, been chased by them, or had indirectly captured them, by suddenly darting behind a tree, when the snake would uncoil, and striking its tail into the tree, would be held by it, and when in this position would be killed by the person pursued.

Now, all of these statements are just as explicit as the finding of dormant swallows in the mud; yet one and all are absolutely false. If, therefore, the impression is made on the minds of the young people of any community that swallows hibernate in the mud, it will be difficult to rid them of the idea that any swallow that may be found in, or even near water, is not indicative of their early teaching's truth, that swallows do really pass the winter in such a manner. Is this more unreasonable than that the belief in hoop-snakes should be so common, even among otherwise well-informed people? If we cannot explain this impression that swallows hibernate in mud, and beneath water too, in some such manner as I have endeavoured to make plain, there is left but one other alternative, to exclaim, in despair, "Lord! Lord! How this world is given to lying."

Let us turn now to a less abundant, but no less interesting species, the cliff swallow. This bird, instead of burrowing into a bank, builds an elaborate nest of mud under the eaves of barns, along rocky ledges, and, in New Jersey more frequently than elsewhere, on the beams supporting the floors of bridges. Proximity to the water is desirable, evidently, but is not an essential condition of the locality chosen for their nests. As in the case of the bank swallow, these swallows live in large communities, and present much the same general features of swallow-life.

The peculiarity of their nest, in being made of mud, of course necessitates frequent visits to water, whence they derive this material for their nests. Now, unlike the bank swallow, the cliff swallow is a late arrival, and no sooner here, tired as he must be, than he commences the work of nest building *de novo*, or of repairs to the old homestead. In either case one thing is absolutely necessary; he must dabble in the mud. Day in and day out, for a week or more, his whole time seems spent in mixing mortar by the water's edge, and transporting it in little bits to the nest. He is wet and bedraggled much of the time; and if a cold north-easterly rain sets in, as is so often the case the first week in May, then these swallows are in a sorry plight indeed, and suspending building operations, huddle about in thickset numbers, twittering mournfully, on the principle that misery loves company. Such storms even sometimes prove fatal to many of them; and they are more frequently found dead near their nests, than are individuals of any other species. Find them then during a storm, or even notice them, for the first time, when they are sitting on the ground at the water's edge, dripping wet at times, and the impression you will have will be that of Kalm, that they look "as if they had been just come out of the sea." This impression too is increased from the fact that there are no heralds of the northward moving mass of swallows of this kind. One and all, they come together. Yesterday, not one was to be seen; to-day, the entire community are settled in their old haunts, and ready for house-keeping. Their migrations are continued through the night, and either by starlight or moonlight, as the case may be, they are guided to their several haunts of the preceding summer. I am very positive that they arrive during the night, and I lay unusual emphasis on this fact; because the appearance of such a flight of swallows the morning following their arrival would be one to give an impression of aquatic hibernation, if such an idea had ever been expressed in your hearing. Not the entire colony will immediately seek the nests of the past summer; there will be many young birds who have as yet not built nests, birds yet to choose their mates. Now such birds will sit in long rows on telegraph wires, on fences; and if it be near, be very sure that they will congregate about the water. Seen, thus congregated about a pond early in the morning, perhaps after a heavy dew, and you can readily see that they will be "as wet as if they had been just come out of the sea!"

(*To be continued.*)

NOTES FOR SCIENCE CLASSES.

PART V.

OUR next example is to study the form and structure of laticiferous vessels which may be detected in all the papaveraceous plants, as well as in Euphorbiaceæ, and in many Compositæ. The specimen from which the illustration is taken is the greater celandine (*Chelidonium majus*), a very common species found just outside villages and around the hedges of old-fashioned gardens. Not unfrequently sections of the petiole and stem are made on purpose to find the laticiferous vessels, but it often ends in failure, from the mere fact that the latex runs out of the vessel speedily when ruptured, so it becomes difficult to trace successfully. By far the better plan is to tear off the young sepals, laying them on the slide, with a drop of water, then placing on the cover slip, examine it as quickly as possible for the vessels along the outer margin; they are readily recognised by the yellow juice. (Fig. 29. No. 1, margin of sep.; 2, laticiferous vessel; 3, cellular tissue.)

Laticiferous vessels are simple or branched tubes, frequently united into a more or less close network, as may be seen in the lettuce leaf. The coloured fluid is known as latex, which is valuable in many cases, as yielding gums and resins (opium, india-rubber, &c.) They occur in a comparatively small number of plants, usually in the cortex, between the xylem and bast cells, sometimes in the outer bar and pith, they accompany the fibro-vascular bundles into the leaves.

Laticiferous vessels are distinguished from vessels containing raphides only by the absence of these crystals. (See fig. 25, raphides from stem of Tradescantia. No. 1, the crystals, or raphides.) These vessels are detected in the outer bark, also in the leaves of many Monocotyledons. A beautiful specimen may be obtained from the decaying petiole of the rhubarb, mounted as an opaque polariscopic object. The crystals of oxalate of lime are really magnificent, when exhibited by an artificial light.

Whilst we have the *Tradescantia Virginica*, a plant found commonly in cottage gardens, under examination, it would be well to bring before the student the circulation of protoplasm observed in the hairs on the filament (fig. 28). It is only requisite to cut off the hairs from a flower just expanding with the razor, and place it with a drop of water on the slide; the deep-pink cell walls are sufficient to bring out clearly the cell contents, without any staining-fluid. 1 is the cell-wall; 2, the vacuole; and 3, the protoplasm in active motion, moving around the vacuole. The protoplasm which is enclosed in a cell wall has no power of escaping from its envelope. The course of the current is usually along the wall, and in simple, spiral or reticulate lines, and is then termed rotation, as in Chara or Valisneria; less often, as in the filaments of Tradescantia, it passes in threads and bands transversely through the cell-sap, and is then termed circulation. The currents are apparently irregular, sometimes suddenly arrested, then commencing again with greater rapidity.

The old term spongiole, as applied to the growing point of the rootlet, is now expunged from our modern text-books; still the student should learn to distinguish the root-cap, especially its form and composition. The essential peculiarity in the roots of all Dicotyledons, is the root-cap. (See fig. 26, root-cap of Pontederia. 1 is the root-cap; 2, growing-point, and 3, young root, composed of cellular tissue.) Beneath this root-cap, as it is termed, the production of new cells continues, whilst the cap itself acts as a protecting shield to the root. As many village students will be unable to procure the pontederia, the duckweed (*Lemna minor*), will equally well explain its nature and structure.

About the best specimen with which we are acquainted for exhibiting the pollen-tube, is the evening primrose (*Œnothera biennis*). Secure a flower early in the morning, when it has just begun to droop; for the petals are only open one evening; and having cut away the stamens and petals, make a transverse section down the style; this requires a

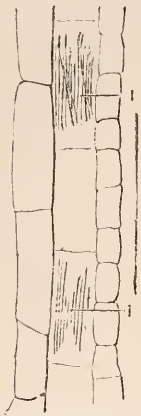

Fig. 25.—Raphides in stem of Tradescantia.

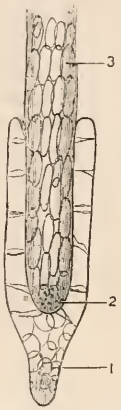

Fig. 26.—Root-cap of Pontederia.

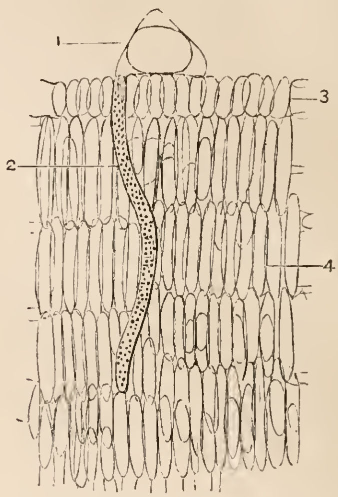

Fig. 27.—Pollen-tube of the Evening Primrose.

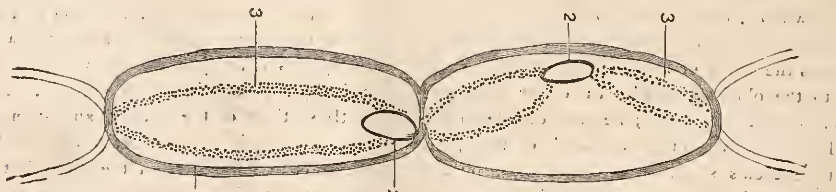

Fig. 28.—Circulation of Protoplasm in Tradescantia.

little patience and practice to do it successfully. Lay the style along the first finger of the left hand, holding the ovary firmly by the thumb, then gently push the razor blade from you, towards the tip of the finger. I seldom fail in this way to secure satisfactory specimens for my class use. (See fig. 27. 1 is the pollen-grain; 2, pollen tube; 3, stigmatic surface, and 4, conducting tissue of the style.)

When the pollen falls upon the stigma, it is excited by the viscid fluid exuded by the stigmatic surface,

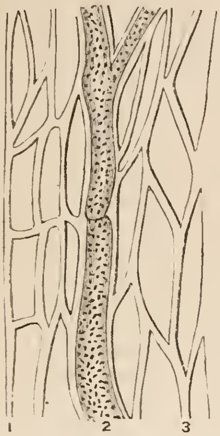

Fig. 29.—Laticiferous Vessel.

it then puts out one or more pollen tubes (2) which are unicellular and usually simple. These penetrate through the conducting tissue (4) of the style, and reach the interior of the cavity of the ovary in a few hours. Of the numerous pollen tubes which as a rule reach the ovary, one only penetrates through the micropyle, and reaches the embryo-sac; at the apex of the embryo-sac, the pollen tube comes into contact with the embryonic vesicles, and fertilises them. Vide Suspensor, in Part III.

J. F. R.

THE DANISH FOREST.

By John Wager.

II.—The Forest in Former Times.

Changes in the forests of Denmark did not cease with the completed formation of the peat-mosses, but continued, and still continue to take place, both as regards constituency and extent, and through the agency of nature, as well as that of man. "Den danske Stat," by Ersler, contains a map showing the distribution of forest over Holstein, Slesvig, Jutland and the Danish Isles at the present day; from which it may be perceived that the Danish islands are in general well-wooded, and that forest extends with varied density along the whole extent of the eastern coast of the peninsula from the south of Holstein, through Slesvig, and the greater part of Jutland; becoming sparser, however, towards the watershed, and almost entirely disappearing on the western side of it, quite to the sea—isolated plots of wood being visible only in a few places here and there. The trees, too, are as strikingly different in point of size as the woods in extent; on the west coast having a stunted growth of from two to four feet in height, and only in a few places attaining to twenty feet; while on the east coast and the islands there are trees one hundred or one hundred and twenty feet high, with proportionate amplitude of bole. The west side too is flat, as well as treeless: a plain of heath, or pasture and cornland intersected with dike fences, from the top of which at dreary intervals a crippled old thorn crouches prone before the pitiless western wind; varied only along the coast by the peaked and ridged sand-hills, which stretch, like miniature Alps, in long parallel with the sea. But the wooded eastern shores present a constant variety of gentle hills and dales and rising grounds, very pleasant and picturesque in their own quiet way, forming tree-crested banks and promontories, and grassy slopes, upon the ever-recurring bays, inlets and fjords, which indent the irregular coast. Such agreeable combination of water with wooded hills may be seen in the Veile-fjord; and yet more picturesque is the wooded scenery of Greisdal, between Veile and Greis Mill. The valley which is deeper and narrower than usual in Denmark, winds among hills composed of gravel and rounded boulders, but nevertheless bold in contour and charmingly overgrown with beechwoods, which descend into the valley and cluster about a stream with, at least intermittingly, a brisk and lively course. Cottages with timber-framed walls and thatched roofs nestle by its side, and here and there the valley opens into green spaces of meadow and corn.

But the western side, now so thoroughly denuded that some of its inhabitants have lived and died without seeing a lofty and well-grown tree, had formerly its great extensions of forest also, which have disappeared partly through the destructive operations of war, and partly through improvident cutting down. The great forests of Fuur and Salling on the Lümfjord were destroyed during the wars of 1657–60; those of Thisted and Ringkjöbing shared a similar fate; and in 1559, when the Danes finally subdued the Ditmarshens, they cut down a large forest which then extended over the present Ditmarsh Heath. A similar contrast is exhibited to the voyager as he sails alternately along the eastern and the western coasts of Sweden; on the eastern side his eye ranges with delight over innumerable islands and islets beautifully studded with pine-trees; on the western side it is everywhere chilled by thronging masses of bleak and barren rock; and the Swedes, who tell you that these also once rose in beauty out of the sea, attribute their present nakedness to the war-fires of the Danes. The traveller will remember that the Grecian islands, which in classic times were richly wooded, have suffered a corresponding denudation.

Turning now to the pages of Vaupell, we are made acquainted with changes which other causes have induced. Simultaneously with improvements in agriculture, which began about a century ago, the uncultivated forest has developed itself with a luxuriance before unknown; and along with this richer growth, many phenomena in the life and mutual relation of the trees have conspicuously presented themselves to view. Young beechwoods are suppressing the ancient progeny of oaks; alder-mosses, which for centuries enjoyed exuberance of health, have been seized with such mortality, that Lolland, once proud of its alder-mosses, as the best of cattle-pastures, can now scarcely supply alder for a pair of wooden shoes, while ash, on the contrary, extends itself and usurps the decayed stumps. Aspen, formerly common in openings of the woods, becomes rarer every day. But most remarkable is the density, scarcely conceivable for Denmark's soil and climate, which the more fertile forests have attained. In the former century, it was greatly complained that some of the woods had been quite uphewn; that others had become miserably thin and open, grass widely extending, and trees disappearing; while now the case is reversed, young beeches are supplanting the grass. Formerly a proprietor only felled a tree when needed for himself or his dependants, and when trees were removed it frequently happened that none grew in their place; now the beechwoods usually grow so rank that they must be thinned, and timber also is felled for sale.

This change is attributable to the allotment of lands, and the abolition of the common-rights of forest-pasturage in 1805. The aim of his work being in part to show how trees multiply and mature themselves when freed from cattle, before treating of the present state of the Danish forest, Dr. Vaupell glances at its treatment in former times, that it may be seen how pasturage came to exert so great an influence on the rankness of its growths, and on the extension and form of the trees.

In earlier times mast, not timber, was the most valued product of the forest; acorns and beech-nuts supplied nourishing food for large herds of swine, such as may yet be seen in the great oak forests of Servia; and when Gilpin wrote, they might be seen on a lesser scale, in our own New Forest, munching acorns with approving grunts, and on the sounding of the swineherd's primitive horn, rushing home, with many a squeal, to supper and bed. For centuries the flesh of swine was in most parts of Europe the most common and esteemed of animal food; doubtless Gurth and Wamba in old Sherwood enjoyed many a rasher of bacon of their own feeding; and though Friar Tuck preferred to fatten on venison pasty, a brother monk of Denmark, quoted by Vaupell, thus expresses, in the language he held sacred, his devout affection for pork:

> "Sine carne suilla non est vita;
> si est, non est ita."
>
> "There is no life sans flesh of swine,
> Or if there is, it is not mine."

Jonge, another Dane, remarks that of all "meat-wares, nothing is dearer to the Zealand peasant than bacon; he could without tiring eat the rank fat to every meal." Heaven itself, without bacon, would have been no heaven to the old Scandinavians; every day in the grand hall of Valhalla, countless heroes who had died in battle, after enjoying the invigorating exercise of morning's fight, with boundless slaughter and reslaying of the slain, sat down, no worse for the fray, to a hugh feast of this delectable dish, which came, smoking and savoury upon the board.

During the Middle Ages the Danish peasants pastured their swine not only in the woods pertaining to their respective communities, but also in the great unappropriated boundary forests; holding that these were commonalities, and that they had the right, not only of pasturage there, but also of cutting firewood and timber. Canute the Great was one of the first kings who began to dispute these claims; and much strife between prince and peasant ensued. But by the end of the Middle Ages, through the growing power of the nobles, the peasant had sunk from the position of owner of the land he cultivated to that of mere tenant. No peasant, but only the nobles and the Crown, might own forest; yet the peasants retained the right of sending their cattle into the so-called common-forests; a practice which continued till near the beginning of the present century, with great increase of usage since the peasants had ceased to be proprietors, and consequently with increased detriment to the forest growths.

As in the Middle Ages, so, during the period of privileged country seats (16th, 17th, 18th centuries), mast continued to be the forest's most important product; and not only neighbouring peasants, but many far distant towns and villages sent swine to the great forests. For instance, every autumn, when

> "Lash'd by furious squalls,
> Bright from their cups the rattling treasure falls,"

Lubeck and Hamburg sent droves of swine to the forests of Holstein, and even of Slesvig, there to grunt and grow fat. The payment per head raised a considerable revenue, in consideration of which the Crown had been induced to appropriate the great forests and deprive the peasants of the right of free pasturage within them they had formerly enjoyed. What swinish multitudes munched and crunched, and grubbed, and grunted under the oaks and beeches of these great old forests, may be learnt from Rantzan, who tells that in 1590, which appears to have been a good year for mast, 63,000 swine fed in six of the

Danish forests, from 4000 to 19,000 in each; while in a moderately fruitful season the forests of Gottorp, in Slesvig, could supply provender for 30,000 of these unclean creatures, whose gluttonous appetites were thus rendered greatly subservient to the carnal desires of mankind.

Swine do not, however, like other cattle in general, injure the forest, cropping the sprouting trees only when mast is scarce; moreover, they plough and sow, as well as reap, burying acorns and beechnuts, and also destroying nests of mice, which are amongst the worst of the forest plagues. Exception was therefore made in their favour, when the mast was ripe, by several forest-ordinances which forbid the pasturing of cattle in the forest; as by that of 1805. The cutting down of beech, oak, and hazel, as trees which bore mast, was also forbidden.

Of all domestic cattle, goats are the most injurious to the forest, having as strong a predilection for branches and young trees as for grass. Large flocks of them were formerly kept; and despite the passing of several ordinances in the fifteenth century and afterwards, their complete exclusion from the forest was not effected till the middle of the sixteenth. Deer, however, thereupon increased all the more, so that the booty secured at a royal hunt, August 1593, amounted to 1600 harts, besides a great number of calves, roes, hares, and foxes. It has always been customary for the Danish peasants to pasture their horses, as well as cows and sheep, in the forest; and horses, by tearing off the branches, and top shoots of trees, damage the forest far more than cows. During the Middle Ages studs ran wild in several districts; and subsequently the peasants, from old wont, took a pride in owning more horses than they had any real use for; and pasturage costing nothing, the number of their horses greatly exceeded that of the royal studs. The custom continued down to the allotment of the commons; in the severe winter of 1802-3, flocks of small, hardy animals, belonging to the peasants of North Zealand ranged the forests there, scraping the withered grass from under the ice and snow, and eating the tops of young trees.

Winter fodder being exhausted, the peasants turned their cattle into the forest in early spring before the grass had grown; consequently they cropped the budding twigs and top-shoots of trees and shrubs, thereby greatly affecting the rankness, and the form and sanity of its growths. In many places underwood disappeared from amidst the oaks, and both oak and beech and other trees assumed abnormal forms in consequence of the treatment they received. The oak, however, is so tenacious of life that it can bear ill-usage with much more impunity than the beech; if its top-shoot is bit off for twenty years in succession the young tree will persistently strike forth another, and larger, every spring. But the beech, though very patient under bovine or equine oppression, is more peculiarly affected by it; transforming itself when repeatedly cropped into a low tree or bush, with short, out-spreading branches and twigs, which bear numerous leaves; thus bearing, in some cases, a resemblance to a clipped yew, but forming, if liberated from dental interference, a low-stemmed many-branched tree. The oak more rarely assumes this form, and then, in general, only upon the old stub after a tree has been felled.

Though cattle gnaw both oak and beech, and perhaps prefer oak leaves to beech, yet they injure the beech most. Open positions and wide grassy spaces are not particularly hurtful to oak, but beech-woods can neither thrive well on greensward nor in an open position. Besides, the cattle protect the oak by consuming the springing beech-plants, which in time, when luxuriant, have usually power to injure most oaks. A muster which took place in one of the forests of about a thousand acres in July 1722, shows how numerously they were grazed; the number of the various domestic cattle it was found to contain amounting to 131 horses, 109 neat, 140 swine and 93 young pigs. Cattle that are sent from open pastures into wet forests are apt to be seized with a sickness caused by eating the grass, which often ends in death; but it does not affect those which are brought up there.

The Danish kings in general have been great lovers of sport, and consequently stocked the forests with numerous game; Christian IV., on a journey from Copenhagen to Hörsholm, killed twelve harts with his own hand. Many of the nobles and gentry over-stocked their forests in the same way. Royal studs and the timber axe also conjoined with the wasteful grazing on the common rights of the peasants to impoverish the forests; which moreover in earlier times had been greatly diminished in area, and were in danger of becoming mere pasture-lands or arable fields. But the mischief had begun to be seen and felt too; scarcity of timber and firewood became subject of complaint, and a fear lest the land should lose its forests altogether was expressed. In answer to a Government circular issued to the country magistrates in 1760, the mischief was attributed chiefly to the reckless manner in which the peasants exercised their communal rights; over-stocking with all manner of cattle, and at unseasonable times, cutting promiscuous wood for fences and withy bands to bind the cattle, at any season, with no regard for future growth, and thus yearly destroying thousands of sapling oaks, ash and other trees.

It was not, however, until 1805 that Government prohibited common grazing in the forests; stating in a short preamble to the enactment that experience had shown the greatly deteriorating effect upon the forests of fellowship, and also that another cause of deterioration consisted in the improvident felling of timber, especially since the sale of the timber had become a chief speculation in the purchase of landed property. It was therefore ordained that all fellowship in forests must cease, and the allotment be affected by the 31st of December, 1810; that all forests must be protected, and therefore fenced; and no cattle, except swine, be allowed to graze therein, nor any mowing under the trees take place. That, as the cutting down of forest ought not to be the chief speculation in the purchase of landed property, no one who by purchase becomes owner of a forest, may during the first ten years fell for sale in the same, unless the Revenue Chamber, after inspection, has decided that the felling will not be injurious.

Having seen the wretched condition of the Danish forest consequent on the prolonged mistreatment which the enactment of 1805 brought to an end, it has now to be shown how the trees, freed from oppression of the cattle, enjoyed without hindrance the bounty of nature and flourished with a vigour before unknown.

OBSERVATIONS ON CLEAVAGE.

IN text-books on geology, cleavage is usually represented as running in a number of straight and parallel lines in masses of rock extending through large districts. The beds are drawn folded in different directions, but the cleavage-planes are uniform in dip, and therefore cut the beds at all angles. When viewed in a large scale the parallelism of cleavage is remarkable, and, in small sections, is rightly represented as a number of parallel straight lines, but when we come to examine these planes closely local variations are by no means infrequent. Taking into consideration the diversity of the physical and chemical composition of rock masses, it would be indeed surprising if the cleavage-planes passed through such masses in straight and undeviating parallel lines. Such a condition is theoretically possible in a perfectly homogeneous rock, and hence the more homogeneous the nature of a rock mass the fewer deviations there will be in the direction of the cleavage-planes running through it. Rocks exhibiting cleavage being composed of beds of very different hardness, the planes will be bent when passing from a hard bed to a soft bed or *vice versâ*. But the refracted planes preserve their parallelism. Now if we find one set of cleavage-planes passing through hard and soft beds, forming acute angles with another set passing through the same beds a little distance off, we may conclude there has been a local variation in the direction of the force which has produced the cleavage. Let us assume, for the sake of simplicity, that the force has been mechanical pressure only. The result of this pressure, long continued, has in many cases been (1) the folding of the beds into anticlinal and synclinal curves, and (2) the production of cleavage-planes perpendicular to the pressure forces. We will now consider only the refraction of cleavage-planes produced by the very varying degrees of hardness of rocks, leaving evidences of local variation in the pressure-forces for another paper.

We have an instructive example of refraction figured in SCIENCE-GOSSIP for November 1881 (figs. 144, 145, p. 245); here is another, taken from the same district, Geol. Surv. Gt. Brit. 57 N.E. In the S.E. corner of the sheet some yellow dots represent Lower Llandovery rocks, consisting of "sandstones and slates," or b^4. Our example occurs in a beautiful valley, on one side of which is situated the farm marked Paut-y-Pedwen on the one-inch map. In the quarter-sheet the beds are shown dipping E. Those represented in fig. 30 dip 72° E., and consist of alternate hard and soft bands. The cleavage-planes of the two sets of beds actually dip at opposite points of the compass. The bed 1 is nine inches thick, and consists of hard silicious clay-slate. The cleavage-planes in it dip 68° W., or form an angle of 40° with the beds, and are of irregular character. The bed 2 is similar to 1, but somewhat thicker; the cleavage-planes running through it are parallel to 1. The layers or laminæ, the result of the cleavage, are roughly $\frac{2}{10}$ inch thick. The beds α and β are very thin, consisting of a soft shaly rock; the cleavage is moreover uniform, dipping 81 E. or forming an angle of 9° with the beds. The laminæ are $\frac{1}{10}$ inch thick and less. Two, measured side by side, were only $\frac{1}{16}$ inch; this gives a thickness of only ·03125 inch for each. The laminæ are moreover very straight, although, as might be expected, the planes occasionally run into each other. The clay slate of which they are composed is dark-coloured and very fine-grained. On the whole, these laminæ present a marked contrast to the coarse, irregular, thick and light greyish ones of 1 and 2. Through a strong lens the beds 1 appear to consist of little irregular grains of quartz scattered through darker-coloured clay-slate. I was able to detect here and there minute specks of true pyrites, little brown patches of oxide of iron (probably the result of the decomposition of the pyrites), and thin plates of talc. In the beds 1 and 2 the latter are often quite large, and can be seen with the naked eye, they are colourless or greenish. The beds α and β appear to be of much the same composition, but the grain being very fine, a higher power must be used for their examination. There seems to be less quartz in these beds.

There is no evidence to show us whether the cleavage-planes were propagated from E. to W., or from W. to E., nor is this important. We may assume, the strike of the beds and the anticlinal axes being directed about N.N.E. (true), that enormous pressure has been applied on the rock masses in a W.N.W. and E.S.E. direction, and therefore that the cleavage was produced simultaneously from N.N.E. and S.S.W. The important fact remains that the planes in passing from hard to soft, or from soft to hard beds were bent or refracted as much as 31°.

It should also be noted that in the hard beds the cleavage-planes cross the beds at large angles; the line of least resistance of such beds would be 90° with the plane of the beds, whereas, in the soft beds, the cleavage forms acute angles with them. The line of least resistance of such beds is parallel to the original layers of the strata (compare also SCIENCE-GOSSIP, 1881, fig. 144). From these facts we may deduce silica (S.G. = 2·6) in 1? Although the densities are practically the same, there is a notable difference in the general hardness of the beds, which at once explains the refraction of the cleavage-planes. Referred to Mohs' scale H=4·5 (i.e. between fluor and apatite) in 1, and H = 2·5 (i.e. between rock-salt and calcite) in α.

It must be borne in mind that the refraction of

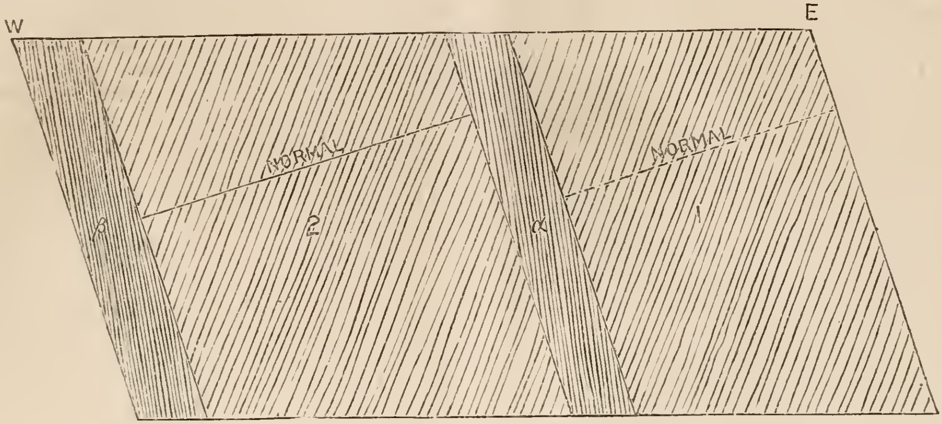

Fig. 30.

Fig. 31.

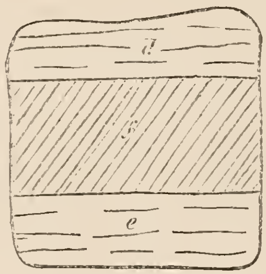

Fig. 32.

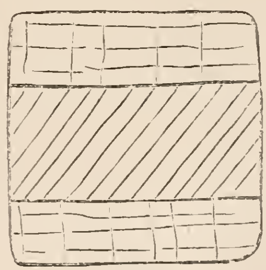

Fig. 33.

the following general law:—When cleavage-planes pass from a hard to a less hard rock the planes are bent away from the normal, or plane perpendicular, to the surface of the beds, but when they pass from a comparatively soft to a hard rock the planes are bent towards the normal. The phenomenon is in fact analogous to the physical law which rules the refraction of a ray of light, but we are not here dealing (as in the case with light) of media of varying densities, for I carefully ascertained the specific gravities or densities of the beds 1 and α; the former, or hard bed, was 2·715, and the latter 2·763. Hence the soft rock is actually rather more dense than the hard one. Is this owing to the greater proportion of cleavage-planes is greatly complicated by the non-homogeneity of rocks, and by the frequent pressure of joints and vacant spaces in them.

In the same neighbourhood some beds dipping 71 E., and striking N. 35 E. (magnetic) showed cleavage-planes in soft beds 83 E., and in thick hard beds 64 W., or a refraction of 33°. The lines in the latter are more irregular even than in 1 and 2 (see fig. 31), an evidence of still greater hardness, due probably to an increased percentage of silica. In the very quartzose beds of this district—the rocks as seen through a lens being largely composed of grains of quartz—the cleavage is still apparent, although very irregular, and passing through the beds perpendicularly, or at very high angles.

Among other beds in this district, formed of much the same material as those described, but differently aggregated, we may particularise three :—

(*a.*) Dark and very hard beds, exceedingly fine-grained ; the cleavage-planes are wider apart than in 1 and 2, one inch often intervening between two planes. S. G. 2·659.

(*b.*) Hard beds the same as *a*, but coarse in texture. Brown patches numerous, and plainly visible to the naked eye. S.G. 2·688.

(*c.*) Still coarser beds of a brownish-white tint. The grains of quartz are distinctly seen without a lens, and are opaque white, and non-crystallised. This rock is in reality a gritstone. The term "sandstone" is not applicable to any beds described in this paper. Clay-slates gradually appear to merge into gritstones. A chemical and microscopic examination would no doubt reveal other interesting differences and peculiarities in the rocks of this district, but enough evidence has been adduced to prove that they have been metamorphosed, and in different degrees. The cleavage has clearly been formed after the metamorphic action. S. G. 2·695.

The refraction of the cleavage-planes propagated through these beds appears to have depended, as has already been pointed out, not on the density of these rocks, but on their relative hardness. No doubt the hard and soft beds differ chemically as well as physically from each other ; the latter are less metamorphosed, and are therefore more argillaceous, or, in other words, less silicious than the harder beds. But the state of aggregation of the particles seems to have had less effect on the cleavage than one might have supposed ; *e.g.*, the beds α and *a* are both very fine-grained and dark, but the cleavage-planes in the former are very oblique and packed exceedingly close together, whereas in the latter they form large angles with the beds, and are wide apart. As a matter of fact the beds *a* are much the harder, and are no doubt the more silicious of the two.

I conceive it to be possible to calculate the relative hardness of two beds from the refraction of the cleavage-planes alone, but extended observations would be necessary in order to obtain a correct formula for the purpose.

Further north, and quite outside the yellow dots marked on the one-inch map, or in the Bala (?) rocks, beds of very hard clay-slate often show no cleavage at all, while the soft beds exhibit it well. Fig. 32 is a typical instance. Indistinct lines of lamination are traceable in *d* and *e*, whereas in *f* these lines are entirely obliterated by the oblique cleavage-planes. But often, especially when the beds crop out, and have therefore been exposed to weathering action, the hard beds are broken up by almost vertical joints (fig. 33), which doubtless mark the direction of the cleavage-planes in these beds. It would be an interesting experiment to submit alternate layers of some hard and soft substance to great and mechanical pressure, not only to prove the refraction of the cleavage-planes, but also to show their regularity and distinctness in the soft layers, their many infections, and their vagueness in the hard ones.

Professor Smith referred, some years ago, to the persistency of the westerly dip of the cleavage in Cardiganshire,* but we have seen that, in one portion of the district at least, this is true only with regard to the hard beds ; in the soft beds the cleavage dips E. at a higher angle than the beds.

E. HALSE, A.R.S.M.

Since writing the above, I have ascertained the density and hardness of the beds *a*, and *b*, *c*, *d*, &c. (SCIENCE-GOSSIP, Nov. 1881, fig. 144), the result of which proves conclusively to my mind that the refraction of cleavage-planes is due not to the relative density, but to the relative hardness of rocks. The S.G. of *a* = 2·734, of *b* &c. = 2·782, difference = 0·048, or exactly the same as the difference between the densities of the beds 1 and α. But the refraction in the former case is only 23°, while in the latter it is as much as 31°. Now the beds *b*, *c*, *d*, &c., are harder than the beds α, β ; in the former H = 3, in the latter H = 2·5, while the hardness of the beds 1 and *u* are about the same. It would appear from these figures that the refraction is directly proportional to the difference between the hardness of the beds, or $\frac{R}{H}=\frac{r'}{h'}$, where R = amount of refraction of one set of beds, and r' of another set, and H the difference in the hardness of one set, and h' of the other set.

Substituting x for h', we obtain the formula $x=\frac{r' \times H}{R}$, which, after ascertaining H and R in one set of beds, will enable us to obtain the difference in the hardness of any set of beds exhibiting refraction by merely measuring the amount of that refraction. But this law must not be considered as established until repeated observations in different districts have amply verified it.

Since I last visited the slate-quarry a fresh section has been displayed ; a clinometer now showed the planes *a* dipping about 80°, and the beds *b*, *c*, &c., about 55°, which gives a refraction of 25°. This shows that the beds vary in relative and absolute hardness at different points ; the irregular lines of the beds *a* and *u* are also evidences of variation in hardness. To ascertain then the mean refraction of the

* "Memoirs of the Geological Survey," Vol. II., 1848.

cleavage-planes of any area, it would be necessary to make a repeated number of observations.

I may mention that the beds, *a*, *u*, in grain are very like the bed *a* (fig. 30), but darker, and with brown patches visible to the naked eye. The cleavage-planes are nearly as wide apart as in *a*. The beds *b*, *c*, &c., appear very like the beds α, β, in composition and grain, but are less dark than the latter, and the cleavage-planes are wider apart.

E. HALSE.

PRESERVING LEPIDOPTEROUS LARVÆ BY INFLATION.

By W. FINCH, Jun.

ALTHOUGH the method for preserving larvæ for the cabinet may be well known to many entomologists, there may be some of our readers to whom the method, simple as it is, may be unknown. Specimens are sometimes seen preserved in bottles of spirits; but these seldom form very beautiful objects. These also cannot be arranged side by side with the imagos in the cabinet. Therefore, to be able to preserve the larvæ, so that they may be placed in the cabinet, with their imagos, will doubtless be a source of pleasure to many a tyro-lepidopterist. And as the season is advancing when lepidopterous larvæ may be obtained in abundance, I offer these few remarks as to the apparatus required and the method of using it.

Take a wide-mouthed bottle, of say two or three pints' capacity (a jam-bottle does admirably), into the neck of which fix an indiarubber bung, tightly; bore two holes through this, one on each side, and about ½ inch from the edge. Now take a glass tube, to fit one of these holes, and on one end of it fix a piece of zinc (we will say the tube is ¼ inch in diameter, then the zinc will be about 1½ inch long, by ¾ inch wide), through the end of which you have drilled a hole ⅛ inch in diameter, this hole must come under the hole of the glass tube. After drilling, rub the zinc smooth, on both sides, then fix to the glass tube, by means of sealing-wax, making the joint perfectly air-tight. Then affix to the zinc, at the opposite end to the hole, a strip of oiled silk (on the under-side, of course), so that one end forms a flap, loosely covering the hole. On sucking at the other end of the glass tube, it will be found that this flap of oiled silk forms an excellent valve, through which no air can pass whatever. Now thrust the other end of the glass tube through the indiarubber bung from the under-side (removing it from the bottle for this purpose, and refixing it). On to the projecting end of this tube (the valve, of course, is inside the bottle) affix an indiarubber tube (of any length), having at its other extremity a hollow ball; these tubes with ball affixed may be bought at the chemist's for about one shilling and sixpence. Now we have a capital air-pump, by means of which the bottle may be filled to bursting-point, on stopping up the other hole in the bung. The indiarubber ball, I should have mentioned, should have a small hole bored in it, so that it can fill itself from the outer air, as it cannot possibly draw any air out of the bottle, because of the valve. By placing the thumb on this hole, and squeezing the ball, a current of air is forced down the tube and through the valve (which closes again immediately) into the bottle. Now into the other hole in the bung thrust a glass tube similar to the one mentioned before; but this need only enter the bottle about two inches, whilst the other should nearly reach the bottom. On the outer end of this latter tube fix a short length of indiarubber tubing, into the other end of which fix the tube with which to inflate the larvæ. This should be of glass, drawn out to a point at one end, by means of melting it over the gas. You should have several of these tubes, of various thicknesses, according to the size of the larvæ to be preserved. Now, the inflating apparatus completed, what shall we do to dry the skin of the larvæ, while inflated? Take a tin canister, clasp a band of iron wire on it, and fasten this to a wooden stand of any kind, taking care that the canister does not touch the wood at all, as it would burn it. Leave the lid of the canister on, so that if the solder (where the tin is joined) should melt with the heat, it will not come to pieces. Cut a piece out of the tin lid a little larger than a florin, and then you have a capital oven. Get a small glass lamp from the chemist's (cost 1*s*.), some wick and spirits (methylated), and set to work in the following manner:—

Take your larva which you wish to preserve, put him into a small vessel, with enough spirits to cover him. Next trim your lamp and light it, place it under the oven, to get it ready heated (you will soon find out the exact heat necessary); your larva will by this time be dead; take him out of the spirits and lay him on a sheet of blotting-paper, turn him about a little, so as to get rid of all superfluous moisture, then take a pen-stock, or anything round, and of similar thickness; and commence to roll out the viscera, or his inside; commence near the anus, to get a good start, this prevents bursting. When you have rolled all the contents of the body out from the head, the whole length of the body, then insert the pointed end of the blowpipe into the anal orifice. I should previously have told you to clasp a bit of watch-spring round this end of your tube, bending it so that it nips tightly on to the pointed end, so as to hold the larva on, as the pressure of air would otherwise blow it off. Fix the watch-spring over the last pair of legs, and then commence to pump air into the bottle, by means of the ball, and soon the larva will become extended in a natural manner. Do not force too much air into the bottle, or the larva will be extended to the full extent of its skin, and look an unsightly object. Just keep the skin full of air, and place it in the oven, holding it there until dry; do not let it touch the sides, or you will scorch it. Green larvæ lose their colour during the process, but this is remedied by inserting a grass stem into the body, down which pour a small quantity of dry colour; shake this about inside the body, until coloured all over of the required tint.

Complicated as this apparatus may seem, it may all be made in less time than it has taken to write this; while the advantage over air-pressure from the bungs is incalculable.

Larvæ preserved as above may be mounted on twigs, or dried leaves of the food-plant, and placed in the cabinet side by side with the imago forms. If this paper proves of any service to the readers (entomological) of this Journal, I shall think myself amply repaid for my trouble in explaining it.

ON BRITISH FRESHWATER MITES.

By C. F. George.

No. V.

AND now let us briefly turn our attention to the females of this family, which, as I have before stated, are very unlike the males; they are considerably larger and more numerous, and therefore are

Fig. 34.—*Arrenurus ellipticus* (upper side), ♀ ⅓ objective.

Fig. 35.—*Arrenurus ellipticus* (under side), ♀ ⅔ object.

Fig. 36.—*Arrenurus buccinator* (under side), 2 in. object.

Fig. 37.—*Arrenurus buccinator* (upper side), 2 in. object.

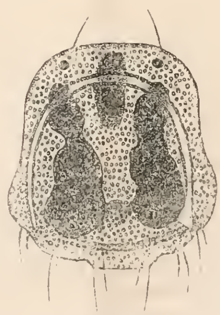

Fig. 38.—Arrenurus, sp. (from above).

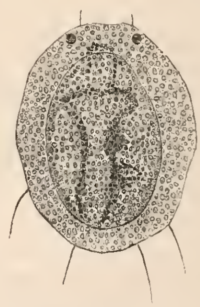

Fig. 39.—Arrenurus, sp.

more easily and frequently found. In the case of globator, I have been able by inspection to satisfy myself as to the true female. In other cases where I give the name of the female, it will be understood that I am justified in doing so, only from its resemblance in some respects to the male, or to some of the drawings of other authors. The females have palpi, exactly like those of the males, their skin is chitinous, and they have their circular or oval impressed line very distinctly marked, and complete. Perhaps the typical form of the body is oval or elliptical, and the first I shall figure is what I take to be *Arrenurus ellipticus*, ♀ (Müller). This rather large and very pretty mite has a good deal of brown in the central part and blue at the sides; it doubtless varies a good deal in colour, with the contents of its cœca; on the under-side the thigh plates are yellow. The peculiar door-shaped sexual plates are well seen, these are very nearly alike in all the females of the hard-skinned specimens of Arrenurus, and have no circular marks or sucking discs upon them. On each side of these sexual plates is to be seen a chitinous plate which, together with the thigh plates, is much more finely punctured than the other chitinous parts of the body. The shape of these plates varies considerably, and will probably be of much use in the discrimination of species when this family shall have been more thoroughly worked out. The next mite (fig. 36 and fig. 37) is still more elliptical or ovoid, and perhaps a little larger than the one just described. It is drawn under a two inch objective, and therefore looks less than the other. From the large amount and deepness of the blue colour, I think it may be the female of *A. buccinator*, although it has not the yellow legs described by Koch.

The next example (fig. 38) is a mite of a most beautiful sky-blue colour, its outlines are seen to be rather angular, it has an opaque whitish Y-shaped mark in the centre, and the other cœca are light brown, the eyes are of a beautiful red colour; I do not know whether it has ever been named. Fig. 39 is of the same colour, but the body is very much shortened, and the cœca are of a beautiful dull vermilion; the under-side (fig. 40) may be compared with fig. 36, when the great difference in shape position and size of the chitinous plates outside the genital aperture will be evident. I have met with another azure blue Arrenurus which was almost globular (fig. 41), and here these plates will be seen different in shape from any of the other sketches.

Fig. 42, which I believe to be the female of *Arrenurus tricuspidator*, is of a dark brick-red colour, with black cœcal markings and coarse granular appearance, and in shape differing much from the other figures. In addition to these, I have met with several females (whose names I could not make out) differing somewhat in shape, size, and colour from those described, but, as I have not mounted or kept accurate descriptions of them, they will have to be taken again before being recorded.

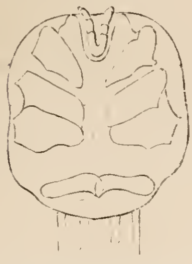

Fig. 40.—Arrenurus, sp. (from below).

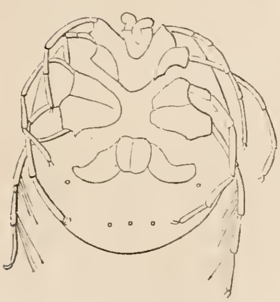

Fig. 41.—Arrenurus, sp. (under surface).

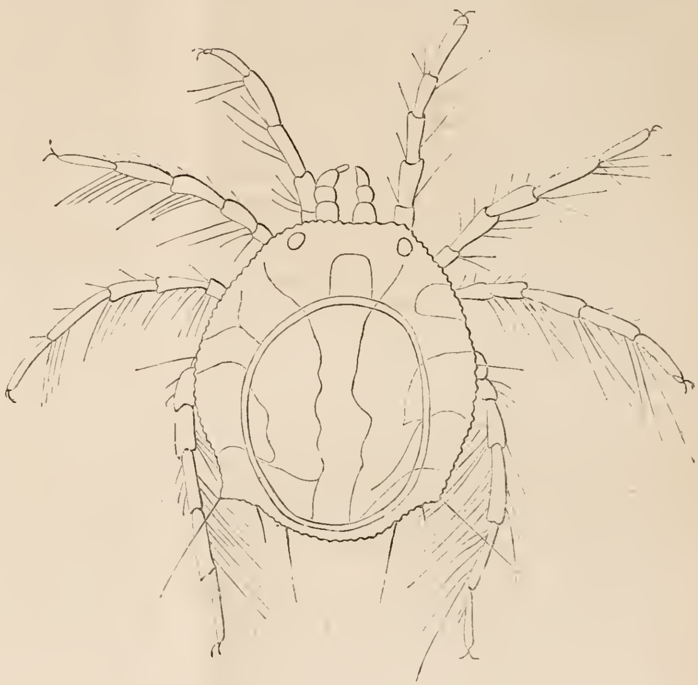

Fig. 42.—*Arrenurus tricuspidator*, ♀, ⅔ object.

WASPS.—Upon several occasions I have seen a wasp catch a butterfly, nip off its wings, and then fly away with its body. Also upon several occasions I have seen one hunting in places where spiders are to be found; but I cannot say that I ever saw one of these individuals caught by a wasp.—*Thomas Kingsford, Canterbury.*

NATURAL HISTORY NOTES FROM SIMLA.

THIS is perhaps one of the best known and most often described of Indian stations. There is something home-like in the neatly kept lawns, and in the trim garden hedges which add a charm to the natural attractions of the place. Nature here has been lavish in her bounty, and botanist, entomologist, and two or three other ologists might find much to interest and much to repay research and labour in their various pursuits. Take, for instance, the entomologist. Ere these heavy rains began, the air was alive with lovely Lepidoptera flashing their prismatic colours in the unclouded glory of the summer sun. The season had been one of unusually prolonged heat, and Papilios, which usually frequent the low valleys and Khuds, came into the gardens, and might be found near every newly-watered plant. As to beetles, any one interested in them could make a most valuable collection up here. There are some very curious ones. Besides the common kind, whose busy wings whirr an unceasing concert during the rainy season, there is one kind which I had never heard until the beginning of this summer. Its approach was made known by a most musical sound, as if some one had struck a stringed instrument. The noise was not particularly loud, but so intense and clear that it could be heard at a great distance. We have often tried to follow the creature, but in vain. It was a musical *ignis fatuus*, and whenever we got to where the noise was last heard, off it went far out of reach, so we never saw it. I think it always chose fir-trees as its favourite haunts, and as our house and garden are set as it were in a frame of dark deodar pines, it had plenty of choice among them. After a few days it seemed to vanish, and I have never heard it since.

There are the rose beetles, which are a very large and destructive class. What ravages they work and how pretty they are, glinting in the sunshine like burnished copper. Then the ornithologist (we have rather a distinguished one up here, by the bye) has a wide range before him—the mighty lammergau sweeping in its majestic flight across the mountain's barren side and swooping down into the valley, where in luxuriant pastures it finds a plenteous supply of dainty food among the herds and flocks. They are, indeed, magnificent birds, but they are worse enemies to the farmyard and poultry house than even the dreaded jackal.

Of smaller birds there are the pert little mina; sparrows, thrushes, robins, cuckoos, have all their representatives; while as to crows, they are the most impertinent of birds. The martins build their mud-walled nests in the verandah eaves, the fly-catcher darts from his favourite perch, and the wagtail waddles across the lawn; and you might fancy yourself in England, till a gaily decked hoopoo struts proudly into view. Deeper in the woods one finds nut-hatches, jays, doves that coo with a very familiar tone, kingfishers, and well-known little tits. Talking of things that fly, though they are not birds, I may mention the flying squirrel. It is very plentiful in some localities, but it is such a recluse that it is seldom noticed. But take a seat just after sunset underneath the deodar, and watch in the gathering twilight for a dark shadow. There it is, from the roof of the house it has dropped to a tree some forty yards off, and there it sits quite unconscious of your presence, or, at all events, quite unconcerned, nibbling at the bark or cracking a nut; you may go close up to it and shoot it, and the only difficulty will be to get far enough, so as to be able to see it and yet not blow it to pieces. Unless shot dead, they cling to the tree, and never drop, however badly wounded; this is lucky, as they are spirited little animals, and if caught and trapped alive, bite and fight for dear life with curious pertinacity.

They are very destructive in the garden, no fruit comes amiss to them, and they are said to nibble the tops of fir-trees and eat the young shoots. Among themselves they are very quarrelsome, and it is difficult to find an unmaimed one. An ear, or a leg, or an eye, will probably be missing. They have taken up their abode in our roof, and hardly a night passes without a terrible fight, when they squeal and scamper about in a most disturbing fashion. Their skins in winter time are exceedingly pretty, and make very charming rugs or mats, but the beasts look so happy darting about or nestling to the sides of the fir-trees, that, destructive as they are, one would feel sorry to shoot them.

The creatures which are most curious to watch are the monkeys, and of course sheets upon sheets might be written about these caricatures of humanity. The likeness is the most striking, because, among their native forests they may be seen side by side with human beings so low in the scale of civilisation that many of the habits of the man and of the monkey are nearly similar. In the winter they grow very bold, and are fierce and troublesome. They will snatch the bread out of a man's hand as he sits munching his chupatee, while in the fowl-yard they will devour all the grain which is thrown to the fowls. It appears that the fiercest of the tribes which frequent our woods always belong to one family, and there is always a representative descendant who pesters the servants at meal-times. To shoot a monkey is sacrilege to a native's mind, and few people after they have once killed one would willingly shoot one, for to see a monkey die, is, it is said, one of the most painful sights that can be imagined.

As to wild beasts, in the sense of beasts of prey, we have but few kinds, and these I shall leave to describe another time, as the mail is just going out, and there is not time for more to-day.

PEN.

ON THE DISCRIMINATION OF DIFFERENT SPECIES OF WOOD BY MICROSCOPICAL EXAMINATION.

THE following is the classification of cross-sections of wood by Mr. C. J. Müller, alluded to in the note on this subject in the last number of SCIENCE-GOSSIP :—

PITH MASS CIRCULAR, OR NEARLY SO.

A.—Edge of Woody Tissue next Pith Crenate.

Name and Character of Medullary Rays.	Character of Ducts or Air-vessels.	Proportion of Pith Area to that of Wood, minus Bark.	Other Particulars.
Æsculus hippocastanum.—Thin, crowded.	Abundant, forming bands, many compound.	1 to 2	Liber in a single ring.
Berberis vulgaris, 2 years old.—Wide apart, thick, flexuose.	Large in the lines of annual growth, small elsewhere.	1 to 3	Woody tissue, mottled, epiphlœum corky.
Sambucus nigra, 3 years old.—Of unequal thickness, several thin between two thicker ones, flexuose.	The larger ducts form distinct rings, others scattered.	1 to $1\frac{3}{10}$	Black spots in endophlœum, bark thick.
Tamarix gallica.—Broad, far apart, widening outward.	Sparse, scattered, large.	1 to 17	Liber in distinct parcels.
Pyrus aucuparia, 2 years old.—Regular, strongly defined.	Crowded and abundant, somewhat radiated.	1 to 8	Liber abundant in 2 rings of parcels, bark rather thick.
Rosa canina.—5 to 10 thin ones, lying between thick ones.	Various in size, the larger being in the lines of annual growth.	1 to $1\frac{7}{10}$	Curved bundles of liber lying between the extremities of each pair of the broad medullary rays.
Cytisus laburnum, 4 years old.—Mostly very thick, with a few intermediate thin ones.	Large, forming conspicuous rings in the lines of annual growth, intermediate ones smaller.	1 to 41	Liber in little parcels, wide apart.
Cratægus oxyacantha, 4 years old.—Thin, somewhat evenly disposed.	Scattered, openings angular.	1 to 52	Liber in irregular parcels.
Hedera helix. — Broad rays widening outwards, alternating with intermediate thin ones.	Scattered and sparse, small.	1 to 7	Liber in small parcels, cells of epiphlœum large.

B.—Edge of Woody Tissue next Pith, even or nearly so.

Name and Character of Medullary Rays.	Character of Ducts or Air-vessels.	Proportion of Pith Area to that of Wood, minus Bark.	Other Particulars.
Syringa vulgaris, 3 years old.—Thin, flexuose.	Large and crowded in the lines of annual growth, intermediate ones small and scattered.	1 to 13	Liber abundant, forming complete rings, loose tissue outside bark.
Cornus sanguineus, 3 years old.—Strongly defined, with intermediate thin ones, wavy.	Disposed in circular bands, abundant, of medium size.	1 to 19	Bark rather thick. Liber very sparse.
Ficus carica.—Wide apart, unequally distant.	Wide apart, large, mostly compound.	1 to 5	Certain rings in the woody tissue, containing granules which give them a clouded aspect.
Corylus avellana, 2 years old.—Thin, crowded.	Mostly compound, arranged in lines radiating from the pith, with intermediate blank spaces.	1 to 71	Liber in a ring, and also detached parcels. Bark full of crystals.
Ulmus campestris, 4 years old.—Strongly defined, wide apart.	Large, arranged chiefly in parcels in the lines of annual growth.	1 to 191	Liber abundant in dense rings and parcels, endophlœum full of crystals.
Ulmus campestris, var. *suberosa*, 2 years old.—As above.	Large, sparse, scattered.	1 to 250	Great development of corky tissue in 6 or more parcels.
Morus nigra.—Thick, placed at unequal distances apart.	Large, many compound.	1 to $3\frac{2}{10}$	Liber in detached parcels, and in a ring.
Ligustrum vulgare, 5 years old.—Straight and regular, nearly equidistant and well-defined.	In rings in the lines of annual growth, intermediate ones few and scattered.	1 to 24	Liber scanty.
Cotoneaster vulgaris, 3 years old.—Thin, nearly equidistant.	Extremely small, form a ring at edge of each annual zone.	1 to 170	Bark thick. Liber in parcels.

PITH MASS TRIANGULAR.

Name and Character of Medullary Rays.	Character of Ducts or Air-vessels.	Proportion of Pith Area to that of Wood minus Bark.	Other Particulars.
Betula alba, 4 years old.—Thin, nearly equidistant, radiating in bundles from rounded angles of pith.	Equally distributed, many compound.	1 to 111	Liber in a complete ring, pith with incurved sides.
Alnus glutinosus, 4 years old.—Thin, radiating in curvilinear bundles from rounded angles of pith.	As above, but smaller.	1 to 81	Woody tissue, rather coarser than that of *Betula alba*.
Fagus sylvatica, 8 years old.—5 or 6 broad rays proceeding from each side of the triangular pith, and widening outwards.	Large, abundant, equally distributed in zones.	1 to 127	Liber abundant in dense parcels.
Vaccinium myrtillus.—Crowded, a few here and there, thickened.	Very small, scattered, abundant.	1 to 15	One angle of pith truncated so as to give it a quadrangular aspect. Liber none, or inconspicuous.

PITH MASS OVOID.

Platanus orientalis, 2 years old.—Thick and wide apart, with occasional intermediate thin ones.	Large, crowded, openings angular.	1 to $6\frac{4}{10}$	Edge of woody tissue next pith crenate. Liber in irregular parcels.
Ilex aquifolium, 2 years old.—Some thick, and wide apart, with intermediate thinner ones.	Very small and sparse, many compound.	1 to 9	Bark full of crystals. Liber in a thin ring, pith cells full of granules.
Acer campestre, 3 years old.—For the most part rather thick, and well defined. 6 well-marked clusters.	In rings or bands, moderate in size, many compound.	1 to 15	Liber in distinct rings, parcels of external corky tissue, edge near pith crenate.
Prunus communis, 5 years old.—Straight and nearly equidistant, of unequal thickness and somewhat flexuose.	Form conspicuous rings in the lines of annual growth, others scattered.	1 to 55	Liber in detached parcels widely separate.
Rhus typhina, 2 years old.—Regular, well defined, distant.	Large, heaped near lines of annual growth, others few and scattered.	1 to $1\frac{5}{10}$	Edge of woody tissue next pith crenate. Liber in curvilinear parcels all round, with a long elliptical opening in each parcel.
Acer pseudo-platanus, 3 years old. — Unequally distant, strongly marked, rather thick.	Of medium size, not very abundant, mostly compound.	1 to 5	Edge of woody tissue next pith, crenate. Liber in a single ring.
Fraxinus excelsior, 3 years old. — Thin, evenly arranged, distant.	Large, forming conspicuous rings in the lines of annual growth.	1 to $4\frac{3}{10}$	Liber abundant in concentric circles.
Tilia Europæa, 3 years old.—Thin, evenly disposed.	Numerous, varying in size, compound.	1 to 55	Liber in wedge-shaped bundles, broad next the woody tissue, narrowing outwards, crystals abundant in the bark.

PITH MASS PENTANGULAR OR HEXANGULAR.

Salix viminalis, 2 years old.—Regular, rather distant, crowded at angles of pith mass.	Scattered.	1 to 24	Liber abundant in parcels, pith 5-sided.
Salix alba, 4 years old. — Regular, thin, waved.	Scattered, numerous, many compound.	1 to 145	Liber in detached parcels, not so abundant as in *S. viminalis*.
Viburnum lantana, 4 years old. Evenly arranged, and of equal thickness.	Of varying size, equally distributed.	1 to 19	Liber sparse, bark full of crystals.

PITH MASS PENTANGULAR OR HEXANGULAR—(*continued*).

Name and Character of Medullary Rays.	Character of Ducts or Air-vessels.	Proportion of Pith Area to that of Wood, minus Bark.	Other Particulars.
Quercus ilex, 4 years old.—Thin, close, equidistant.	Sparse, in radiating bundles, with intermediate blank spaces.	1 to 198	Woody tissue, mottled. Liber in a complete circle.
Rubus fruticosus.—Short, thick, in bundles, with intermediate thin ones.	Large, scattered.	1 to $1\frac{6}{15}$	Liber in curved parcels between the extremities of the medullary rays.
Castanea vesca, 5 years old.—Radiating in curvilinear parcels from projecting points of pith, of unequal thickness.	Large, arranged in the lines of annual growth, apertures mostly oval.	1 to 62	Liber abundant in elongated parcels, woody tissue, mottled.
Populus nigra.—Thin, regular.	Abundant, not large, pretty equally distributed, mostly compound.	1 to 55	Liber in scattered parcels.
PITH MASS OF IRREGULAR SHAPE OR ANGULAR.			
Clematis vitalba.—12 in number, broad, connected near the bark by arches of liber.	Very large, crowded.	..	Woody tissue in 6 broad wedge-shaped bundles, alternating with six narrow ones, pith stellate, with twelve rays.
Pinus sylvestris, 3 years old.—thin and crowded.	None, but a few lacunæ.	1 to 197	Bark thick, containing resin.
Taxus baccata.—Thin and crowded.	None, no lacunæ.	1 to 227	Pith very irregular in outline, with processes.
Robinia pseudacacia.—Thin, distant.	Large in the annual ring, small and scanty in other parts.	1 to 8	Pith lobed.
Thuja.—Thin, crowded, flexuose.	None.	..	Pith stellate, 4 rayed, very small.

MICROSCOPY.

"STUDIES IN MICROSCOPICAL SCIENCE."—Variety and an artistically high character continue to distinguish these weekly issues. Among the recent studies we particularly notice the following:—"Transverse Section of Spleen of Infant," "Tran sverse Section of stem of *Juncus communis*," "Ditto of Spleen of Cat."

"THE JOURNAL OF THE POSTAL MICROSCOPICAL SOCIETY."—No. 4 of this Journal has been published (edited by Mr. A. Allen), containing the following papers:—"On the Structure and Economy of the Daphnia" (Presidential address, by Mr. A. Hammond, F.L.S.); "On the size of Dust Particles of Wheat and Coal," by H. Epps; "On the Bursting-point of some Starch Cells," by W. J. Dibdin; "Pond Hunting in Winter," by E. Wade-Wilton; besides selected notes from the Society's Note-book, Reports of Societies, Correspondence, &c. As might be expected by all who are acquainted with his drawings, the illustrations to Mr. Hammond's paper are excellent.

"JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY."—The December part of this Journal is full of unusually interesting matter, including papers on "Some Organisms found in the Excrements of the Domestic Goat and the Goose," by R. L. Maddox, M.D., and on "A Further Improvement in the Groves-Williams Ether Freezing Microtome," by J. W. Groves. In addition, we have a capital summary of current researches relating to Zoology, Botany, &c., as developed by microscopical research, as well as a full Report of the Proceedings of the Royal Microscopical Society.

FLUID CAVITIES IN METEORITES.—As the author of the paper on Fluid Cavities in a Meteorite, referred to by your correspondent in this month's SCIENCE-GOSSIP (p. 276), I may perhaps be permitted to state that I shall be very happy to give every additional information in my power to him and to all those who may have taken an interest in this subject. I have a number of sections of the Meteorite of Braunfels, and also a few fragments of the material, which I shall be glad to submit to the examination of experts.—*Heinrich Hensoldt.*

HELIOPELTA.—In June 1844, a paper by Professor Ehrenberg appeared in the Monatsb. d. k. Akad. zu Berlin, entitled, "Ueber eine neue marine Tripel Bildung von der Bermuda Inseln," in which he says, "Herr Professor Bailey in West Point, New York, der flüssige amerikanische Freund mikroscopischen Forschung, hat dem Vorfasser eine Probe einer Erde von der Bermuda Inseln zugesandt, dass er dieselbe mikroscopische analysiren und der Inhalt zu organischen Formen namhaft machen und bestimmen möge. Ihm ist sie von Herrn Tuomey aus Petersburg in Virginien mit andern Erdarten zugekommen." It is certain that Professor Ehrenberg jumped to the conclusion that the deposit was from the Bermuda Islands. I saw many years ago a small packet of the deposit in question, which had been sent by Professor Bailey to Mr. Brightwell of Norwich; it was labelled "*Bermuda* Tripoli, J. W. B.," nothing being said about islands, and in spite of the close resemblance this deposit bore to the other Virginian earths, we all fell into the same error as Ehrenberg; it is probable that Bailey himself knew no better, as he does not appear to have ever corrected Ehrenberg's mistake. I am convinced that a similar mistake has been made with regard to the Moron deposit, which Greville says came from Spain. Judging from the resemblance the forms found in it bear to those in the Californian deposits, I think there can be little doubt that it came from some obscure place of that name in California. It has always been a matter of surprise to me that Ehrenberg should have figured so few of the beautiful forms more or less plentiful in the Bermuda deposit, particularly as the "Mikrogeologie" was not published until 1854. The species of Heliopelta he figured and described are *H. Metii* (named after Jacob Metius, inventor of microscopes, 1606). *H. Leeuwenhoekii* (named after the celebrated microscopist, 1675) with 8 divisions: Monatsb. and Mikrogeo. Pritchard says it has 10. *H. Eulerii* (named after Euler, the famous optician), with 10 divisions: Monatsberichte; Pritchard says 12. *H. Selliguei* (not Selligurii) (after a maker of improved microscopes), with 12 divisions; Pritchard does not give the number of divisions, but spells the name erroneously (Seliquerii). *H. Dollondii* was first published in the Mikrog. (p. 263) but not figured. It is now generally admitted that there is not sufficient difference between Heliopelta and *Actinoptychus* to warrant the constitution of a new genus, or that the number of "divisions" are of any specific value. *Omphalopelta versicolor* is the internal plate of Heliopelta. Frustules of *Aulacodiscus margaritaceus* not unfrequently occur with the processes differing in number on the opposite valves, and a few days ago I picked out a frustule of *Coscinodiscus punctatus*, Ehr. (oval var.), the valves of which separated in mounting. One of them has the granules somewhat densely packed, in the other they are close near margin, but scattered as they approach the centre.—*F. Kitton.*

MOURNE DIATOMS.—Ehrenberg first described the Mourne mountain Diatoms in the Monatsberichte for 1842, and in the Mikrogeologie tab. xv. is devoted to the forms found in this deposit, which he says is from Mourne Mountains, Down, Ireland. In 1867–8 Dr. Arnott and myself wanted to obtain some of this material, but were unable to do so, and we came to the conclusion that Ehrenberg's sample, received from the Countess of Caledon, was marked "Mourne" only, and was really the deposit from Lough Mourne, co. Antrim (sold as Lord Roden's Plate Powder), which he erroneously supposed came from the Mourne Mountains. In support of this explanation is the fact that the forms he figures are those occurring in Lough Mourne, such as *Surirella Caledonica* (named after the Countess), *Campylodiscus Hibernicus*, &c. &c.—*F. Kitton.*

GREENWICH MICROSCOPICAL SOCIETY.—"At the Annual Meeting, held at the lecture hall on the 20th December last, Mr. George D. Colsell, of 5 Hamilton Terrace, Hyde Vale, Greenwich, was elected Hon. Secretary of this Society."

MAGNIFYING MEASUREMENTS.—Will any of your more experienced readers kindly explain a difficulty? I cannot quite understand the magnifying measure of diameters as used in Microscopy. I have hitherto supposed that any object magnified, say 100 diameters, would appear 100 times as long and 100 times as broad as its real size. But when using the combination of 1 inch objective with B eye-piece, by a celebrated maker, said in his list to magnify seventy-six diameters, and using the stage micrometer as an object—the $\frac{1}{100}$ of an inch divisions only appear to be one-third of an inch long, instead of, as I expected, $\frac{76}{100}$, that is, three-quarters of an inch—a very considerable difference. Thus three magnified divisions of the micrometer appear to go to an inch, instead of one division going to three-quarters of an inch. I have hitherto thought that when each division of the micrometer (100ths), drawn by the camera lucida, measured one inch on the paper, the figure was magnified 100 diameters ($\times$ 100); but if this were so, each division, when viewed by a combination magnifying seventy-six diameters, that is, $\frac{3}{4}$ of 100 diameters, would naturally appear $\frac{3}{4}$ of an inch, instead of, as it does, appearing $\frac{1}{3}$. I shall be greatly obliged if any of your readers who understand the subject will explain my difficulty.—*E. A. C. H.*

CANADA GOOSE.—A few of these birds are shot along the south coast most sharp winters; it must not be supposed, however, that these come from Canada. The bird is easily domesticated and agrees well with common geese, and may be found in many private grounds in England. It has long been naturalised in many parts of France, as both Buffon and Bewick speak of it as being common there. It is most likely that the bird referred to came from France, as during the prevalence of S.E. winds many wild fowl common to the French coast are to be met with in our own southern estuaries.—*F. Churton.*

ZOOLOGY.

The Littel Auk (*Mergulus melanoleucos*).—A specimen of this bird was picked up at Isleham, on November 28th, 1882, driven inland by the severe weather experienced at that time on the coast.—*Albert Waters, B.A., Cambridge.*

Portuguese Men-of-War off the Suffolk Coasts.—It is not a foreign fleet of war vessels here implied, but certain members of the Siphonophora known by the above popular name, and distinguished by zoologists as *Physalia utriculus*. They were driven by the recent storms as far out of their ordinary oceanic coasts as Aldeburgh, where several specimens were secured by Dr. Hele, who kindly forwarded me a couple.—*J. E. Taylor.*

Extracting Minute Snails.—The best plan which G. E. Bishop can adopt is to boil the shells in solution of potassic hydrate ["caustic potash"]; this dissolves out the snail, and leaves the shell beautifully clean. They must be well washed afterwards in warm water.—*R. A. R. Bennett, Oxford.*

The Butterflies of Europe.—Part XI. of this work contains some of the most artistically coloured sketches of butterflies of any yet published. The species and varieties figured and described are those of the genera Melitœa and Vanessa.

The Mungoose.—A very interesting pamphlet on the mungoose now being employed on the sugar estates in the West Indies, has just been published by Mr. D. Morris, director of the Public Gardens and Plantations, Jamaica. The experience gained may be of some use in those parts of Australia where the common rabbit is a pest. The mungoose has now become thoroughly naturalised in Jamaica and Barbadoes. It has been estimated that the loss in the sugar estates of Jamaica from the depredations of rats amounted to £100,000 per annum. Some of the best estates had actually been thrown out of cultivation by them, but since the introduction of the mungoose from the East Indies these estates have gradually been taken up again. Mr. Morris puts the annual saving from these animals at 90 per cent. of the rat-catching expenses, and at 75 to 80 per cent. of rat-eaten sugar canes. This would represent a total saving to the island of Jamaica alone of nearly £45,000 per annum.

Vitality of Insects in Gases.—Some interesting experiments have just been published in the "American Naturalist," to show the difference in tenacity of life enjoyed by some insects over others when exposed to certain noxious gases. The vessels used were large glass bottles fitted with inlet and outlet tubes for the gases. The following results were obtained: Oxygen.—The exhilarating effects of this gas seemed to pass off after a short time, flies living in it from 9 to 29 hours, the common yellow butterfly for 12 hours, a moth (Noctua) for one and a half days. Colorado beetles, although exposed for 3 days, seemed quite uninjured. Hydrogen.—House-flies became quiescent in 20 minutes, although one was able to fly after 24 hours' confinement. Upon Colorado beetles this gas seems to have as little effect as oxygen. A noctua died in 20 minutes, and a black wasp in 10 minutes. Carbonic acid anhydride.—Flies died in 10 to 15 minutes. Colorado beetles recovered after 3 hours' exposure. Bed-bugs also recovered after 2 hours' exposure. Carbonic oxide.—Ants died in half a minute to a minute. Colorado beetles revived after remaining in it for 45 minutes. Prussic-acid and nitrous acid fumes acted fatally in every case. Colorado beetles were the only insects which resisted chlorine after one hour's exposure. Nitrous Oxide.—Colorado beetles lived 2 hours, moths (Noctua) an hour and a half, young grasshoppers were but little affected. Variable mixtures of hydrogen, marsh gas, carbonic oxide and hydrocarbons.—Colorado beetles revived after an hour's exposure. Croton bugs (*Ectobia Germanica*) after half an hour, young of grasshopper after an hour. A cicada died in 10 minutes. The writer concludes by showing that a new way of preserving insects is possible by having air-tight cases filled with some gas noxious to certain of the smaller insects.

"The Practical Naturalist." (Manchester: John Heywood.) This is a new and well-placed competitor in current scientific literature, edited by Messrs. H. S. Ward and H. J. Riley, published at one penny. It promises well in every respect.

Provincial Societies.—One of the most gratifying signs of the times we live in is the multiplication of societies in our provincial cities and towns devoted to the study of natural science. The papers read are often of a high-class character, and the "Reports" and "Transactions" of such societies are therefore increasing in their scientific value. The "Transactions of the Birmingham Natural History and Microscopical Society" contained the following papers:—"On a Nest-Building Fish," by Sylvanus Wilkins; "On Underground Fungi," by the Rev. M. J. Berkeley; "On the Desmidieæ of North Wales," by A. W. Wells; "Freshwater Aquaria," by R. M. Lloyd; "Notes on Papyrus," by W. R. Hughes; "How to Work the Archæan Rocks," by Dr. C. Callaway; and "On Commencing the Study of Fungi," by Dr. M. C. Cooke. The "Transactions of the Hertfordshire Natural History Society" (vol. ii. part 2) contains papers on "Local Meteorological Observations," by the Rev. C. W. Hervey and Mr. John Hopkinson; "Notes on Insects observed in Hertfordshire during 1881," by Miss E. A. Ormerod; "Notes on Birds observed in Hertfordshire" during the same year, by John E. Littleboy; "On *Chlorodosmos hispida*, a new Flagellate Animalcule," by F. W. Phillips, &c. The "Proceedings of the Belfast Naturalists' Field-Club," 1880–81, contains, besides archæological papers and very interesting accounts of excursions, the following:—"On the Boulder-Clay of the North-East of Ireland," by S. A. Stewart; "On a Collection of Birds Shot in Belfast Lough," by Thomas Danagh; "On Carnivorous Plants," by W. H. Phillips; and "Glacial Notes among the English Lakes," by Mr. F. W. Lockwood. The "Proceedings of the Norwich Science-Gossip Club" contains the President's Address, in which we find able abstracts of the papers read during the year.

BOTANY.

"The Botanical Exchange Club."—The Report of this club for 1881 has appeared, edited by F. A. Lees, F.L.S., giving lists of new varieties, and new habitats of British plants, with notes and comments by various well-known botanists.

Proliferous Sundew.—In a recent stroll across Putney Heath I obtained a few specimens of *Drosera rotundifolia*. On looking these over at home, I found among the sphagnum in which they were growing a single leaf which had become detached at some time. It was somewhat attenuated and the filaments shrivelled, but from the under surface two roots were given off. Near the growing-point these became clear and semi-transparent, whilst the growing-point itself was of the same crimson as the tentacles. From the upper surface three of the tentacles had become developed into buds which had now given rise to as many tiny sundews, each with four or five leaves with minute greenish tentacles. Is it common for Drosera to reproduce itself in this way? I have had large numbers of them during the last five or six years, but have never noticed a similar case.—*E. Step, Putney.*

"The Gardener's Chronicle" gives an interesting account of the effects of the stinging tree (*Laportea gigas*). The pain produced by the sting of a single hair on the right hand gave rise to remarkable symptoms; the pain being confined to the right side of the body, succeeded by a numbness and slight paralysis. Besides the pain, a sensation of losing the senses, or rather of becoming insane, was experienced. The severe symptoms lasted two hours; the spot pricked remaining constantly painful for nearly a month after being stung.

Early Flowers.—I picked to-day several specimens of *Mercurialis perennis* with male flowers fully expanded. I have never known it so early. It grew on a sheltered bank. We have in our garden winter aconite, hepaticas (double and single), anemones, Alpine auricula, primroses, violets, polyanthus and pansies in bloom.—*M. E. Pope, Paddock Wood, Kent.*

GEOLOGY.

MR. WHITAKER'S READINGS OF RED CHALK.*

My remarks I will limit to Hunstanton Chalk,
Knowing nothing of Lincoln and little of York,
Perfection I pine for—but still I *must* talk—
Unanimity in drawing a different conclusion,
From like premises adds to our native confusion,
Yet this is the way that geologists mull,
Giving birth to my Norfolk (not Irish) "bull."
If we tot up the notions from which one may choose,
We find there are fifteen quite possible views;
But eight I dismiss without an apology,
By the aid of known fossils—or Palæontology.
Thus seven remain, of which two, none have thought,
Though over the five they have squabbled and fought,
And to the discussion bad reasoning brought.
One takes up his views—oh, is it not droll!
Because "correlation's" the greed of his soul.
While another whose thoughts are unsound and unripe,
Founds all his conclusions on what he calls "type."
But this let him smoke and put in his pipe—
"Ever-varying Nature, in monotonous way,
Never lays down a bed universal of clay,"
So why should at Folkestone lie "typical" gault?
Mr. Wiltshire, methinks that your reason's at fault.
Why should Nature be "squared" to a type in this way,
Explain it, O Wiltshire, explain it, I say.
Now let us from fossils discuss the rocks' age,
And try to decipher this obscure page
Of Nature, and list to the words of a sage!
Your minds with the details I wish not to plague,
For really the state of my own is but vague.
But of *seven* conclusions we're left with but *two*,
Which from fifteen at first is reducing "a few,"
But then *one* of them must be certainly true.
It *is* Lower Chalk, or it is *that* and Gault,
But between these opinions at present I halt,
And so would all others if worth but their salt!
This is my belief to close all the talk,
And none can gainsay it—Red Chalk is—Red Chalk.

A. Conifer.

The Geologists' Association.—No 6 of Vol. VII. of the "Proceedings" of this society contains papers on "The Progress and Prosperity of English Submarine Tunnels," by C. E. De Rance, F.G.S.; "Description of a Section across the River Severn,"

* "The Red Chalk of Norfolk." Part of Presidential Address to the Norwich Geological Society. Geo. Mag., Jan. 1833.

by Evans D. Jones; "On the Geographical Distribution of Corals," by Stuart O. Ridley, F.L.S.; together with interesting accounts of various geological Excursions.

FOSSIL WORMS.—Dr. G. J. Hinde has kindly forwarded us his paper (communicated to the Royal Swedish Academy of Sciences) "On Annelid Remains from the Silurian Strata of the Isle of Gotland." The descriptions are based chiefly on the jaws of errant worms found in the soft shales of Fröjel and Wisby. Most of them belonged to worms nearly related to the existing Eunicea, nine species of which are here described under the generic name of Eunicites. Another genus, called Ononites, includes eight species; the genus Arabellites has ten species, and Lumbriconereites four species. The jaws of all these species are beautifully figured. We have a great deal of real solid palæontological work here packed away in a very small space. This paper cannot fail to enhance Dr. Hinde's growing reputation.

FOSSIL "WALKING-STICK" INSECTS.—Until the present only 110 species of insects were known from the Carboniferous rocks of the whole world. In France none were known until 1877, when M. Brongniart received some wings of Blattidæ from St. Etienne; and in the same year was sent him from Commentry a Phasmian, described under the name of *Protophasma Dumasii.* Since that date, at least 430 impressions have been obtained from the coal-measures of Commentry; these include 300 Blattidæ and 130 insects of various orders. From M. Fayol M. Brongniart has just received a remarkable Orthopteron of gigantic size, found in fine blackish shales at Commentry. All parts of the body, except the upper part of the thorax and abdomen, are preserved. It approaches the Phasmidæ or "walking-stick" insects most closely; and to that group M. Brongniart refers it as forming a new genus, under the name of *Titanophasma Fayoli.* The genus Titanophasma comes nearest to Protophasma among fossil forms; among recent types it resembles Phibalosoma in size and the general form of the body, and in the presence of numerous spines and warts upon its legs. The occurrence of insects in which mimicry is so highly developed as in this group, so far back as the Carboniferous period, suggests that they must have had enemies, at present unknown to us, against which they were protected by their resemblance to inanimate objects.

"THE MISSING LINK."—Whether this remarkable specimen of humanity now exhibited at the Westminster Aquarium is a "missing link" or not, nobody will deny it is of the greatest interest. It is a child seven years of age, capable of speech, whose body is covered with short, dense, soft hair; with feet prehensile, hands capable of being bent quite back on the wrist, pouched cheeks, used to store food as in the monkeys, jaws slightly prognathic. It will not do nowadays to settle such an anomaly by calling it a *lusus naturæ*, for most naturalists are agreed that "sports" and "monstrosities" are often only "reversions to ancestral conditions." The father of the child was covered with hair in a similar manner. The family was discovered in the Lao country, by Mr. Carl Bock, the well-known traveller and anthropologist. Miss Bird, in her charming book on Japan, describes the short, hairy aboriginal race of that country, known as Ainos; and more recently Mr. A. H. Keene has described the Aino ethnology more fully and scientifically. In the extreme east of Asia we have these dwarf hairy Ainos fast becoming extinct; and now a Siamese hairy family turns up with decidedly simian characteristics. In Burmah hairy people have been occasionally known. It will be remembered that, many years ago, Mr. Everett was sent to Borneo to explore the caves for possible early remains of man, as it has always been imagined that it is to the tropical and subtropical parts of the extreme East we should look for "missing links" between humanity and the lower animals.

NOTES AND QUERIES.

A POISONOUS LIZARD, AND NEW SNAKES.—Perhaps those of your correspondents who do not already know about it, would like to hear that a new and poisonous lizard has been discovered in America, named the Heloderm. It can kill a guinea pig in three minutes; its food at the Zoological Gardens consists of eggs and mice; it is thought that its natural food is reptiles; it has therefore been offered a grass-snake and a slowworm; but it has taken no notice of them. It is a short thick-set, dull-looking creature; its colour is dull yellow with dark mottlings; its length I omitted to ascertain. Some new snakes have been discovered about Jeddah; there are several at the Zoological Gardens. Noting from one now before me, its description is as follows. Its length is about 5 feet; it is very slender, and has an extremely thin and tapering tail. Its ground colour is a pinkish brown, the former hue predominating; the fore part of its body is darker than the latter, and indistinctly spotted, while the tail end is clear and light, thus giving the creature a very strange appearance. Its head is noticeable, the eyes seeming to project above the top of the head, frog fashion. It feeds on frogs and mice, the latter for preference, and likes to lie in water. I shall be happy to send portions of the cast skin to a few microscopists, if they desire it. Can any correspondent tell me anything of the food or habits of the bombadier or fire-bellied toad (*Bombinator igneus*) of which I have lately caught a specimen in Belgium?—*H. C. Brooke.*

WHITE FLOWERED PLANTS.—I have the following plants with white flowers:—*Ajuga reptans* (bugle), York. *Lychnis Flos-cuculi* (ragged robin), Pen Maen Mawr, North Wales. *Polygonum hydropiper* (water pepper), York. *Prunella vulgaris* (self-heal), Pen Maen Mawr, North Wales. *Centaurea Scabiosa* (great knapweed), Seaton.—*Alfred Waller, York.*

Mildness of Season.—A specimen of the small white (*Pieris Rapæ*) was captured in a garden near Nottingham on January 6.—*W. Allen.*

The Cricket.—With much interest I have read the paper on the production of sound by crickets, written in the last number of Science-Gossip by H. T. Bacon. But is that gentleman quite right in stating that the French name of this insect is "cri-cri"? During the many years I lived in France I never heard it called anything but *le grillon;* under which name it is apostrophised by Béranger, in the well-known song, beginning:

> "Au coin de l'âtre où je tisonne,
> En rêvant à je ne sais quoi,
> Petit Grillon, chante avec moi
> Qui, déjà vieux, toujours chansonne.
> Petit Grillon, n'ayons ici,
> N'ayons du monde aucun souci."

La Fontaine and Florian have also made *le grillon* the subject of several of their fables.—*W. T. Greene.*

Mud Inhabitants.—It appears to me, that the green mud mentioned by R. M. W. in last Science-Gossip as a species of the unicellular chlorophyllous alga, *Palmella*, is possibly the form *uriformis*, and the "creature" described and inquired about, a *Rotifer vulgaris.* They are very common, and usually found in such habitats as "spouts of a building." Dr. Lankester's "Half-hours with the Microscope" figures and speaks of both Palmella and Rotifer.—*H. W. Lett, M.A.*

Mud Inhabitants.—The little creature, enquired after by R. M. W. in the December number of Science-Gossip, is the larva of a gnat, which I have often watched under a "half inch." It forms a mud house; and to see it building the same is amusing. It seems to hold by the tail when so occupied. I have taken a quantity of them with the mud and water out of the spout, put all in a basin, covered with muslin; after a while the sides will be ornamented with their mud retreats; then gnats will be the result. In the same spout I have found *Rotifer vulgaris*, also "rolling balls," which may be *Langenella euchlora*, for they have the "red eye" as figured in Pritchard's "Infusoria," 1852, plate 1, figs. 27, 28.—*F. S.*

Sea Birds near Cambridge.—I have more than once seen gulls flying over the low-lying meadows even close to the town [of Cambridge]. I was greatly surprised, I remember, when I first saw them some winters ago, and could scarcely believe they were, what they proved to be, viz. sea-birds. This winter several guillemots, shearwaters, and common gulls have been captured in the county, especially in Burwell and Toleham fens and near Newmarket.—*Albert H. Waters, B.A., Cambridge.*

Large Viper.—What can have possessed Mr R. T. Green to so stoutly dispute my statement of the fact that I had killed an unusually large specimen of the female viper? Permit me to assure him that it is he that has made a mistake, not I, for the reptile killed by me was a veritable viper (*Pelius verus*), and not a common snake (*Tropidonotus natrix*), nor was it a small crowned smooth snake (*Coronella lævis*, which latter, judging from descriptions I have read, and coloured figures I have seen, much more nearly resembles the common viper than does the former, and probably few experienced naturalists would mistake either one for the other. The colour, markings, general appearance, and attitude when attacked, serve, at once, to distinguish the viper from its harmless congeners. Your correspondent seems to be ignorant of the fact that the common English viper, like other members of the family Viperidæ; is ovo-viviparous—that is to say, brings forth its young alive from eggs hatched internally. The concurrent testimony of the ablest naturalists is too well established to be shaken by a single *ex parte* statement—a statement which, if not contradicted, might possibly mislead some few young naturalists into believing that vipers were viviparous, instead of ovo-viviparous. But for this, I should consider it quite unnecessary to trouble you to insert this reply. I may add that usually young vipers are born with fragments of their egg cases adherent to them.—*Edward H. Robertson.*

The Dormouse.—In answer to your correspondent "Meta," I am pleased to answer questions about the dormouse, of which I have had plenty of experience. It should be kept in a nice roomy cage, with a divided off sleeping-place, which should be filled with soft hay. It should have daily a slice of apple, or a little bread and milk, and three or four nuts, which must be taken from their shells for it. A little hemp is good now and then as a change, in cold weather. It should be kept in a warm room, or it will sleep all the winter; even then it will occasionally sleep for a day or two, and when found so, should not be suddenly awakened, or this will in course of time damage its constitution. It should certainly not have one of those atrocious "wheel cages" which generally result in severed tails, and, where two are kept, frequently in dislocated necks. Many years ago, I kept two squirrels in a wheel cage; one got its back injured, another got its tail cut off. I have often seen mice tailless through being kept in these tread-mills. I do not approve of teaching dormice tricks, white and common mice are the best for that. The dormouse is naturally delicate and sleepy, and prefers trotting up and down its owner's arm, to running along a tight rope with a flag in its mouth. To give it exercise, fix some forked twigs in its cage, and then you will afford it a beneficial means of amusement. I think, also, that owing to its sleepy nature, it would be rather hard to teach it tricks. If "Meta" desires any more information, I shall be happy to give it, on receipt of a letter addressed—*H. C. Brooke, Grammar School, Staplehurst.*

The Dormouse.—"Meta" should feed her pet with nuts, beech mast, bread and milk, and a little corn; but it will require little, if any, food in winter, unless the weather be very mild, or the temperature of the room in which it is kept be warm enough to rouse it into activity. No mice in a natural state hibernate, and spend the cold weather in a state of torpidity, but warmth rouses them easily. I had one dear little dormouse, so gentle and tame, it was a great favourite, and it had gone to sleep in its warm nest of cotton-wool and hay, in a tiny wooden box up in my bed-room, when one night I ordered a fire to be lighted, and next morning found my pet dead in the bath. The poor little thing had been roused by the warmth of the room, came out of its box, and climbed up the bath in search probably of water; for I have noticed that they are very thirsty when first they awaken in spring. I never attempted to teach mine any tricks, but I found them very easy to tame and gentle when handled. I much prefer dormice to squirrels; some of the latter bite severely, as I know to my cost.—*Helen E. Watney.*

Observations on two Spiders.—On entering my office this morning, I observed two spiders in close companionship upon one of the window panes, and on drawing near too rashly, surmised that one of them was in the act of draining the vital fluids from the other. Upon touching them however, they slowly separated, and I then saw that they had been attached by an organ, which I did not at the moment recognize as one of the palpi, but which I was afterwards satisfied was really the case. Although disturbed by my touch, the spiders only drew back a short distance from each other, apparently being oblivious of my presence, so closely was their attention concentrated upon each other. The male spider remained perfectly stationary, with its long and almost transparent legs advanced, and moving with a tremulous but regular motion, as though lightly tapping upon the glass. This movement was apparently quite intelligible to the female spider, which slightly responded, and then slowly advanced to the male, which, however, made no movement forward, but awaited until the female was in close companionship, when it touched her abdomen with one of its clubbed palpi, which it pressed gently but firmly against the region of the ovipositor, withdrawing it again immediately, this was repeated about three times, when I perceived a minute drop of transparent fluid upon the place which had been touched, but whether this proceeded from the palpus of the male, or the body of the female, I could not perceive, but imagine it exuded from the female. The male now pressed its palpina more firmly against the female, and apparently found some orifice or organ of attachment, for it was retained in that position for perhaps a couple of minutes. After repeating these processes the male remained stationary for perhaps a couple of minutes, slowly rubbing its clubbed palpi together, after which it slowly withdrew. Only one of the palpi was employed, so far as I could perceive, but the light coming strongly through the glass enabled me very clearly to note the action of the spiders, although I had no lens to assist my eyes, and was enabled to more clearly follow their movements in consequence of the transparency of their limbs; for they were not the heavy dark house spiders, but, I believe, a species commonly found inhabiting a large, light web under the shelter of grassy banks. I need scarcely add that the spiders were undoubtedly occupied in the processes of coition, but how far my observations coincide with what is known of their action during this process, I cannot say, as I have never read anything on the subject. —*E. Lamplough*, *Hull.*

SEA ANEMONES.—Sea anemones always eject their food in the way described by R. McAldwie, and he should either keep marine scavengers in the vase, or have a pair of the proper long wooden pincers, for removing any ejected scraps of beef or fish on which they have been fed. When living near the sea, I had some large tanks well stocked with different kinds of sea flowers, and I found it very necessary to keep the water pure, otherwise my stock sickened and died off.—*Helen E. Watney.*

AUTUMN DOG'S MERCURY (*Mercurialis perennis*). —This plant has been found as an autumn flower for the past three seasons. The stations are sometimes different from those of the primroses, and are warm, sunny ditch banks, on a light soil, in which circumstances they obtain a maximum of both heat and moisture. They also occur with primroses in woods, as described in the following paragraph. In December 1881 several plants in full fruit were gathered in South Beds. It would be well if observers of earliest dates would bear these facts in mind. Such plants as wild hyacinth, pilewort, hazel, and hawthorn, are of much more value for phenological observations.—*J. S.*, *Luton.*

AUTUMN PRIMROSES.—This is now (1882) the third season in succession in which primroses have been plentiful during the autumn in several woods in South Beds. In fact, one begins to expect them regularly, and to wonder for how many seasons they may have blossomed unobserved. The stations in which they occur, are those portions of woodland in which the undergrowth has been recently cut down, and consequently the rootstocks are more exposed to the stimulating action of the sunlight, than those that grow in the more shaded parts. They are generally to be found in such situations during the whole of the winter, in more or less abundance, according to the weather, and the writer has gathered them in each month from September to the following June.—*J. S.*, *Luton.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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.

E. C. J.—Your application came much too late for us to accede to your request.

E. A. C. H.—Get Dr. Cooke's "Ponds and Ditches," price 2*s*. 6*d*., published by the Christian Knowledge Society. It will introduce you to some of our common infusoria. "Microscopic Fungi," by the same author, coloured plates, price 6*s*. London: D. Bogue. "British Sea-Weeds," by W. H. Grattame, published at the "Bazaar" Office, price 2*s*. 6*d*.

C. R. L.—The galls on oak leaves sent, go by the name of "artichoke galls," from their resemblance to the artichoke. They are formed by a neuropterous insect, called *Aphilothrix gemmæ*.

A. THOMPSON.—The minute objects from stomach of cod-fish are fragments of the tests of small sea-urchins.

MISS S. GLASGOTT.—Will you kindly send us your full address? Your note does not contain it.

JAMES SMITH (Aberdeen).—Professor Owen is still alive and working, and we hope he may continue so for years to come. The President of the Royal Society is Dr. Spottiswoode; the President of the British Association is Dr. Siemens.

W. G. W.—We think you will find Huxley and Martin's "Elementary Biology" quite sufficient. You might get the reagents from Hunter and Sands, 20 Cranbourne Street, who would no doubt also procure you the skeleton of a frog. You would find McAlpine's "Biological Atlas" of great use.

A. BEALY.—"Land and Water" is published weekly, price 6*d*., at 176 Fleet Street, London. "The Midland Naturalist" is published at 3 St. Martin's Place, at 6*d*. monthly. "The Naturalists' Monthly" is published by John Heywood, Manchester, at a penny a month.

E. W. ANDREWS.—Your letter miscarried, and we have only just received it. We shall be happy to forward a letter from you to Dr. De Crespigny.

H. C. BROOKE.—Accept our best thanks for the specimens of cast skins of snakes you have sent us.

W. M. STEVENSON.—The "London Catalogue" is a list of acknowledged and recognised British species and well-marked varieties of plants. It is published at 6*d*. by D. Bogue, 3 St. Martin's Place, Trafalgar Square. You cannot do better than procure (after using Messer's "Analysis") Hooker's "Student's Flora of the British Islands," published by Macmillan at 10*s*. 6*d*.

H. G. BRIERLEY.—It is difficult to identify a species of such difficult plants as the freshwater algæ from so small a portion as you sent us, but we have little doubt it is *Batrachospermum alpestre*.

J. SMITH.—Your question is rather obscure, but we presume you allude to the swollen condition of grain. This may be produced by the microscopical fungus popularly known as the "bladder brand," from its swelling the grain. It is a stage in the development of Tilletia caries.

W. OFFICER.—Will you kindly send us another specimen, as your others were lost in transit?

META.—Alas! The chrysalis reached us in as flattened a state as the arm of a strong post-office clerk could reduce it to by stamping.

EXCHANGES.

WILL those applicants for polyzoa, which were advertised to be given away in the December number of SCIENCE-GOSSIP who have not already arranged for the expense of sending, kindly forward three or four stamps for postage? The immense number of applications renders this request a necessity.

SECTIONS of the meteorite of Braunfels, containing fluid-cavities with vacuoles in perpetual motion; well mounted. Will take in exchange scientific books.—H. Hensoldt, 7 Machell Road, Nunhead, London, S.E.

WANTED, three good specimens of *Cladonia sylvatica*, or of *Sticta sylvatica* for three of *Sticta intricata*, var. Thouarsii.—James McAndrew, New Galloway, N.B.

MICROSCOPE, slides and apparatus cost 8*l*. What offers in books?—F. Long, 20 Lorne Street, Burnley, Lancashire.

FOSSIL diatoms from Frauzensbad in Bohemia, and Celle in Hanover (any quantity), in exchange for whatever good micro-material, mounted or unmounted.—T. C. Rinnböck, 14 Simmering, near Vienna, Austria.

WANTED, a correspondent in Ireland to exchange aquatic (phanerogamic) plants; rarity is not so much wanted as good and carefully-dried specimens. European and British aquatic phanerogams, junci, or carices offered.—A. B., High Street, Croydon, Surrey.

WINGS of *Urania riphæus* (most brilliant lepidopteron known), *Ornithoptera rhadamanthus*, Procridæ (green foresters, metallic scales), for the microscope; the following shells: *Helix ericetorum*, *Chiton marginatus*, *Helix Cantiana*, *Trochus tumidus*, *Bulimus acutus*, *Trochus cinerarius*, *Venus fasciatus*, *Natica Alderi*, *Venus ovata*, *Zonites cellarius*, *Cyclostoma elegans*, *Venerupis iris*, *Tapes virgineus*. Several species of Madagascar coleoptera, wood-section (Japanese). Desiderata, mounted microscopic objects, specimens of the Chrysididæ, Rye's "British Beetles" or Messer's "British Wild Flowers by Natural Analysis."—Joseph Anderson, jun., Chichester, Sussex.

WILL send list of micro slides to choose from for unmounted material.—S. R. Hallam, 22 High Street, Burton-on-Trent.

A PACKET of twelve unmounted animal hairs, including lion, tiger, leopard, hyæna; black, white and grizzly bears, and others for well-mounted slide.—A. Draper, 275 Abbey Dale Road, Sheffield.

SCARCE unmounted animal hairs for other objects of interest.—A. Draper, 275 Abbey Dale Road, Sheffield.

WANTED Carpenter's "Microscope and its Revelations," 6th edition; will give in exchange Cassell's "History of the War between France and Germany," 2 vols. cloth gilt, illustrated, and Cassell's "Household Guide," vol. 1.—J. Burton, 78 Theobalds Road, London.

L. C. 7th ed., offered 107, 858, 859, 906, 936, 1422, and others. Wanted rare British potamogetons, orchids, or other plants.—Alfred Waller, 17 Low Ousegate, York.

WANTED unmounted, histological, human, and animal, also pathological sections stained or not, also parts of insects, cleaned foraminifera, diatoms, spicules, botanical sections of stems, and wood sections, stained or not, also well-mounted slides of the rarer chemicals, as platino-cyanide of magnesium, chloride of palladium and thallium salts. First-class slides &c., in exchange.—Frederick Martin, Clevedon.

LARGE phonograph cost seven guineas, for sale or exchange, what offers?—H. W. Wager, Bank Buildings, Regent Street, Stonehouse, Glos.

SOME very interesting microscopic life, offered in exchange for British land and freshwater shells, or a tube will be sent on receipt of six stamps to defray cost of postage, tubes, &c.—H. W. Wager, Bank Buildings, Regent Street, Stonehouse, Glos.

EXOTIC LEPIDOPTERA.—Many species in duplicate to exchange for others, exotic only. Wanted particularly species of the genus Papilio for figuring, with a view to a monograph of the genus.—J. C. Hudson, Railway Ter., Cross Lane, Manchester.

I WILL send a packet containing 36 micro-fungi, or 24 spicules of sponges, Gorgonias, &c., some rare and all accurately named, in exchange for 3 really well mounted micro slides on glass slips. Sections and parasites preferred, no diatoms.—J. Tempère, Storrington, Sussex.

WANTED, Huxley's "Crayfish," Gosse's "Manual of Marine Zoology," Bell's "Crustacea," and Itnyn's "Cyclas and Pisidium."—J. Darker Butterell, 2 St. John Street, Beverley.

WANTED, tinfoil for electric purposes, carbon clamps, binding screws and any cheap electricity apparatus. State lowest price and particulars to—K., 7, St. Paul's Close, Walsall.

HAVING a large number of stamps, of all descriptions, both in albums or singly, or in small quantities, I will exchange them or microscopic slides, fossils, electric apparatus, or anything small, in scientific way. Write enclosing particulars to—K., 7 St. Paul's Close, Walsall.

EGGS of king-bird, bluebird, American robin, chipping sparrow, flicker, Indian swift, weaver-bird, scissorbill, and many others, also some English and foreign nests to exchange for others.—Geo. A. Widdas, Woodsley View, Leeds.

A COLLECTION of foreign shells from South Africa, West Indies, &c., in exchange for British specimens on natural history, or popular works on the same.—S. B. Axford, 15 Commercial Road, Bournemouth.

FOR exchange, about two hundred species of British lepidoptera. Desiderata: British or foreign lepidoptera; or offers.—A. H. Shepherd, 4 Cathcart Street, Kentish Town, London.

LINDSAY'S "British Lichens," Landsborough's "British Zoophytes," Lewis's "Sea Side Studies," &c., offered in exchange for Bell's "Stalk-eyed Crustacea," or "Quadrupeds," Bates' "Sessile-eyed Crustacea," Johnston's "Zoophytes," and other Natural History works.—C. A. Grimes, Dover.

A SECOND-HAND book called "Rural Bird Life," by Charles Dixon, which I should like to exchange for some fossils.—F. B. Mason, St. Gregory's, Stratford-on-Avon.

WANTED, trilobites and other Silurian fossils, encrinites with heads. Fossils, corals, and small recent corals, foreign, Cape, limpets, large ones, flint implements. Crystals from lead, iron and copper mines, also any kinds of fossil crustacea. Exchange, Haldon fossils, upper greensand; limestone, fossils, Devon; polished slabs of Devon corals and sponges; minerals, Devon and Cornwall; live marine animals, &c., and sections of the Devonian corals for the micro'.—A. J. R. Sclater, Mineralogist, Bank Street, Teignmouth, Devon.

WANTED to know where I could get the specimens of animal and plant life mentioned in Huxley and Martin's "Elementary Biology." Also skeleton of frog, and the more uncommon reagents referred to.—W. G. Woollcombe, The College, Brighton.

SOME typical rocks, fossils, and minerals offered in exchange for land and freshwater shells, recent or fossil, foreign or British.—B. B. Woodward, 51 Aynhoe Road, West Kensington Park, W.

WANTED to exchange Foraminifera (mounted or unmounted) and Polycistinæ mounted for other Foraminiferal material, diatoms or other objects.—Harvey, 2 Short Street, Cambridge.

"ENGLISH MECHANIC," vols. 29 to 35, first six bound half-calf, cost £2. 12*s*., also "World of Wonders," Cassell's, cost 8*s*. bound, also number of common birds' eggs, such as rooks', wrens', &c. Will exchange for works by Darwin, Huxley, Proctor, Tyndall, Wilson, &c., for minerals, fossils, eggs, or insects. The minerals and fossils may be common as I have got none.—James Smith, 27*a*, George Street, Aberdeen.

BOOKS, ETC., RECEIVED.

"Report of Department of Agriculture," 1880. Washington: Government Printing Office.

"Propagation of Food Fishes, &c. Commissioners' Report," 1882. Washington: Government Printing Office.

"Colin Clout's Calendar." By Grant Allen. London: Chatto & Windus.

"Man before Metals." By ——. London: C. Kegan Paul, & Co.

"Studies in Microscopical Science." Edited by A. C. Cole.
"Journal of Conchology."
"Land and Water."
"Northern Microscopist."
"Midland Naturalist."
"Practical Naturalist."
"The Field Naturalist."
"The Young Naturalist."
"Natural History Notes."
"County Notes."
"American Naturalist."
"Canadian Naturalist."
"American Monthly Microscopical Journal."
"Boston Journal of Chemistry."
"Good Health."
"The Botanical Gazette."
"The Southern Science Record."
"La Feuille des Jeunes Naturalistes."
"Le Monde de la Science."
"Ciel et Terre."
"Cosmos: les Mondes."
"Bulletin de la Société Belge de Microscopie."
&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 11TH ULT. FROM:—R. H.—F. L.—J. McA.—H. H.—J. C. R.—E. C. J.—J. G.—A. H. W.—M. E. P.—H. R. A.—A. B.—J. A., jun.—J. C.—C. F. G.—J. B.—H. W. W.—W. B. G.—F. M.—J. S.—H. C. B.—A. D.—C. M.—E. W. A.—A. W.—W. B.—E. S.—J. S.—C. A.—R. A. R. B.—H. E. W.—A. E. G.—W. O.—W. M. S.—A. W.—S. R. H.—S. R. B.—T. M. R.—W. F.—B. B. W.—J. T.—F. K.—T. S.—C. L. C.—C. K.—T. K.—F. B. M.—N. A.—C. A. G.—J. S.—A. H. S.—W. B. G.—F. A. A. S.—E. A. C. H.—A. J. R. S.—E. C. J.—W., F.—J. D. B.—A. H. B.—G. D. C.—W. H. J.—R. U. W.—S. B. A.—G. A. W.—P. E.—W. G. W.—S. S.—J. S.—A. B.—&c.

AN INQUIRY INTO THE ALLEGED HABIT OF HIBERNATION AMONG NORTH AMERICAN SWALLOWS.

By CHARLES C. ABBOTT, M.D.

[*Continued from page* 27.]

IN the reference made by Kalm to swallows, he specifies the barn-swallow as being that which he saw on the 10th of April (new style), 1750, in a wet, spiritless condition, sitting on posts and planks. Now, in this case, we have a species of swallow that differs greatly in its habits from the preceding. While sociable, and willing that a neighbour should dwell near by, they are by no means gregarious; and it is often observed that but a single nest will be in a building, however large it may be. Unlike the bank or cliff swallows, they are quite contented to seek their food, flitting over fields, and about the buildings wherein are placed their nests. They are not to be associated with water or its vicinity, any more than with the driest stretches of dusty fields.

How then, are we to explain the soaked appearance of those seen by Kalm, sitting on posts and planks? I think the preceding sentence explains it. He saw these birds first on the 10th of April, and on the next, far greater numbers of them, sitting on posts and planks. They had but reached their destination — probably had just completed a protracted flight of hundreds of miles; and also, bear in mind, they travel at night, and probably only at night; they were seen in the morning, as he expressly states. Thoroughly fagged, at the end of a long journey, and early in the morning, when all else was dripping with the moisture of a rain-like dew, would it not be strange indeed, if these new-comers, like all animate and inanimate nature about them, were not "as wet, as if they had been just come out of the sea"?

But the barn swallow asks no lengthy holiday on his arrival. He quickly recuperates, and the duties of the hour are squarely met. If, during the summer, his wanderings are less about water than land; it is to the water that he goes first, when ready to construct his nest, or repair the structure of last summer. By the water's edge, he carefully mixes the adhering mud that forms the exterior of his house. Here, we have a repetition of what I mentioned with reference to the cliff swallows. Just at the time when the supposed mud-encased swallow should leave his submarine abode, and all bedraggled, wet and worn, should be seen spreading himself in the sun, and drying out, in readiness for a summer's campaign—then do we really find the beautiful barn swallows busy at the water's edge, and often well wet through; but, instead of having lately emerged from the water, they have literally dropped from the clouds.

But if, for many and good reasons, we set aside, as a misconception of the facts, the impression still retained by many, that swallows hibernate in the mud, at the bottoms of lakes and rivers—what have we to say of the more reasonable proposition that they hibernate, as do many animals in underground retreats, in clefts of the rocks and even in hollow trees? Now, the one simple way to decide this matter, is to find them hibernating, as they are said to do.

So far as my own experience extends, I have never found a swallow hibernating in any position, nor do I ever expect to; and, furthermore, I believe nine-tenths of all the accounts that are published of the discovery of the hibernating swallows, could be readily explained as something very different, if all the facts of the case could be ascertained. But when we come to study very closely the habits of a familiar bird, that to all but ornithologists is a veritable swallow, our common swift or "chimney-swallow," then I am fairly staggered, and find myself saying beneath my breath, "After all ——!"

In conclusion, then, it behoves me to consider this common chimney swallow very carefully and candidly, and determine how far certain occurrences that I have witnessed, are indicative of hibernation.

In a large unused chimney of an old house built in 1708, standing near my home, thousands of chimney swallows annually congregate, arriving in April—or appearing then—and departing, well! I am not certain when.

Now this chimney has an internal surface of about 425 square feet, and allowing one square foot to each nest, will accommodate so many pairs of swallows. But I find that not more than one-third of the available space is utilised. At this rate, there would be one hundred and forty pairs of swallows occupying the chimney at one time. Now this may seem like a fish story, but it is an inconsiderable fraction of the truth. I have carefully timed by my watch an unbroken line of entering and out-going swallows, and seen them in these processions steadily enter and reappear for five and a half minutes, without a break, each bird followed by another so closely, that intervening spaces were scarcely discernible. The downward and upward series were of course different birds to a certain extent, and it is a fair estimate to say that fully one thousand swallows were making a nesting and roosting place of this one chimney at the one time.

Not the least curious feature of these large colonies is the evident fact that but a small proportion of these birds are nesting at this time; and we are lost in amazement, when considering that the fragile eggs and tender fledglings should escape destruction, surrounded as they are by such a crowd of jostling, climbing, crawling, tireless swallows. Nor is it at all easy to reach any definite conclusion concerning the object of these non-nesting birds, in thus continuously through the day entering their roosting-place—the chimney.

Now these particulars are mentioned in this connection, to show that many hundreds of these birds often roost in the one place, and must be very closely packed together when all are at home. For a portion of every twenty-four hours they are well able to withstand the depressing influences of a crowded condition, with certainly a minimum of fresh air to breathe. The same conditions would prove fatal to most other birds, if indeed not to all others.

This feature of the summer-life of these birds please bear in mind.

Any time after the middle of September there is likely to be a change. A severe north-east storm coming, they are gone! A week may pass, and not a swallow is to be seen. You may listen at the chimney holes, and not a swallow is to be heard. The sky is as birdless as in bleak December. But again the weather becomes warm; our magnificent October days are come. The mellowest sunshine of all the year gilds the broad meadows and adds a glory to the scarlet maples; and, again, scores of chimney swallows as before are flitting all day long in the cloudless skies. Whence come these birds? They are not so many, indeed, as were here before the biting north-east winds bade all our summer birds depart; but far too many to consider them as mere stragglers. Indeed they are too strong of wing to be thus looked upon. We felt, or might have felt certain, that the swallows had gone; but with the returning cheery days, these birds are again with us. Either they were closely stowed away during the storm, or they are more northern birds which, leaving their summer haunts beyond the track of the storm that visited us, had only reached us as they were moving southward after the storm had passed. This, I think, very likely is the truth of the matter; but many circumstances strongly point to the former supposition—that of temporary shelter during the storm. Here is an instance. On the 4th of October of the past year, the weather with us was warm, the thermometer ranging from 65° to 85° Fahr. Throughout the morning there was a brisk shower, or series of them; but by 2 P.M. it had cleared, with a gentle wind from the north. It gradually grew colder, and by sunrise on the 5th, the temperature had fallen to 40° Fahr., and the wind had increased in violence. All this day thousands of chimney swallows, and a few of other species, were seen flying southward; keeping as near to the ground as possible—just avoiding the tree tops, and in open spaces, often just clearing the ground. They were in dense flocks, and appeared to be driven helplessly before the cutting blasts of the north wind then prevailing. The weather moderated the next day, and on the 7th of the month, there were very many swallows flying about just as usual; they did not finally disappear before the 20th of October.

Such flocks of swallows, as I have mentioned, are certainly indicative of a voluntary or forced migration, to a certain extent. What becomes of such storm-driven colonies (and they are an annual occurrence) I cannot say; but they are certainly indicative of the habit of migration obtaining among these birds, to a certain extent. On the other hand, what of the many swallows that remained for fully two weeks after the storm I have mentioned? As bearing upon this point, the following is worthy of note. In December, 1879, I had occasion to have a wood-stove removed from a fireplace, and one for burning coal put in its place. The removed stove had not had a fire in it for nearly a year. On detaching the pipe, there were found seven swallows in one of the elbows, occupying the space between the angle and the damper. They were all perfectly well and comparatively vigorous. On being placed upon the floor of the room, they soon recovered their full senses, and after a feeble flight about the room, passed quickly through an open window and were seen no more. The great bulk of the chimney swallows apparently departed by the 25th of October of that year. I certainly saw none later; yet fifty-five days after that date, seven are found, in fine health and strength, snugly stowed away in a stove pipe. It is fair to suppose that they had lived for this length of time without food. If so, have we any right to limit the length of time that they may thus remain in a semi-torpid or hibernating condition? To maintain that such a question is reasonable, is not an attempt to carry water upon both shoulders; for swallows' hibernation in sheltered places, surrounded by the atmosphere, is vastly different from lying in mud at the bottom of a lake or the ocean. In a second somewhat similar instance that has come to my knowledge, a number of these birds were found in a hollow sycamore which was cut down in the month of February. These birds were dead when I saw them, and I was assured by the wood-cutter that they were stiff and cold when he took them from the tree. They were not frozen, however, and the appearance, on dissection, was such as to lead to the belief that they had died but very recently; certainly before the tree was cut down, but not long previously. There was no decomposition; some trace of fatty tissue, and the blood liquid; the bowels and stomach empty, but moist, soft, and flexible.

In this case, happening during a remarkably mild winter, that of 1879–80, it is possible that swallows might survive in such quarters, when a season of ordinary severity would destroy them.

It is claimed that we do not know where the winter haunts of these birds are; if so, may it not be that, like the almost as abundant bats, these birds congregate in caves or hollow trees? But if we grant this much, these hibernating places are not to be looked for in New England or the Middle States, but so far south as to be beyond the reach of the severest frosts of our winters. Certainly, did they hibernate with us, in the same manner as the bats, their hiding-places would have been brought to light oftener than even such instances as I have related, have been noticed. As a thousand or more may be found in one chimney during summer, it is fair to presume that, in hibernating, equal numbers would then also be congregated. No such swallow bonanza is yet upon record. On the other hand, if chimney swallows are thus disposed of during winter, it becomes easy to account for stragglers that, for some unknown reasons, have not joined the innumerable ranks of their fellows in their southern flight; but which, in lieu of this, have essayed to brave the winter by seeking such shelter, in protected places, as they may find. That such stragglers can survive an ordinary winter has not been shown—cannot be, until they are taken in full vigour from their hiding-places, at the close of the season. To find living swallows in a cave, tree, or chimney in February or March, would be a decisive matter; to find such birds before New Year's Day, does not show that they would be able to remain in health the season through, and reappear in full vigour in March or April.

So far, at least, as my own observations extend, the chimney swallow is practically a migratory bird, so far as New Jersey is concerned. In what manner the winter is spent beyond our boundaries, I cannot say; but offer such trivial instances as I have related, as possibly confirmatory of the belief on the part of many, that, like bats, they strictly hibernate. It remains as yet, however, an open question; but to discover that such was really true of them, would have little bearing upon such a strange belief as that true swallows hibernate in mud.

What is still needed is a system of the most careful observations, made without a trace of preconceived opinions. What child but thinks that our flying squirrels really fly, instead of sail through the air! Too often ignorant ourselves, we give illusive answers to our children, and many errors are thus perpetuated by the world at large, which a little patient observation might readily have checked. On the other hand, when we affect to become observers, how often do we rashly jump at conclusions, based upon deceptive appearances! Certainly, in my own brief experience, I can only testify to the apparent reality of a bird, less common than swallows, but superabundant in New Jersey, hibernating in mud. I refer to the little rail, or sora (*Porzana Carolinensis*). Early in August, with all the regularity of the passing seasons, these birds suddenly appear in vast numbers, in the meadows skirting the Delaware river. Now ornithologists know well enough, that the rail is strictly migratory; and I have yet to see the first gunner, or other person familiar with our meadows, who ever saw a rail-bird earlier than in July, and seldom then. Nevertheless they are here weeks prior to that month, but so closely do they keep themselves to the muddy, weed-grown marshes, that their detection is well-nigh impracticable. Of course, there must be taken into consideration the fact that, prior to the middle of August, they are not sought for; but then, and until after frost, thousands are killed by the gunners. Now, the gunners, the farmers, and those whose business or inclination takes them to these marshes, know the rail-birds as a suddenly acquired feature of these marshes, and if they see them, see them running lightly over the mud that skirts the ditches in our marshy meadows. They are as much a feature of such localities as frogs; and, like those, they are extremely sensitive to frost. It is not strange, perhaps, that the impression of hibernation should have been entertained with reference to this bird; but it must be borne in mind, that mere sudden disappearance should not suggest hibernation in the mind of any thoughtful person. Birds that migrate by day, rather than in the night, disappear as suddenly as do the rail-birds, but being seen on their migratorial journeys, of course, are not invested with any peculiar habits.

It seems never to have occurred to those who insist upon the hibernation of the rail-bird in the mud, that a still greater mystery is the impulse that should affect all these birds at the one moment; for their sudden and simultaneous disappearance is always insisted upon. The truth is, however, that they do not disappear all together. After the first hard frost, be it early or late, the great majority of them promptly disappear; but a fraction of their former numbers remain. Now, what, I believe to be a rational explanation of the apparent hibernation is this: The number of rail-birds in a given tract of marsh is suddenly greatly diminished (this occurs on the day following the first hard frost); those that remain are often weak of wing; and many are found dead, probably having been wounded by the gunners. One and all are found only in the marshes, and coupled with these facts is the one more important than all, that the rails are not seen migrating. They invariably depart at night. Herein lies the solution of the common impression; one far more prevalent than that concerning our swallows, whose movements we can watch. The while we are familiar with the rail-birds, they are associated with frogs and the aquatic life of our marshes. Frost comes and they are gone. We do not see either frogs or rail-birds disappear; but we know where the frogs are, and remembering the amphibian habits of the bird, we continue to associate them and relegate to the mud with the croaking frogs, these timid, weak-winged birds. But, in very truth, they have gathered themselves up in their long husbanded strength, and in the stillness of the frosty night, have winged their way southward, without a sign.

As I pointed out in the case of the swallows, as a matter of course, many are unable to undertake the journey. It is safe to say, that thousands that are crippled by the sportsmen remain in the marshes all the winter, but they finally succumb to the rigour of the season. Such old and crippled birds have been made a study by lovers of the wonderful in all ages, and the mis-read history of non-representative specimens has been strangely accepted by very many as the authentic life-histories of these birds for centuries.

"THREE-TOED SLOTH."—In "The Museum of Animated Nature" it is mentioned, also by Charles Waterton in his "South American Wanderings." Waterton had one in his house for some weeks, he also saw this animal in its natural habitat.—*Clara Kingsford, Canterbury.*

THE COMMON ORCHIS (*ORCHIS MASCULA*).

By EDWARD MALAN, M.A.

IF Mary Howitt's theory about flowers were really the true one, then how would it ever be possible to account for the existence of such a plant as the common orchis? I don't think it would be possible. For the common orchis does not possess that beautiful brilliant colouring, nor that graceful symmetrical shape, nor that delicate rare perfume which ministers so much to our æsthetic fancies, and which forms, as Professor Kerner says, the chief source of those dim romantic ideas with which most people regard flowers.

It is, very probably, for this reason that the allusions to the common orchis in poetry are so few. Shakespeare increases our pity for Ophelia's death by mentioning her fantastic childish garlands.

> "Of crow-flowers, nettles, daisies, and long purples."

And Miss Ingelow calls up the regret "that keenlier in sweet April wakes," by introducing the flower into her musical stanzas, in these words,—

> "Lost, lost and gone. The Pelham woods
> Were full of doves that cooed at ease:
> The orchis filled her purple hoods
> For dainty bees."

Tennyson just catches the sullen characteristics of the plant in his "Dirge:"—

> "Round thee wave self-pleachèd deep
> Bramble-roses faint and pale,
> And long purples of the dale.
> Let them rave!"

While Whittier refreshes us, like an afternoon breeze, when he speaks of western winds telling to orchard trees—

> "Tales of fair meadows green with constant streams,
> And mountains rising blue and cool behind,
> Where in moist dells the purple orchis gleams."

These few notices, which are for the most part of sombre hue, appear to exhaust the poetical interest in the common orchis. It must be owned that they are hardly enough to explain the plant's existence.

But as soon as the intelligent observer applies the modern theory, and perceives that flowers do really wear a robe of more than royal comeliness, and that every exquisite detail and amazing wonderful contrivance, every streak, blotch, channel, and hair, every inflation or depression of surface, every posture of the various organs, and every abundant or scarce supply of nectar and perfume has been designed by the wise author of Nature to answer some definite purpose in the best possible way; and, while obtaining a benefit from insect visitors, to offer in return a wage for service done—then, behold! in a moment his heart leaps up in ecstasy, Mary Howitt's lines become invested with a deeper and truer meaning, the distant economy of flowers appears like a wished face in a crowd, and a far grander vision of creation unfolds before his view. At once, to quote Horace Smith's hymn, living preachers speak with voiceless lips, every cup becomes a pulpit, every leaf a book, and this new gospel is sounded in our listening ears—that no created organism can be selfish or self-sufficing, but that every unit is connected with its neighbour in some mysterious marvellous manner; and that unless a double deed of good is done, when any good is done, a deed of beauty as well as a deed of duty, the doer does not fulfil his appointed end in Nature.

I have selected the common orchis as a good example of this, and I hope to succeed in showing how curiously and unexpectedly it illustrates this creed, and proves itself to be not only useful to one class of insects, but also highly attractive to another. For whether the plant is a favourite with poets or not, it is in itself a most absorbing study, and will always be remembered for having occupied such keen intellects as Sprengel, Brown, Müller and others, and for having furnished that higher estimate of creative power which we owe to our illustrious countryman, the late Charles Darwin.

An enumeration of the various peculiarities of the common orchis will now be undertaken, ascending from the root upward; and I must warn the reader that no little credence is required to rightly apprehend the series of surprises in store, for nothing about the common orchis is common. It is not common in the sense that bluebells, primroses, and buttercups are common: it hasn't got a common root: it hasn't got a common flower: it isn't fertilised in the common ordinary way: and the extreme care bestowed on each part of it is anything but common.

The *root* of the common orchis is a didymous or twin root (*radix didyma*), and consists, as Sir Joseph Hooker says ("Science Primer," p. 40), of two distinct fleshy tubercles, one large and the other small. These grow together at the base of the stem, and from the column, or place of attachment, numerous slender fibres spread out horizontally. When an orchis is in flower (April and May), the stem and leaves proceed from the crown of the larger tubercle, while the smaller one is attached at the neck. Later on in the year, when the orchis is seed-bearing (end of July), the larger tubercle has become brown and husky and withered, the fibres have disappeared, and then the whole plant dies. Meantime the smaller tubercle has grown plump and vigorous, and detaches itself into a separate plant with a plumule or growing-point of its own, which eventually becomes the orchis of the following year. The orchis is thus propagated by its tuber.

The appearance of the *plumule* announces that the orchis belongs to the great order of Monocotyledons, which, of course, are distinguished for possessing (α) one seed-leaf only, (β) straight-veined leaves, (γ) endogenous wood in long fibres, and (δ) floral whorls in 3's and 6's. The snowdrop, crocus, daffodil, hyacinth, and tulip also belong to the same order, and flower early in the year, when the soil is hard and stubborn, so that the mechanical advantage of a single dagger-shaped growing-point is obvious. In general, bulbs which bear flowers die after fulfilling that debt, but sometimes, as just described, the plant is continued by the formation of a new bulb, which does not altogether perform the part of a true root. The tuber of the orchis is a case in point, for it contains a store of food, not for the leaves and stem, but for the new tuber. It is, therefore, composed of starch, loosely consolidated in minute granules like tapioca, and not in flakes like the bluebell. For the production of this starch, besides the usual amount of oxygen, hydrogen, and carbon obtained from the atmosphere, much potash is required, which, with nitrogen and sulphur, forms albuminoid, the chief food of the life-giving principle in plants. The commonest albuminoid is gluten ("Science Primer," p. 26). The whole nature of the orchis is viscid, and its tuber, when soaked in water, emits a transparent gum. The tuber itself survives for eighteen months, a period which may roughly be divided into three stages: (1) from the first appearance to the separate existence; (2) from the appearance of the rootlets to the development of the new tuber and the perfecting of the leaves; (3) from the appearance of the leaves to seed-bearing and decay. It would be an interesting discovery to ascertain the age of a tuber and the amount of increase annually: does a tuber, two inches in length, say, represent the reserve of twelve or more years? For it is evident that the common orchis grows extremely slowly. From the tuber is made Salep (Sahhleb, in Arabic), a nutritious preparation which forms a considerable part of the diet of the inhabitants of Turkey, Syria, and Palestine, and comes to us in hard oval cakes of a yellowish colour, not quite transparent. It tastes like arrowroot and is very wholesome, and contains a greater quantity of nutriment in the same bulk than any other vegetable substance known, one ounce mixed with soup being sufficient food for a strong man for a day. If this old-fashioned statement is true ("Library of Entertaining Knowledge," vol. ii. p. 158), then the care taken by nature in preserving so valuable a product is at once explained; but Dr. Lindley instances the orchis as being a case of beauty apart from utility, and he denies that Salep is prepared from its tubers. It is worthy of remark that the orchideæ do not flourish in rich or highly-manured lands, the soil of grass-meadows suiting them better. Gloucestershire supplies many tubers, but those from the Levant are finer.

I would now call attention to the shape of the *tuber*, which seems specially designed to assist the peculiar growth of the plant. Like a royal progress through a disaffected region, the common orchis seems to have strayed into a dangerous quarter, where all sorts of precautionary measures are necessary to ensure safety. First of all, the tuber is heart-shaped like a fishing-float, not inversely heart-shaped like the bulb of a bluebell, and the rootlets proceed from the plumule and not from the solid base. It has taken some time and much experimental observation to discover the reason for this arrangement, and indeed I am by no means sure that I have rightly apprehended the truth, even now; but I am tempted to put down the reason as it appears to me, plant would be unarmed in the great struggle for existence, for it cannot abide deep-planting. To meet this peculiar requirement, how admirably is the shape of the tuber adapted! Before it is detached, it is oval: after its detachment it is heart-shaped: which accords with the law of solid bodies moving through liquids, whereby the larger and heavier part is made to go first. To ascertain this, I planted thirty-six tubers of *Orchis mascula* in a shallow box, on August 1st, 1881, and a single tuber in a deep large

Fig. 43.—A, Tubers of *Orchis mascula* (April); B, roots; C, neck.

for there is no help to be gained from the books. The new tuber, being formed at the side of the old tuber, is evidently not intended to occupy the same space, but, on the contrary, it is purposely pushed more deeply down into the soil where the springs of life are not exhausted. Thus the plant makes a little journey annually, the tubers in April being about two inches below the surface, whereas in August they are six inches deep. So far from this being a fortuitous circumstance, it is one of those precautionary measures already mentioned, without which the pot. The plants all flowered last spring, but with this great difference: those in the box appeared above ground in September, they kept their spotted leaves through the winter, and were in flower by March 20th; whereas that one in the pot did not appear above ground till February 10th, and was not out in flower till April 30th; after which it died, while the others survived. The case of the bluebell, which has to meet different engagements, is exactly the opposite: the bulb is inversely heart-shaped, the roots proceed from the solid base, and the plant starts from a depth of seven or eight inches below the surface. One is here naturally led to ask why, supposing the above to be true, hasn't nature contrived that the new tuber should be settled in its proper place at once—wouldn't that have been easier? Undoubtedly it would, but the general law, by which the descending axis of plants is made to seek depth and darkness, couldn't be broken; and so the above plan is adopted. What a proof of Divine care!

The *rootlets* are formed during the second stage of the tuber's existence, and are made up of an outer skin with loose intermediary cells between the skin and the central fibre. They have the appearance of whipcord, but they are brittle and sensitive. The cells are like tapioca; their function is to absorb mineral moisture from the soil, to supply the plumule and the leaves. I think this must be the reason of their position, for if the tuber supplied the leaves with nutriment, then clearly the rootlets would have to start from the base; and, as a proof of this, I found in April a fine plant in flower, perfectly healthy and vigorous, but with the old tuber entirely devoured by slugs, and the new one meagre and aborted. As it is, the rootlets spread upward, downward, and horizontally, either drawing the tuber to the surface and helping it to shoulder its way higher, or else preventing it from descending any lower.

The last thing to notice about the tuber is its extraordinary *scent*, which resembles the scent of carbolic acid, nitrate of silver, or the reptile house at the Zoo. It is increased by darkness and moisture. It produces a chill shuddering sensation, if inhaled for any length of time, accompanied by a feeling of headache and nausea. Now, I am anxious to know if this peculiar unsavoury reptilian odour is in any way a protection to the orchis, and I should feel greatly obliged to anyone who would enlighten me. Consider the life history of the plant. It grows in meadows and hedges at a time of the year when the weather is severe, and forage for small animals very scarce. The gardening journals for the spring of 1881 contained many notices of the ravages made by mice among bulbous plants; but, although I have found many tubers destroyed by slugs, I have not as yet observed the marks of teeth on them. Why don't mice gnaw the tubers of the common orchis? I will venture an explanation. Anything bitter is rejected by men and animals as disturbing the bile: the case of buttercups and toads will readily occur. Cats and dogs turn from shrew-mice in disgust, but hedgehogs and snakes devour them. Can this odour be intended to warn shrew-mice of their natural enemies? If so, what a truly remarkable plant the orchis is! for there seems to be nothing but protective precaution about it. The case of the bluebell does not interfere, it will be noticed, with this explanation, because the orchis is only required in sparing abundance, as will be shown hereafter, and affords no pollen; whereas the bluebell is deeply planted and supplies vast quantities of pollen. The cold clammy reptilian character of the orchis certainly deserves greater attention on the part of botanists.

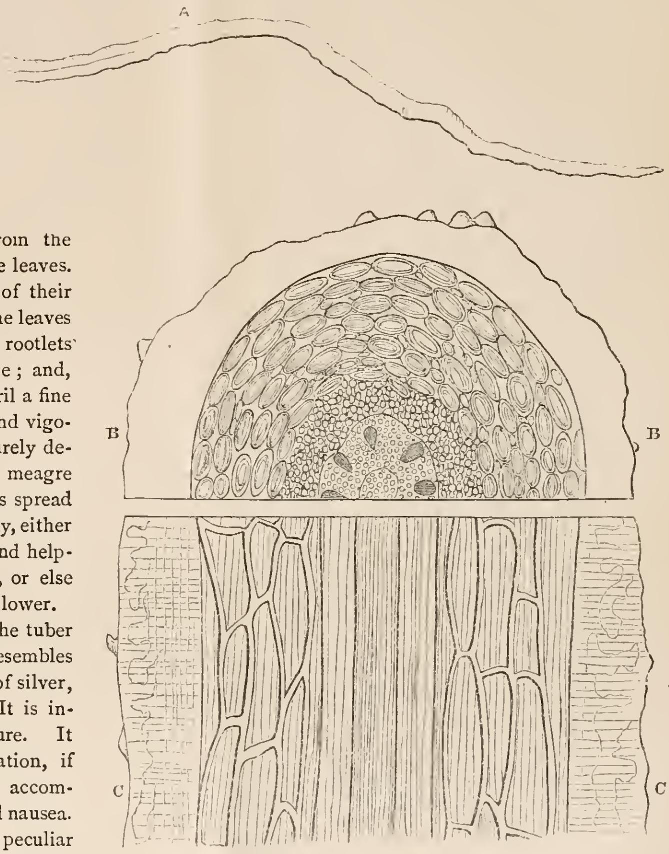

Fig. 44.—A, Root of *Orchis mascula*; B, transverse section of root; C, longitudinal section of root.

The *stem* and *leaves*. The skin of the common orchis is a *scape*, or a simple erect herbaceous hollow cylinder, rising directly from the root and elevating the flower, but not the leaves. It dies as soon as the seed is set, and when dry has a pungent snuffy odour. Its cellular tissue is arranged in isolated bundles. There is nothing extraordinary about the stem, except the fact that breaking it prevents the new tuber from flowering the following year. The Rev. B. S. Malden was kind enough to point this out, for I was puzzled to know why some plants, with many leaves, bore no spike. The check to the system, no doubt, prevents the juices from being elaborated and ripened, and so the finishing-touch, as it were, is never put, and the spike suffers.

The *leaves* are exceedingly interesting, and will amply repay all the trouble of microscopic investigation. They are radical, simple, linear, smooth, with entire margin, common vernation, and purple spots. A spotted leaf is called *coloratum*, because it is not entirely green; they are often blistered (*bullatum*) also. They lie most frequently in the form of a five-fingered star, they absorb a large amount of sun-action, and are most conspicuous. A leaf consists of (α) an epidermis, or stout white spotted upper skin, arranged in hexagonal cells, like the skin of a crocodile, (β) a layer of chlorophyll, and (γ) an under-skin perforated with numerous stomata which are admirably situated to perform their functions. Free from the dust and the sun's rays, they are useful to catch the evaporation of the soil, to give off superfluous moisture, and to assimilate material from the air for food. The stomata must play an important part in the formation of the spike, which does not appear till the leaves are fully developed. The skin of the upper surface is more difficult to explain, but the beautiful appearance of the spots, either when seen, handsome and sullen in the woods, or blood-red and hexagonal under the microscope, arrests the attention and forces from us the questions, why should the leaves be spotted? Do the spots protect the plant in any way by repelling foes, or are they merely ornamental? Certainly their resemblance to the common snake is very striking, and as, according to some botanists, the orchid family survives by an organised system of deception, these purple spots may possibly be intended to deceive mice or other enemies. They are arranged without any order, sometimes many and large, sometimes few and small; and, as far as I have been able to observe, the leaves of those plants which grow in hedges have the most spots. Is this only capricious chance? or does Sprengel's conviction, that the wise Author of Nature hasn't created a single hair in vain, point to some set purpose? During the past two years I have repeatedly tried to ascertain this, but those gentlemen with whom I have communicated on the subject, have not considered the above suggestion sufficiently established by facts to be worthy of much notice. They argue that if the spots are intended to deceive mice, what is the fate of those varieties of the common orchis which have no spots, and how can mice be deceived in the dark? But if any organism, through misfortune or fault, abandons a protection provided by nature, then it must be content with reduced safety; for the spotted leaves generally seem less mangled than the plain. At any rate, it seems almost incredible that such conspicuous marking should be there for mere beauty apart from utility; and the quaint Scotch superstition, though interesting from the piety with which it is conceived, does not offer a substantial explanation. It is strange that spots in the animal world should be connected with venom and rapacity. Can the spots secrete acrid juices which emit an odour by night, and form a protection from slugs by day? Mr. Britten, of the British Museum, and Mr. Stansfield, of Sale, do not think they form any protection, and I have frequently noticed leaves much spotted yet much gnawed; though how much more they would have been gnawed, had the spots not been there, it is impossible to say. This theory of mine is occasioned by absence of information and the conclusion that the leaves elaborate the spike; for the spike suffers when the leaves are damaged, and when once fairly out in February, the leaves do not grow much larger. The plain-leaf variety I regard as a straggler on the line of march, who, for some reason, has not kept up with the main body, and whose kit and accoutrements are consequently not in perfect order. This may be the result of disturbance, soil, manure, lime, &c., for the specimens experimented with last year had every one of them paler flowers and fewer spots than the year before; and Mr. Wallace has shown that spots, eyes, and lines vary and appear on the most highly modified parts. This, again, connects the flower and the leaf. A spot, when examined by the microscope, presents a beautiful series of hexagonal cells, like a honeycomb, depressed towards the centre, with a red hue, and light fawn-coloured ridges intervening. The colouring matter (*erythrophyll*) coagulates very soon, though, if dried at once, it retains its tint.

Finally, can the age of the orchis be determined by the number of the leaves? Seedlings with one and two leaves are continually found in April, but these have no spike. I have not found a spike with less than three leaves; so that, supposing a leaf is added successively year by year, the plant that has ten leaves must represent the accumulated reserve of twelve or more years. These are points which it would be deeply interesting to discover.

The *inflorescence*. Hitherto we have been considering the *personal* organs of the common orchis, or those relating to the individual vitality of the plant; now we come to the *relative* organs, or those concerned with the reproduction of the species. These in all flowers are the most conspicuous, ornamental, and interesting parts, and they compose what is generally understood by a flower. Our poetical ideas are centred in the flower, and most people regard the flower only, but an inquiry into the reasons of the different shapes and structures of flowers, so far from being dry and prosaic, is found to be, since Charles Darwin and others have brought their intellects to bear on the subject, an entirely new delight, which affords sure answers to otherwise unsolved riddles. For we have now arrived at the actual flower that will always be memorable in the annals of botany, and the case is something like this. Thousands before Galileo had observed the stately swing of the great brass chandelier in the cathedral at Pisa, and thousands before Newton had noticed the fall of an apple on a chill October day; thousands before James Watt had watched a boiling kettle, and thousands had seen bees flitting about the flowers of the orchis and loosestrife; but it took the perseverance and genius of Darwin, to unravel the mysterious mechanism of this curious plant. It is strange now to read the remarks made about the fertilisation of the common orchis prior to the year 1862: some said that it is fertilised by absorption, while others, carrying their ideas to the excess of caution, declared that it was one of those unexplained secrets of nature into which it was not proper to pry.

The term *inflorescence* is applied to the general arrangement of flowers on a stem, which is managed in such a variety of clever ways that plain evidence of more than human resource and invention is given in bold characters. Take, for instance, a spike of the common orchis and a flower of the common buttercup; the inflorescence of the one is the exact opposite of the inflorescence of the other. The buttercup is of primitive type, centrifugal, and with leaves developed: the orchis is highly modified, centripetal, and with leaves plain. In the buttercup ("Science Primer," p. 54), the flower that terminates the axis of the plant opens first, then the one next to it, and so on, until the flower farthest from the first has opened. Such inflorescence is called centrifugal, because the order of flowering is from the central axis outward, and the axis itself does not elongate. In the orchis, the flower farthest from the top opens first, then the next, and so on, till the one at the extremity of the spike is reached; and all this time the axis is elongating. The teazel is different again, for it opens its flowers first half-way up the head, and then works upwards and downwards.

Here the very natural question may be asked: Why should two common flowers, which come out about the same time, have exactly opposite arrangements? The answer happily is simple enough: the two flowers have two very different offices to perform. The buttercup supplies a vast amount of pollen, and the orchis supplies what? That's the question! That has been the object of these observations, to answer the question: What does the orchis produce necessary to secure the visits of bees? With your permission, I will proceed very leisurely at this point of the inquiry, like a gossamer-spider feeling tremblingly along its line.

A full-grown orchis-spike shows many sessile, irregular, labiate, ringent flowers, duly arranged one above the other. The process of opening, which is here only just begun, takes about a fortnight, so that allowing a fortnight for the ripening of the pollen, the entire period occupied in unfolding a spike is about a month. During this time the flowers remain open, bidding for insect-services night and day, for an orchis-flower, unlike the marigolds and sun-eyed daisies, that close their winking flowers in rain, is incapable of closing again after having once opened; but as soon as the ovary has been impregnated, the flower, having performed its office, fades away, and if the spike is a large one, the lower flowers are dead before the upper ones are expanded. Next, look at the delicate poise of the flower; it is fastened like a spring. This provision is necessitated by the state of the case, for as the flowers cannot close when once open, it is manifest that the wet and heavy dews would soon spoil the pollen if the corolla faced upward, and it harmonises also with the centripetal inflorescence; for it would be inconceivable that a flower should be made in such a way that a bee visiting it would be subjected to the inconvenience of flying backwards, as would occur if the inflorescence were centrifugal. Our examination, then, has not extended far before we see how eminently an orchis is adapted for the visitation of insects; and, even if we were not familiar with all the deeply interesting facts about the order, I think the above could not escape notice.

(*To be continued.*)

THE PRE-CAMBRIAN ROCKS OF ENGLAND AND WALES.

By W. W. Watts, B.A., F.G.S.

THE study of the Pre-Cambrian rocks of England was for many years neglected and even ignored, from the time when Murchison declared that it was not possible for such rocks to occur there. He worked out to some extent the great gneissose rocks of the north-west Highlands, and not finding some of their characteristic details repeated in the Malverns he concluded that the gneisses of that place were merely altered Cambrian rocks, and thought that he was confirmed in this conclusion by the fact that the strike of these gneisses agreed with that of the flanking Cambrian deposits. The value of this we shall estimate later.

In spite of this assertion from the lips of the director-general of the Geological Survey, many men believed that we had in England and Wales representatives of these very ancient rocks, and amongst them I may mention Mr. W. S. Symonds, who, writing in 1872, in "Records of the Rocks," states his belief that the crystalline rocks of Anglesey and Caernarvon, the schists of Holyhead, the rocks of Bardsey, and of the Lleyn or Caernarvon peninsula will all eventually be classed as Pre-Cambrian; he continues and includes in this statement the Twt Hill rock of Caernavon, the syenitic axis of St. David's, and the Malvern gneiss. How far his ideas were correct this paper will endeavour to show, and we shall see that in few or no points did he miss the mark.

From several points of view these rocks are of great interest, for they admit us to a whole volume of the earth's history, which, when carefully read and thoroughly understood, will enable us (in part, at least) to bridge the gulf between the knowledge we have from stratigraphical geology on the one hand, and from celestial physics and chemistry on the other. But this volume is written in an obsolete language, and the ink was blotted and smeared before it had thoroughly set in; and, in addition to this, the volume has been cut and torn into fragments, of which many have been entirely lost and many have become almost useless. So the translation is difficult from a triple cause, for we have to piece the rocks together and to supply what is lost or missing, to see through the changes, defacing, and obliteration which the original characters have undergone, and to reason out the methods by which the rocks were formed; for we cannot suppose that the agencies at work at these distant periods were precisely like those we can observe to day.

In spite of these difficulties, the Pre-Cambrian rocks are being gradually reduced to order, just as the chaos of "Transition and Greywacke" grew up, under the skilled workmanship of Sedgwick and Murchison, into the beautiful and connected Cambrian and Silurian systems.

In America, Dr. Sterry Hunt has identified six distinct systems below the Potsdam sandstone; they are, in ascending order:—

1, Laurentian; 2, Norian; 3, Huronian; 4, Montalbian; 5, Taconic; 6, Keweenian.

Of the first four of these an excellent account was published in SCIENCE-GOSSIP some time back. Each of these systems contains a great thickness of rocks, but they cannot be definitely correlated with their equivalents on this side of the Atlantic.

Neglecting the American, Scotch, and Irish Pre-Cambrians, I propose to give a résumé of the characters of these rocks in the district where they occur in England and Wales; there are seven such districts, and, in the order in which they were originally described they are, 1, Malvern (1864. Holl, Q. J. G. S. xxi.); 2, St. David's (1876. Hicks, Q. J. G. S. xxxiii. &c.); 3, Caernarvonshire and N. Wales (1877, Hicks, Bonney, Hughes, Q. J. G. S. xxxiv. xxxv. &c.); 4, Anglesea (1877. Hicks, Hughes, Callaway, Roberts, Q. J. G. S. xxxiv. xxxvi. &c.; Geol. Mag. 1880, 1881); 5, Shropshire (1879. Callaway, Q. J. G. S. xxxv. &c.); 6, Charnwood Forest (1876. Bonney and Hill, Q. J. G. S. xxxiii. &c.); 7, Cornwall.

1. *Malvern.* Holl, in 1864, wrote his splendid paper on these hills, and boldly claimed a Pre-Cambrian age for the gneisses there. The rocks are mostly felspathic and hornblendic gneisses, sometimes massive, but more frequently well foliated. Mica occurs plentifully in some parts, for instance near the Wych, and epidote is a rather common mineral. The fine hornblende rock of North Hill is well known for its handsome appearance and remarkably tough character. There are good granitoid rocks here and there, some closely resembling those of the Wrekin. The general strike of these rocks is along the chain, i.e. north and south, but there are many local variations. The dip varies greatly, and is frequently as much as 85°.

The sketch (fig. 45) gives an idea of the character of the bedding of the rock, which agrees with its foliation.

Intrusive granites and diorites occur all along the ridge, and some care is requisite to distinguish between the igneous and metamorphic rocks. On the east side of Herefordshire Beacon there is a curious hälleflinta-like rock, which Dr. Callaway classes as Pebidian. Although the strike of the Pre-Cambrian

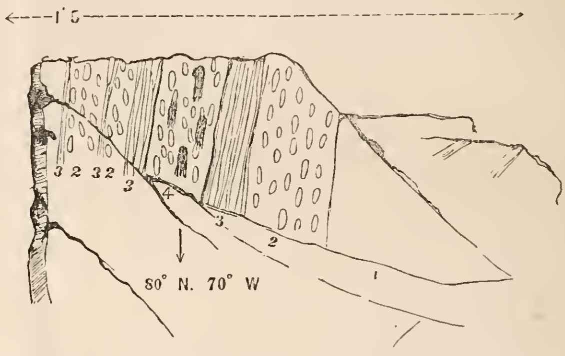

Fig. 45.—Knoll south of Worcester Beacon. 1, Compact Hornblendic rock; 2, coarse gneiss, with lenticular patches of fine gneiss in it.

rocks agrees with that of the surrounding Cambrians, the dip is often in an entirely opposite direction, and in Raggedstone Hill, Holl has given a section of the unconformity splendidly displayed (fig. 46). As the Hollybush sandstones are probably the equivalents of part of the Lingula flags, there cannot be any doubt as to the Pre-Cambrian age of the gneisses, which are now acknowledged to belong to the Dimetian system.

2. *St. David's.* About the same time as Holl was working at the Malverns, Dr. Hicks announced the presence of Pre-Cambrian rocks underlying the Cambrian at St. David's. He did not however begin to work on these at once, but felt his way down to them, by working out the Cambrian thoroughly. He established the succession in descending order through Arenig, Llandeilo, Tremadoc, Lingula, and Menevian beds, down to the Harlech group in which he discovered a fauna of Trilobites, Brachiopods, and Annelids, exceedingly rich for beds so low in the series. Below these rocks were ashy shales, and

agglomerates, which had been previously called altered Cambrian beds, and were supposed to have been metamorphosed by the central "Syenitic" ridge. Finally, Hicks established here three systems, to which he gave the names of Dimetian, Arvonian, and Pebidian.

The Dimetian System consists of a series of truly metamorphosed rocks of a curious character. True foliated gneisses are rare, but the rocks are massive in character; they consist of compact granitoid rocks (granitoidite), with much quartz, and some felspar, little mica and some chlorite. A microscopic examination of these has proved them to be elastic or fragmentary in their origin. Besides these, there are quartziferous breccias, quartz schists, quartzite, one band of crystalline limestone, and some green rocks which appear to have been inter-bedded lavas of a basaltic character.

The Arvonian System of Dr. Hicks appears to be everywhere separated by faults from the Dimetian, and presents some curious varieties of rocks. Among these what the Swedish geologists call *Hälleflintas* are conspicuous. These are altered silicious rocks, which appear to have been formed from the denudation of highly silicious lavas and ashes. In addition to these, however, quartz-porphyries or felsites, true volcanic rocks or acidic lavas occur in some quantity, often showing spherulitic structure.

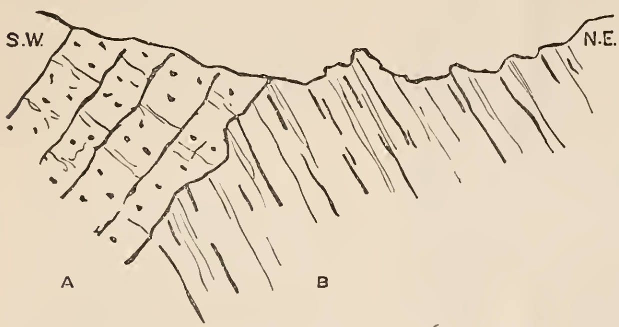

Fig. 46.—Quarry south of Raggedstone Hill (Holl). A, Holly-bush sandstone; B, gneissose rock.

The Pebidian System is found in unconformable contact with the Dimetian, and faulted against the Arvonian rocks. It consists chiefly of volcanic rocks, agglomerates, conglomerates (by stratification and rounding of fragments), ashy beds, hornstones, and what, for want of a better name, are called imperfect ashy schists of green, grey, and purple colours. One contemporaneous felstone lava appears on the coast west of Porth Liskey, where the beds are well exposed. The basement conglomerate of the Cambrian System rests unconformably on these rocks, and contains pebbles of Pebidian rock, thus most indisputably proving the order of succession and age of these rocks.

(*To be continued.*)

RECREATIONS IN FOSSIL BOTANY.

(LYGINODENDRON OLDHAMIUM.)

By James Spencer.

No. VIII.

THIS very singular but most beautiful fossil plant was originally described by the late Mr. Binney, F.R.S., from specimens obtained from the neighbourhood of Oldham, under the name of *Dadoxylon Oldhamium*.

At that time this plant was generally thought to have belonged to the coniferæ, and to have been the representative of that family of plants in the forests of the coal-measures.

Some time after Mr. Binney's paper appeared, another paper on this same plant by Professor W. C. Williamson, F.R.S., was published in the Transactions of the Royal Society. In that memoir the author clearly demonstrated, that Mr. Binney's plant was not a dadoxylon, according to Brongniart's description of that genus. He also showed that its structure was so very peculiar and distinctive as to warrant him in placing it in a new genus; and as one of its distinguishing features consisted in the reticulated character of the vessels of the woody cylinder, he gave to the new genus the name of Dictyoxylon, still however retaining Mr. Binney's specific name; hence, throughout the greater portion of the memoir, our plant rejoiced under the new name of *Dictyoxylon Oldhamium*.

Towards the end of the memoir, the author again changed the name of the plant for the following reason: upon examining a fine series of sandstone fossils in the Liverpool Museum, Professor Williamson thought that some of them were the casts of similar plants to his new genus Dictyoxylon. He subsequently learnt that similar sandstone fossils had been described by a Scotch gentleman of the name of Gourlie, under the name of *Lyginodendron Landsburghii*. Upon reading Mr. Gourlie's description, he became confirmed in his conjecture, viz. that Lyginodendron and Dictyoxylon were only different forms of the same genus. Therefore following the rule laid down as one of the canons of science, namely, that the oldest name should claim precedence, he generously gave up his own name of Dictyoxylon in favour of the older name of Lyginodendron. But, as there was no proof that the Scotch plant was specifically identical with the English one, he still retained Mr. Binney's specific name for the Oldham plant, so that the correct name for this plant is now *Lyginodendron Oldhamium*.

The Oldham district has long been noted for its rich stores of fossil plants, which have been brought to light chiefly through the labours of Messrs. Butterworth, Nield, Earnshaw, and the late Mr. Whittaker. Professor Williamson has frequently alluded to the invaluable aid that he has received from them, and of their untiring devotion to the cause of science.

By a curious coincidence, my first acquaintance with the fossil plant now under description, dates from the first time that I met Mr. Butterworth. I was geologising at Southowram Bank Top Coal Pit, near Halifax, one Saturday afternoon, when the unusual sound of a fresh hammer attracted my attention. It proved to belong to Mr. Butterworth; mutual explanation took place, and among the

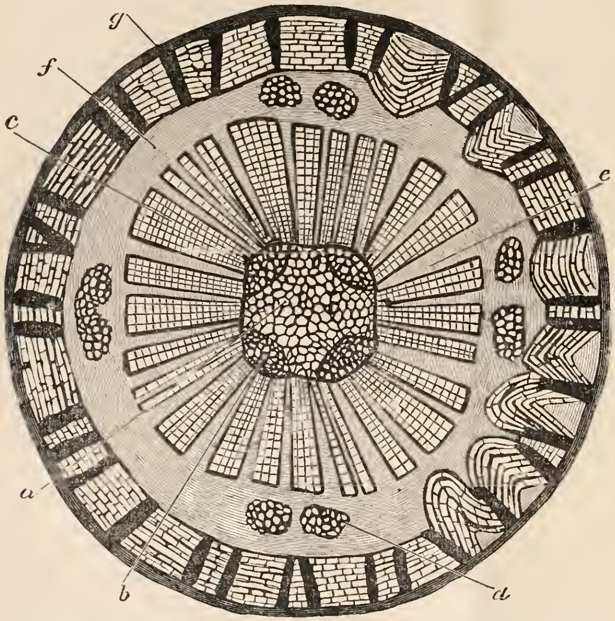

Fig. 47.—Section of *Lyginodendron Oldhamium* (mag. 12 diam., from specimen in Author's cabinet). *a*, central cellular pith; *b*, medullary cylinder; *c*, woody cylinder; *d*, cortical bundles; *e*, medullary rays; *f*, inner bark; *g*, fibrous layer.

"spoils" which we won on that occasion was a good specimen of *Lyginodendron Oldhamium.* Since then many a pleasant ramble have I enjoyed with my Oldham friends, both in Yorkshire and Lancashire, in search of fossil plants.

Lyginodendron Oldhamium proves to be one of the most common fossil plants found in our Halifax district. My cabinet contains a large series of sections of this plant which I have prepared from specimens found in them. The one from which our illustration has been taken has all its various tissues in a beautiful state of preservation, and from which we are enabled to learn a great deal about the structure of the plant.

On comparing a transverse section of Lyginodendron with a similar one of Dadoxylon, we see at once that there is a very great difference in the structures of the two plants. We find that instead of the simple, but very compact arrangement of the tissues seen in the latter plant, there is a very complicated state of arrangement of them in the former plant. In Lyginodendron the tissues are not only more varied in form, but the component cells and vessels are also more variable in size and generally larger than they are in Dadoxylon.

A transverse section of *Lyginodendron Oldhamium* (fig. 47) shows the usual tripartite division of the stem into pith, woody cylinder, and bark.

The pith is formed of two distinct zones, after the manner of the pith of *Lepidodendron Harcourtii*, viz. a central cellular medulla (*a*) formed of a very regular hexagonal parenchyma, the cells of which are larger than those composing the pith in Dadoxylon. This central cellular pith is surrounded by an interrupted zone of vascular tissue, the cells and vessels of which are barred (*b*). This zone is known as the "vascular medullary cylinder." In very young plants the central cellular pith is completely enclosed by the medullary cylinder, but as the plant increased in size, the latter began to break up and soon resolved itself into four detached bundles, and the intervening spaces became occupied by the extension of the central cellular pith.

The woody cylinder (*c*) is formed of vessels which are arranged in radiating rows or laminæ which are separated from one another by true medullary rays. In fig. 47 (*b*) and in young specimens generally, many of these laminæ consist of a single row of vessels, but other laminæ in the same section have from two to six rows of vessels, while in older plants there are sometimes as many as twelve or more rows of vessels in each lamina and without intervening medullary rays. Generally speaking, the vessels increase in size in passing from the inner edge of the woody cylinder towards the periphery, up to a certain limit, when they split up into two; those vessels which occur in single rows are generally the largest, and they gradually decrease in size as the rows in each lamina increase in number.

In longitudinal sections the vessels are seen to be long tubes, and, as already stated, their walls are reticulated, and not pitted as the vessels are in Dadoxylon, or barred as in the Lepidodendroid plants. The medullary rays (*e*) which bind the laminæ together, form nearly one-half of the ligneous cylinder, and they are composed of elongated cells of mural parenchyma, similar to those which occur in

Stigmaria and other Lepidodendroid plants, and also in modern Dicotyledonous plants. These rays vary in size, from one or two to six or more rows of cells.

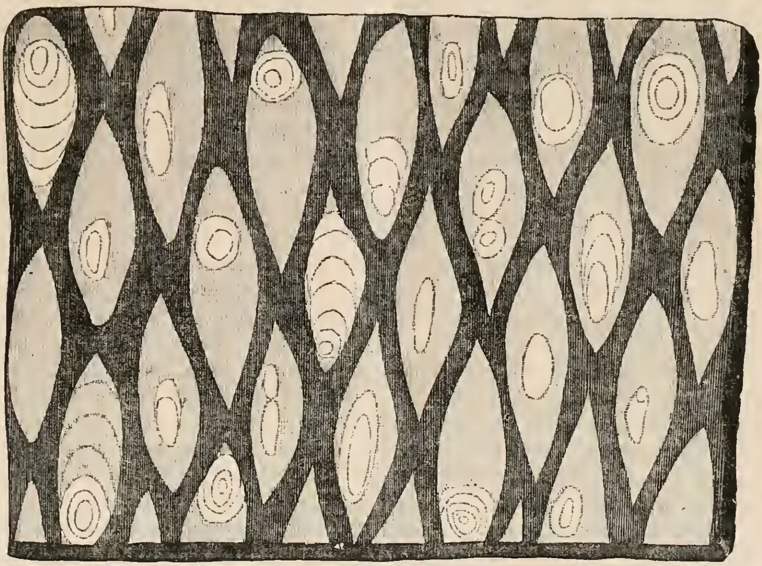

Fig. 48.—Tangential section of fibrous layer in Lyginodendron (mag. 8 diameters).

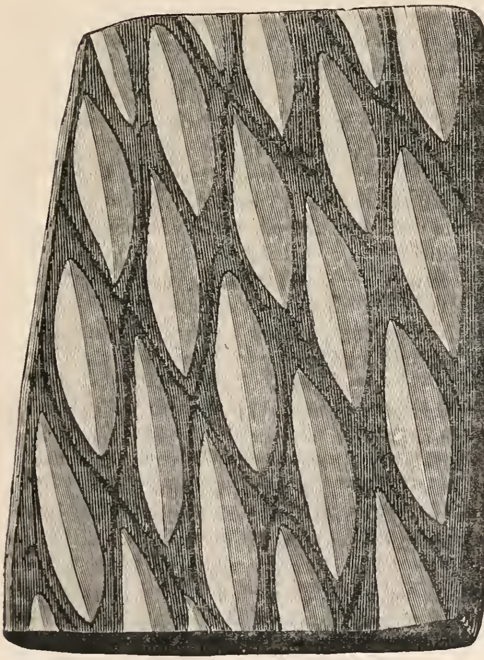

Fig. 49.—Ironstone cast of Lyginodendron (nat. size).

The bark: this part of the plant is a most peculiar and highly characteristic structure. It may be divided into three portions; namely, inner, middle, and outer bark. The innermost portion of the inner bark is composed of cellular tissue of a very delicate character, which is known as the pseudo-cambium layer. This layer, however, is rarely preserved in the fossil state, although it occurs in several of my specimens. The remainder of the inner bark (*f*) is composed of larger cells, with thicker walls. The outer bark is also formed of similar cellular tissue to the last named, but is very rarely seen; indeed the whole of the true epidermal layer has not yet been found attached to the plant, that I am aware of. The middle layer (*g*) is the most characteristic feature about the bark, and, on account of its almost indestructible character, it is nearly always more or less preserved. It is composed of a series of fibrous bands, formed of dark brown tissue, and so dense in structure as to appear like black lines. These bands are of pretty uniform length, but very irregular in outline, so that they appear not unlike Roman numerals, which give to transverse sections of this plant a striking resemblance to a clock face. These dark bands are composed of true fibrous vessels, which appear round in transverse sections, but are seen to be long and fusiform in longitudinal ones. Tangential sections (fig. 48) show that these bands ascend the stem in an undulating manner, and interlace with one another, thus enclosing large lenticular spaces and giving to these sections an appearance not unlike that presented by cortical sections of Lepidodendron. But there is really no affinity between the two sets of tissues, for while the latter tissue is cellular, the former is true woody fibre. I have in my cabinet some large cortical sections of *Lepidodendron obovatum* in which the leaves have lost their raised central portion and nothing remains, save the narrow outlines of the edges, which cause these sections to look very like tangential sections of Lyginodendron. But upon comparing them under the microscope, the difference between them is seen at once. The large rhomboidal spaces between the fibrous bands are filled with cellular tissue, which varies considerably in form even in the same plant.

In the transverse section from which our illustration is taken, this tissue takes the form of long oblong cells, which in some cases stretch across the spaces between the fibrous bands, in others they are trailed about in a very curious manner, which is very probably due to shrinkage during or before fossilisation. They gradually decrease in size, as they approach the regular tissues of the inner bark. There is yet another interesting feature in connection with the bark.

Placed amid the cellular tissues of the inner bark are four pairs of vascular bundles (*d*), formed of similar tissues as those composing the vascular medullary cylinder. These bundles form an interesting, and at the same time a most characteristic feature, in all transverse sections of *Lyginodendron Oldhamium*. In longitudinal sections they are not so conspicuous, on account of their component vessels being reticulated in the same way as those forming the contiguous ligneous zone, so that they appear to be merely its outer edge.

The presence of these bundles explains a curious feature which is observable in most transverse sections of this plant, and which was for a long time a puzzle to me, and that is, the undulating outline presented by the ligneous cylinder.

At the first glance it might appear, as it did to me, that these undulations were due to pressure, but such is not the case, as they occur in specimens which do not appear to have been at all compressed, and which have their tissues well preserved. These cortical bundles are placed in the hollows where the undulations curve inwards, while those of the medulla are placed where they curve outwards. It appears very probable, as was suggested by Professor Williamson, that the two sets of bundles acted as stays or buttresses to strengthen the somewhat lax tissues of the plant. The great majority of specimens of this genus shew no signs of either branches or foliage, for the cortical bundles do not appear to have any connection with either leaves or branches. There are other bundles of tissue in the bark which may have had some connection with either leaves or branches. Some of my specimens show branches or fronds being given off from the bark. There are other petiolar bundles which originate either in the ligneous zone or medullary cylinder, but which, in many cases, appear to have terminated at the outer surface of the bark, and most probably were connected with leaves or cones or other deciduous appendages. These facts render it probable that the stem may have had a crown of fern-like fronds; there are also other facts which point to the affinity of Lyginodendron with the tree-ferns. But on the other hand, in its double pith and woody cylinders, it is more allied to the Lycopodiaceæ, as represented by the Lepidodendroid plants. It is one of the many coal plants, of which it may be said that we have yet to learn a great deal more about them before this can be placed in its proper position in the vegetable kingdom, and also one in which we may perhaps learn something about the great question of the evolution of the fossil plants of the coal-measures.

The chief object which I have in view in writing these papers is, that by the aid of our studies among the fossil plants found in our coal-ball nodules more light may be thrown on the history of our ordinary fossil plants, and especially on those forms the history of which is very obscure, so as to still further increase the growing interest taken in them.

My cabinet contains a series of peculiar impressions of fossil plants with which I have long been familiar, but which I was unable to make anything of as to the kind of plant to which they had belonged.

But after reading the above memoir on *Lyginodendron Oldhamium*, and becoming practically acquainted with the structure of the peculiar cortical fibrous layer as seen in tangential and transverse sections, a flood of light was thrown on these hitherto unknown fossil impressions.

In the sandstone rocks of the millstone grit series, as well as in those of the coal-measures, we frequently find fragments of sandstone casts which are characterised by the possession of a series of raised ridges and corresponding depressions, which ascend the stem in a somewhat spiral manner, nearly after the manner of the leaf-scars of the Lepidodendroid plants. These ridges and furrows vary considerably in length, according to the size of the plant, and very probably these variations also sometimes indicate different species. In some specimens the ridges are fully four inches in length, while in others they are not more than half an inch in length. They also vary considerably in height and form: some of them are smooth and rounded; others stand up half an inch above the surface of the plant, ending in a sharp edge; others again are rounded and striated. The most beautiful specimens are, however, found in the ironstones of the coal measures, as is usually the case with most of the ordinary fossil plants. Fig. 49 is taken from one of these ironstone fossils.

Fossil collectors generally regard them as the impressions of Lepidodendroid plants, to which they bear a close resemblance. But this is one of those cases which not unfrequently occur among fossil plants, in which the ordinary impressions and casts convey but a faint idea of the real form of the original plant when growing in its native soil. These singular fossils are the impressions of the fibrous layer (fig. 47, *g*) in the bark of Lyginodendron, and, of course, do not represent the external appearance of the plant when growing, as the real epidermal layer was outside of the fibrous zone.

The many varieties of these sandstone casts indicate that there were probably many species of Lyginodendrons.

They are found in the sandstone rocks in the millstone grit series, and at various horizons in the coal strata. They have also a great horizontal range, occurring, as has been shown, in the Scotch coalfield whence the late Mr. Gourlie obtained his specimens, and also in Lancashire and Yorkshire, and very probably in other coalfields. The great range of these plants and the abundance and large size of their remains, prove that they attained to arborescent dimensions and flourished in great numbers, and that they formed a very important part of the flora of the Carboniferous age.

The question may be asked, What are these plants: but, like many other questions, it is far more easily asked than answered. I have already pointed out that *Lyginodendron Oldhamium* possesses affinities with both the Lycopodiaceæ and the ferns of the same geological age, and that it was originally described as a Dadoxylon or fossil pine. But the fact is, the stem of Lyginodendron is so very anomalous in its structure, that we shall have to learn a great deal more about the plant before we can place it in its proper botanical position.

We are not sufficiently acquainted with its mode of branching, or whether the branches partook of the nature and form of fern-like fronds as has been suggested, or otherwise, and nothing whatever is known about its roots; while in regard to the most important point as to the character of its reproductive organs, we have yet to learn whether it bore seeds or spores. It is, therefore, very obvious that, until we know more about these parts, especially about the character of its fructification, such an anomalous structure as is presented to us in the stem of Lyginodendron must yield us an uncertain guide to its proper classification.

This plant has been supposed by some fossil botanists to have been the parent of some of the gymnospermous seeds which occur so plentifully in the coal measures, and the great difference which exists between its structure and that of the true fossil pine. Dadoxylon has been accounted for in the very great difference in the habitats of the two plants. It has also been suggested that the seeds may have been brought from a distance by water and deposited among the débris of other plants. In the case of the seeds found in sandstone rocks and in limestone shales such was undoubtedly often the case, but my experience of the manner in which these seeds occur in the coal strata, and especially those which are found in our coal balls, leads me to think that it is highly improbable that they have been brought from any great distance. On the contrary, there is an abundance of evidence to prove that the parent-trees must have flourished on the spot where the seeds are now found. In our coal balls, numerous species of *Trigonocarpons* and other gymnospermous seeds have been found associated with the remains of the ordinary coal plants, such as stems, leaves, fruits, and abundance of spores. The occurrence of spores along with the larger fragments is almost certain proof that such vegetable débris must have been deposited on land and became entombed on the spot; for if water had carried them away from the place where they had been originally deposited, the spores being so light could not have been deposited along with the heavier seeds and other fragments.

Nor do I believe that the parents of the seeds could have been at all rare, or more easily destroyed than many of the other coal plants; hence I am forced to the conclusion that we must look to some of the fossil plants with which we are already familiar for the parentage of these seeds. Whether Lyginodendron may prove to be one of these we must leave for future discoveries to tell us, but from its near affinity to Dadoxylon it is not improbable that such may have been the case.

POND LIFE IN MIDWINTER.

In several numbers of Science-Gossip last year, we were reminded of the fallacy of the opinion that ponds are destitute of life during the winter months; and I should like to add my testimony to that borne by the Rev. W. C. Hey, M.A., and others, on this subject. More than once, after reading of some rare or common inhabitant of our ponds, I have had my desire to search for it dashed to the ground by being informed that it was not to be found during the winter months! Last December, when I told a naturalist that I had found plenty of the very common cyclops and daphnia in some pump water, he told me they had no business there at that time of year! But in the month of January last, I determined to put aside and ignore all that had previously obtained credence with respect to pond life in winter, and search for myself, in order to see if things were as they had been represented. With the memory fresh on my mind of what I caught in two excursions, I can truly say I am thankful I did so. I made my first excursion on Jan. 8, to a pond about two miles from Southampton, and I was soon convinced that this particular pond at any rate was not devoid of life, even though I visited it on one of the coldest days we had during the winter, and with a keen north-east wind blowing all the time. On this first visit, the only "fishing" apparatus I had with me was a bottle with a narrow neck, attached to some odd pieces of string I happened to have in my pocket. Notwithstanding all disadvantages, before I left the pond I had managed to secure a good number of the ordinary "waterman" beetle; any amount of *Cyclops quadricornis*, female, male, and larvæ; *Daphnia pulex* of course; the larva of *Ephemera marginata*, and also of the phryganidæ. While alluding to the caddis-worm, I should like to correct the erroneous notion which Mr. Ollard, of Enfield, gave expression to in the May number of SCIENCE-GOSSIP. He asked if any one could tell how it was that the bits of weeds, grass, &c., out of which caddis-worms make their cases kept their natural state so long as the insects required their use. But it is not true that the materials used do retain their "natural state" so long as the caddis-worm inhabits them. Many of the addis I have taken this year have been enclosed in cases which have lost all their greenness. On Jan. 11, I made another excursion to the pond mentioned above, and with much more satisfactory results. While I obtained duplicates of all the things above named, I also was fortunate enough to take others of much greater worth. Upon examination of the various bottles in which I had placed my spoil, I found the following: *Noteus quadricornis* (of which a very good drawing is given on page 541 of the sixth edition of Carpenter's "Microscope"); *Eosphora aurita*, *Trachelius anas*, and an abundance of *Volvox globator*. I was much pleased with the last "find," as even so great an authority as M. C. Cooke asks, "what becomes of the *Volvox globator* during winter?" I have not yet finished my examination of my bottles, and it is possible that the "half hath not been told" of what they really contain. But surely enough has been said to overturn the notion that our ponds in midwinter are wholly destitute of life.

REV. H. CARRINGTON LAKE.

Southampton.

COLLIERS' FOLKLORE.*

A CURIOUS bit of folklore exists amongst the Lanarkshire and other colliers, to wit, that "the smell of the blooms of peas and beans makes the fire,"—referring to explosions. It is astonishing how wide-spread the notion is. Were such explosions most frequent during the hot months, when these "blossoms scent the gale," there might be reason for supposing the miner's dread of these months to result from a wish to connect cause with effect.

Statistics however show that the hot months are the least liable to explosions; and, although at that time, if ventilation be bad, foul gases and "damps" do arise from diminished barometrical pressure, it is in the cold season with a high or rising barometer that explosions most frequently occur.

Mr. Robert Hunt, of the Mining Record Office, to whom I wrote on the subject, writes as follows: "The 'peas blossom damp' and the 'trefoyle damp' is not unknown.

"As Plott in his 'Natural History of Staffordshire' (1686) says: 'I never heard that this was mortal to the workmen, the scent thereof freeing them from the dangers of a surprise.' He says that in the Peak country of Derbyshire, they appear to think that the odour of the flowers is a cause of the 'damp.'

"But here they are wiser than to think it proceeds either from peas or trefoil; it being rather apprehended to arise from the workmen's breath and sweat, mixt with the streams of the golden marcasite (Arabic fire giving stone iron pyrites) or brass lumps, than anything else.

"It is not generally supposed in any district that any 'damp' can arise from peas, beans, or trefoil, but that damps do arise in the collieries having the smell of these blossoms."

Mr. Hunt adds: "I give you on the other side a table of 234 explosions of fire damp which occurred from year 1710 to 1878. You will see that the months of June and July are the most exempt from explosions.

January,	21	explosions.	July,	13	explosions.
February,	15	,,	August,	19	,,
March,	26	,,	September,	18	,,
April,	22	,,	October,	20	,,
May,	19	,,	November,	25	,,
June,	13	,,	December,	33	,,

I have just noticed that the author of the "Colliery Warnings" says that in 1882 there were 23 explosions with a rising barometer, and only six with a low, and that but 10 out of 30 were accompanied by southerly winds—supporting the belief that the most dangerous time is when the barometer is high or rising, although fire damp appears in greater quantities when there is a decrease of atmospheric pressure.

A. G. CAMERON.

H.M. Geological Survey, Lincoln.

* Communicated by Mr. J. Young, a former collier, and now weigher at Quarter Iron Works, Hamilton, N.B.

EELS IN VINEGAR.—The other day, a friend called my attention to a small phial of vinegar, which, on being closely examined, was seen to be swarming with living creatures of minute size. When examined by the aid of a microscope, they had the appearance of eels, the microscope making them appear about an inch long, and about as thick as a pin. They appeared to be enjoying themselves immensely, wriggling about at a great rate. They were quite transparent, except in parts, where there was a dark matter in their interior which I took to be food. As a great many microscopists read this paper, I thought some of them would kindly explain what these were, and how they came.—*W. Finch, jun.*

MATERNAL INSTINCT.

WITHOUT desiring to rake up any of the evidence which has been tendered in favour of and adverse to the probability of the viper swallowing her young in presence of threatened danger—beyond noting the fact that, while there is no physical obstruction to their being received into the mouth, gullet or stomach, there are certainly no special and exceptional facilities in the structure of those parts to admit of it in the adder, as has been alleged—may not this question be asked :—Supposing it to be proved that such a proceeding does take place, will not that be the only instance in nature of a mother betraying any protective instinct for a brood which do not in any way depend upon her for subsistence?

Snakes, whether hatched from extruded eggs or produced alive, are ushered into the world in a perfect condition, and are capable of getting their own living from the moment of birth. If we except slight pigmentary changes in the skin, and the additional development of certain appendages, such as the rattle, the organs and the function in the infant snakeling differ in nowise from those of its parent, beyond mere capacity. Even venomous species enter upon life with a supply of ammunition all ready, and need no training or experience to put it to its proper use. The little nose-horned vipers which were born at the Zoological Gardens last winter killed mice before they had seen the light twelve hours; and I have known rattlesnakes within three hours of their birth knock over young rats as though they had been shot. Little boas and pythons, too, begin to feed in a similarly short space of time, doubling up their quarry as artistically as the adult of thirty feet; and newly-hatched grass and other serpents of the ovo-viviparous persuasion have been observed to take tadpoles almost immediately, without involving any maternal interference.

In no other part of the world, as far as I have been able to discover, does such a theory obtain with regard to any snake—nor, indeed, with regard to any reptile, except that the Indians on the banks of the Orinoco declare that the female jacare or alligator keeps her young under shelter of ledges and caves in the rocks and disgorges her half-digested food for their benefit; which, considering that this creature leaves her eggs in the sand to be hatched by the heat of the sun, certainly displays a degree of wisdom on her part equal to that of the oft-quoted wise child which knows its own father! The common viper is so difficult to keep alive in confinement, that no opportunity has hitherto occurred of settling this vexed question in menageries; four were born in the Reptilium at the Zoo ten years ago, but did not survive long enough to afford any criterion, and died unswallowed. Russell's vipers, moccassins, and seven-banded snakes have bred there on several occasions; two batches of hybrids between the Jamaica yellow-snake and a female pale-headed tree-boa were produced; a large family of common boas made their appearance in the summer of 1877; and water vipers, nose-horned vipers, common rattlesnakes, yellow boas and ringed snakes have all been born there. But in the case of none of these has the slightest indication of maternal instinct been shown by the mother, nor have I been able to perceive a trace of anything of the sort in the horrid rattlesnake and others of my own which have given birth to young. The fact that parturient serpents are unusually savage, need scarcely, I think, be taken into account in dealing with this consideration. It was stated some years ago that a brood of young smooth snakes, born in captivity, were wont to rush to the mother and take refuge underneath her body when they were disturbed; but whether there was anything else in the cage for them to take refuge under did not appear. Viviparous lizards occasionally swallow their young, but do so from pure alimentary motives, without any intention of restoring them to society, and one can conceive of cannibal elapidæ, like the hamadryad and chequered snake, acting in a similar manner; lizards, however, betray no concern for the welfare of their offspring, and it seems strange that if so defenceless a creature as a new-born slow-worm is left to fight its own battles, such elaborate provision should be made for the safety of little veneniferous beings so much better qualified to take care of themselves.

In those curious and undoubtedly anomalous instances of incubation which have been observed among ovo-viviparous ophidians, an exemplification of something approaching this instinct has been manifested in the violent resentment shown by the serpent when the eggs were disturbed, and the pertinacity with which she has adhered to her task. A grass-snake in this condition bit my hand as I was taking her temperature; and to those who are acquainted with the character of this reptile, no better proof could be afforded of the intense revolution which its nature must have undergone.

A remarkable variation of maternal intuition came under my notice in Nicaragua. Some alligator's eggs had been substituted for the legitimate contents of a hen's nest, and the deluded fowl continued to sit on them until they were hatched. (Alligator's eggs have a hard shell, and are very little bigger than a hen's—much smaller than one would expect.) No words can describe the surprise and astonishment depicted by that hen, as she surveyed the strange chickens. For several hours she pondered over them, never clucking, and making no effort to scratch food for them; then, finding no solution of the puzzle, she gave it up and beat them to pieces.

ARTHUR STRADLING, C.M.Z.S.

29, *Woodford Road, Watford.*

NOTE ON *CLADOSPORIUM DEPRESSUM.*

MY friend Mr. Soppitt, of Saltaire, sent me last month a few leaves of *Angelica sylvestris*, on which were growing perithecia of *Sphærella ostruthii*, Fr. These perithecia are remarkable, as being aggregated on small angular greyish spots which are distinctly limited by the venules of the leaf. It appears that the mycelium which has begun to grow within the parenchyma of any intervenular area is unable to penetrate the vascular bundles of the venules, and is consequently confined to the area within which it originated. The perithecia of this species are almost constantly barren in this country, and it becomes a question how the fungus is propagated. I was pleased to see one answer to this query in the small tufts of dematoid mould which grew on and round the bases of many of the perithecia. This I found to be *Cladosporium depressum*, B. and Br. It is well known that the perithecia of many sphæriaceous fungi are adorned in this way, as is so beautifully represented in the plates of Tulasne's "Selecta Fungorum Carpologia;" and in point of fact most of the fungi contained in the suborder Dematici, like those in the Sphæronemei and others, will be found to be mere modes of reproduction of species included in other orders. For instance, the common *Cladosporium herbarum* is known to be only the conidial stage of *Sphæria herbarum*, and in the same way it must be admitted that *Cladosporium depressum* is the conidial phase of *Sphærella ostruthii*, and the means whereby the fungus propagates itself during the summer, although it must have some other mode of continuing its existence through the winter months.

W. B. Grove, B.A.

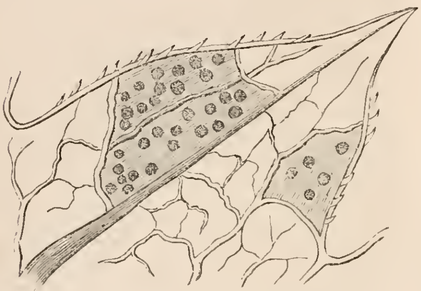

Fig. 50.—One of the serrations of the leaf of *Angelica sylvestris*, with three intervenular patches of *Sphærella Ostruthii*.

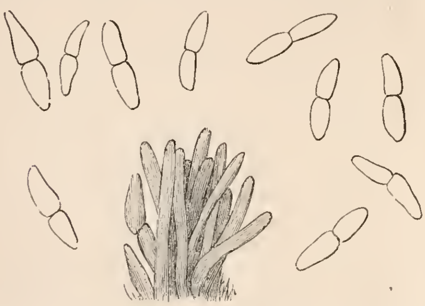

Fig. 51.—Tuft of flocci and spores of *Cladosporium depressum*.

MICROSCOPY.

Manchester Microscopical Society.—The annual soiree of this flourishing society was held in the Athenæum, Manchester, on Saturday evening, February 24th, and was attended by a large company of ladies and gentlemen. There was a capital show of microscopes and microscopic objects, living and dead. During the evening a lecture was delivered by Dr. J. E. Taylor, editor of Science-Gossip, on "Flowers and Fruits, and their Relation to Insects and Birds."

Anatomical Objects.—We have received from Mr. R. G. Mason a series of cheap and very effective sections, illustrating the normal anatomy of the mammalian lung, with full instructions for mounting, &c. These cannot fail to be instructive to a young beginner.

Meteorites.—Some time ago, I bought one of the slides showing moving bubbles, named by H. M. (page 276), and compared it carefully with several genuine slides of meteorites, which in no respect does it resemble. I should think it is built up chiefly of waterworn quartz grains (with here and there a grain of orthoclase and (?) Microline) cemented together by an iron-oxide of some kind whose precise constituents can be determined by analysis only; probably it is limonite. M. Hensoldt is a stranger to me, but from all I learn, he would be the last man intentionally to mislead his fellow-workers, and he could settle the doubt by obtaining an analysis from a recognised authority. Meanwhile will H. M. submit his slides to a competent judge of meteorites and let your readers know the result?—*T.*, *Yorkshire College.*

Magnifying Measurements.—E. A. C. H. has made some mistake, either in the power of his objective and ocular, or in making his measurements. A 1-in. objective (assuming, as is usually done by English opticians, that the distance necessary for perfect vision is 10 inches) magnifies 10 diameters. Ross's, Beck's, and Powell and Lealand's B. ocular, magnifies $7\frac{1}{2}$ diameters, giving an amplification of 75 diameters; that is, supposing that the length of the body is 10 inches, but if, as is often the case with continental instruments, it is only 8 inches, or even less, the amplification would of course be only 60. But as E. A. C. H. says his objective and ocular only magnifies $33\frac{1}{3}$ diameters, the length of the body of his microscope must either not much exceed 4 inches, or his objective has a power of only 4 diameters. If this is not the case, he has made some error in using his camera lucida, and instead of projecting the image on the paper at a distance of 10 inches from the edge of the camera, he has placed it at only 5 inches (or less); this would of course diminish it one-half. When desirous of ascertaining the magnifying power of an objective and ocular, I place a six-inch scale divided into $\frac{1}{10}$ths, the same distance from the eye as the screw of the objective, and if one eye is directed to the scale, and the other to the magnified image of the divisions of the micrometer, the latter are seen upon the former, and the amplification is easily determined. As no microscopic illustration can be of scientific value, unless its true amplification is given, the correct magnifying power of the objective and ocular employed should be ascertained and stated.—*F. Kitton.*

METEORITES.—Referring to H. M.'s remarks on this subject (SCIENCE-GOSSIP, December 1882)—a paper was read before the Quekett Microscopical Club, in November last, calling attention to the fact that the so-called Braunsfels Meteorite is not a meteorite at all, but a quartzite. The opinion of authorities was quoted, and specimens of quartzite, &c., were exhibited, showing the similarity existing between them and the so-called Braunfels Meteorite. The above specimens of quartzite, &c., containing fluid cavities, with bubbles which have spontaneous motion (as often enclosed in quartz) were also exhibited side by side, for comparison, at the last Conversazione of the Royal Microscopical Society.—*F.R.M.S.*

STUDIES IN MICROSCOPICAL SCIENCE.—We draw especial attention to No. 38 of this admirable series—a section of rock, "red syenite" from Ord Hill, Sutherland. The slide accompanying the "study" is a most important object, clearly showing all the constituent parts, down to the air bubbles in the quartz. The plate of the "study" describing the syenite is coloured, and is one of the finest which have yet appeared. The letterpress description is written by Professor Heddle, M.D., and is very clear and full of matter interesting to the student.

BIRDS OF BRAZIL.—The following books relate to the ornithology of Brazil: Burmeister: "Systematische Uebersicht der Thiere Brasiliens" (Leipzig, 1855–56). Vols. 2, 3 relate to birds. Pelzen: "Zur Ornithologie Brasiliens" (Wien, 1871). Spix: "Avium Species novæ quas in itinere per Brasiliam anno 1817 collegit et descripsit" (Monachi, 1824–5). Swainson, "Birds of Brazil and Mexico" (London, 1841). Probably this list may serve the purpose of G. A. K., who at p. 277 Vol. XVIII. asks for titles of works on Brazilian Birds.—*A Manchester Pythagorean.*

ZOOLOGY.

BIOLOGICAL WORKS.—Mr. D. F. Howorth has published an admirable paper (read before the Ashton-under-Lyne Biological Society) on "The Natural Sciences as illustrated in the Ashton-under-Lyne Free Library."

LOCAL ORNITHOLOGY.—We beg to call attention to an admirably drawn up "List of the Birds of the Banbury District," by F. C. Apton, B.C., the Rev. B. D'O. Aplin, B.A., and O. V. Aplin. This List is published under the auspices of the Banbury Natural History Society, by John Potts, Banbury.

STAFFORD SCIENTIFIC INSTITUTE AND FIELD CLUB.—This society has made its influence felt in Stafford by introducing popular science lectures. The following gentlemen have addressed good audiences on various subjects: Dr. J. E. Taylor, editor of SCIENCE-GOSSIP, Mr. Richard A. Proctor, editor of "Knowledge," and Professor W. Barrett, of Dublin.

SPIDERS.—The process described by Mr. E. Lamplough (SCIENCE-GOSSIP, pp. 46, 47, February, 1883) is well known as that by means of which the female spider is impregnated, and has frequently been described by various authors, beginning with Martin Lester in 1678. The exact method of this process is probably different with most spiders. What has not been so frequently well observed as yet is the method by which the spermatic fluid is transferred by the male spider from its secreting organs to the palpal organs. An exceedingly valuable paper on this (from careful experiment and observations) was read a few days ago before the Linnean Society by Mr. F. M. Campbell, of Hoddesdon. I may add, for the benefit of those who may wish to study our indigenous spiders, that this subject is included, among others connected with spiders, in a work by the present writer, "Spiders of Dorset," published in 1879–81, by the Dorset Natural History and Antiquarian Field Club, pp. 1–625, with introduction, pp. i.–xlii., plates i.–vi.—*O. P. Cambridge, Bloxworth, Dorset.*

HELIX OBVOLUTA.—I am glad to corroborate a note which appeared in an old number of your valuable paper, as to Crabbe Wood, near here, being a locality for that rare shell *Helix obvoluta.* I have found it there for the last three years in company with *Clausilia rolphii*, both alive, and also the empty shells under hazels, where the snail always hibernates according to my experience. Winchester is at least fifteen miles from Buriton, the woods near which place are the only locality I have been able to find in works on conchology. Surely, therefore, its existence here is a strong argument for its being indigenous, inasmuch as (if my memory serves me rightly) Dr. Gwyn Jeffreys reasons the same point from its occurrence in two woods near Buriton only six miles apart. I should be glad to hear from any of your correspondents, whether they have discovered localities other than those to be found in the principal woods. *En passant*, I may be allowed to mention that at Tenby—a very favourite watering-place of mine—I last year found *Helix pisana* as plentiful as ever, simply swarming on the grassy slopes by the town. This note may interest your readers. I must apologise for so much intrusion on your space.—*B. Tomlin, Winchester College.*

Black Stork.—Your correspondent H. W. Lett will, I am sure, be glad to hear that the black stork recorded by him, although the first Irish specimen, is by no means the *fifth* British killed individual; there are thirteen recorded instances of the occurrence of the black stork in England, in addition to which three were seen for some days in the county of Norfolk in the year 1823, all of which escaped the usual fate of rare visitors to our inhospitable shores. Mr. Lett's bird will therefore be the seventeenth British black stork.—*T. S.*

The Yorkshire List of Lepidoptera.—For some years past Mr. Geo. T. Porritt, F.L.S., of Huddersfield, whose fitness for the task is well known, has been engaged upon a List of the Lepidoptera known to occur in Yorkshire, for the "Transactions of the Yorkshire Naturalists' Union." He has been aided by the leading naturalists of the county, and has also paid attention to the literature of the subject, and has now finished the task. The result of his labours, which many besides Yorkshire naturalists will be pleased to see, has been the preparation of a catalogue which need not fear comparison with that of any other county in these kingdoms, including 1344 out of the 2031 on the British list, or a proportion of about two-thirds. The list will occupy about 130 pages of the Transactions.

BOTANY.

New British Species of Mucorini.—During the past four months, I have succeeded in finding the following six species of the Mucorini, concerning which I can discover no previous record of their occurrence in Britain: *Pilobolus œdipus*, Montagne. Stem short and thickish; swelling turbinate; columella very obtuse, piercing the sporangium nearly to the summit. Spores spherical, granular, unequal in the same sporange, 10·5–1·48 μ, with a distinct epispore, germinating easily in water. On cow or pig's dung. *Pilobolus Kleinii*, Van Tieghem. Stem slender and elongated; swelling ovoid; superior hemisphere of the sporangium not reticulated; columella conical, spores oval-oblong, variable, orange, averaging 15 μ × 8 μ, not germinating in pure water. On horse and cow dung. These two species have hitherto been confounded by observers with *P. crystallinus*, Tode. *Pilaira Cesatii*, Van Tieghem. This species, which is the *Pilobolus anomalus* of Cesati, has the sporange nearly the same in structure as Pilobolus, but differs in not projecting its sporange explosively as the latter does. It is a much taller plant, reaching above one inch in height, while the two Piloboli mentioned above do not exceed one-tenth of an inch. Columella hemispherical, the lower half forming an apophysis below the sporange; stem cylindrical, not septate at the base. Among Mucor on horse dung. I have also found *Chætocladium Brefeldii*, parasitic on *Thamnidium elegans; Piptocephalis Freseniana*, De B. & W., parasitic on Mucor; and a species allied to *Mortierella tuberosa*, Van Tieghem, which may possibly prove to be distinct.—*W. B. Grove, B.A.*

Curious structure of an Orange.—While pulling an orange in half, a small cavity was disclosed at the stalk end, which contained another small orange covered with pulp and attached towards the stalk end by the same substance. I do not know whether such deformities in oranges are common, and should be glad to hear if any of your correspondents have observed any.—*F. H. Parrott, Aylesbury.*

Autumn Primroses.—Observations similar to those of your correspondent, Mr. J. S. (Luton) revealing the open character of the last three winters in their influence on the South Bedfordshire woods, should interest solar physicists, who will recall that in 1876 Professor Balfour Stewart asserted that the winter temperature range at Kew was greatest at the time of sun-spots. But what should likewise interest North countrymen, I have at the present moment lying before me a slim and slender primrose, picked on the estate of the Marquis of Bute, at Mountstuart, in the island of Bute, on the 9th of September last. It has scarcely half the dimensions of an English March blossom, and retains much of the sepulchral beauty of its native pine shade. Although it be rumoured Mountstuart is a paradise of mildness, there was an impression on my mind that the stray late-blooming primroses met with in the Western Highlands had been retarded by the excessive spring rainfall. Perhaps some one knows?—*A. H. Swinton, Guildford.*

Early Flowers.—While making for home this afternoon, I found some of the common avens, or herb Bennett (*Geum urbanum*) out in all its glory. Is it not very early for it to be so?—*Alex. Ogilby.*

Early Flowers.—During the week January 8–15 I found several plants of the lesser celandine or pilewort (*R. ficaria*) in blossom. They grew on a lawn, under a leafless but spreading Spanish chestnut tree, whose branches ran along the ground for 15 to 20 feet. Locality—border of Sussex and Surrey;

weather cold and foggy. Only a few of the blossoms were perfect, the sepals and petals being often wanting. On January 21st, I observed that the filberts (in the weald of Kent) showed many female blossoms, the male flowers being only partially expanded.—*M. E. Pope, Edgbaston.*

FUNGUS IN ORANGES.—Would some reader kindly inform me the name of a fungus which grows in an orange? I found one growing on a pippin; it had grown up to the rind, which was slightly blackened. I have cut it out, and dried it. I never met with one like it before; curiously enough the fruit was not injured in the least, it grew up like a black tulip, not mixing with the fruit.—*S. A. B.*

ETYMOLOGY OF SPHAGNUM.—Could any of your readers enlighten me with regard to the word *Sphagnum?* I believe there is no classical authority for it; and it cannot be imported from the Greek, as the word σφαγνον does not exist. Pliny uses the word *σφαγνος.* So it appears to me it would be more correct to speak of a sphagnus and the sphagni.—*B. Piffard.*

GEOLOGY.

LOWER PALÆOZOIC ROCKS, CORNWALL.—Serpentines have been divided into Ophite (methylosis igneous rocks); Ophiolyte (methylosis calcareous rocks), while the latter may be Ophicalcite or Ophidolomite, in which respectively part of the calcite, or part of the dolomite, is unchanged. Most of the ophites that I am acquainted with are intrusive masses, but as some eruptive rocks are in bedded masses, some ophites after them are also in bedded masses. Tuffs more usually are changed into steatite and allied rocks, but some in part are changed into ophite; such often have a look as if they were intruded into the bed of steatite, but more correctly they are part of the bed. Lately I met in the co. Wexford a peculiar bedded ophite—in part ophite and in part smaragdilyte. Ophiolytes are nearly invariably in bedded masses; yet, in the eastern portion of the Mweelrea mountains, north of Killary Bay, co. Mayo, there are curious intrusions or protrusions of calcareous rock, generally more or less dolomitic and in part ophiolyte or steatite. All the Cornish rocks, as far as I examined them, were ophitic, usually methylosis Gabbro or diallage rock, and occurred as intrusions. However, on the coast line between St. Michael's Mount and the Lizard there are tuffs changed in part into steatite and in part into ophite, and these to me appeared to be in bedded masses. Elsewhere I have suggested that the Lower Palæozoic rocks of the Lizard probably are either Cambro-Silurian (Lower Silurian) or Cambrian, as they and their associated eruptive rocks are very similar to the rocks of these formations in Ireland. There is, however, no direct evidence to prove their age, further than that they belong to one of the Lower Palæozoic formations, but to which of these it is hard to say, and my suggestion is just as probably correct as not. The Cornish ophites are metalliferous, as are also the Irish Cambro-Silurian ophites.—*G. H. K., Lurgy brach, Letterkenny, co. Donegal.*

FOSSIL OOLITIC MADREPORARIA.—A paper on this subject has been read before the Geological Society by Robert F. Tomes. The author called attention to the fact that there has been sometimes in the study of corals a confusion made between growth by fissiparity and by gemmation. If the former process result from the gradual conjunction of two opposite septa, so as to form a new divisional wall in the calyx, there is no risk of any such confusion; but if the separation has been by the formation of a constriction in the central part of an elongated calyx, this may be, and has been, confused with growth by gemmation. A large number of the forms here described were collected near Fairford, Gloucestershire. They occur in a white marly clay, occurring between the Forest Marble and the Cornbrash. A detailed section was given, and the particulars of some other coralliferous beds. These are not all upon the same horizon, though there is a considerable relation between their coral faunas. The author gave a description of twenty genera and thirty-four species. Of these the following genera are new to the British Oolites: Bathycœnia, a new group of the family Astræidæ (Eusmilinæ), containing two species; Favia, Astrocœnia, Enallohelia, and Tricycloseris are for the first time recorded as occurring in the British Oolites; and Confusastræa and Oroseris, recorded by the author from the Inferior Oolite, are now added to the coral-fauna of the Great Oolite. In the discussion which followed, the chairman expressed his sense of the value of the paper. He observed that most of these corals were compound, and some of them especially peculiar to reefs; although compound Madreporaria were found living as deep as 750 fathoms. They, therefore, did not seem to very much elucidate the question of the depth of the Mesozoic sea. Simple or solitary corals certainly did not throw more light upon the question, because they occurred from shallow water to very great depths, even to 3000 fathoms. Mr. Brown's collection, mentioned by the author, come not from two horizons, but all from one, at a spot about two miles W. of Cirencester, in a zone about 6–18 inches thick, near the top of the Great Oolite. Professor P. M. Duncan confirmed the statement of Professor Prestwich, about the horizons from which Mr. Brown's collection was made. These corals, described by Mr. Tomes, were from lenticular coral-beds, not from reefs. They could hardly be very deep-sea formations, from the oolite contained in them, which seemed at the present time to be a shore-formation. It was a mistake to suppose that live reef-building corals ever occurred below about 25 fathoms. It was to be regretted that a good writer such as the author did not come more frequently among his fellow-workers, for he would then have learnt that many of the statements made by him about calycular gemmation and fissiparity were already in print, and had been so from the days of Milne-Edwards. Fissiparity and gemmation were quite distinct things. Some corals keep the figure of 8 described by the author, some depart from it during subsequent growth. Unfortunately M. de Fromentel, referred to by the author, was not a student of recent corals. The cosmilian forms had been found exhibiting fissiparity; these had been actually renamed by Mr. Tomes, though the speaker had already assigned them to an existing genus. He felt doubts as to the validity of some of the genera proposed by Mr. Tomes. The coral could not be named Confusastræa without a section; it presented some characters allied to Favia. He called attention to the so-called Cyathophoræ, which had lost their septa and all their internal characters. Sections, he would observe, were absolutely necessary for the study of fossil corals.

"Proceedings of The Geologists' Association."—No. 7 (vol. vii.) of the above, besides very interesting accounts of excursions, contains papers "On a New Section in the Thames Valley," by J. L. Lobley, F.G.S., and "Notes on the Geology of Cumberland North of the Lake District," by T. V. Holmes, F.G.S.

Discovery of Remains of the Large Elk at Monmouth.—A short time ago the discovery was made at a part of the river Severn, known as Hayward's Bay, near Aure, and the find is now in the possession of Mr. Charles Philps, of Aure. It consists of a fine buck's head and antlers, the former being partially petrified, while the latter are of gigantic dimensions. There are seven spurs on each antler, one spur on the left being no less than 15½ inches in length. The length of the antlers, from the crown of the head to the tip, is 3 feet 7½ inches, while the bases of the antlers measure 7¾ inches, the width from tip to tip being 3 feet 1½ inches. The specimen, which is in remarkably good preservation, seems to point to the fact of the large elk, numerous remains of which were found in King Arthur's Cave, Doward, having been an inhabitant of Dean Forest. —*L. Francis*.

"Love-mouse."—A day or two ago my daughter was presented with a dormouse by a cottager, who called it a "love-mouse." Have you or any of your numerous readers heard this name before, and what can be the origin of it?—*W. Hambrough.*

NOTES AND QUERIES.

Spontaneous Generation.—Mr. Hamson asks me to give my reasons for the statement that "There is no such phenomenon as spontaneous generation," and then proceeds to ask several questions. How do I know there is no such phenomenon as spontaneous generation? Do I argue that because snails are not produced spontaneously, there is no such process at all; or do I hold that, because spontaneous generation has not yet been detected, no such process is possible, or, if possible, that it never will be discovered? I think that my words were sufficiently clear, and that 99 per cent. of those who read my little article would understand me to refer to our present knowledge, not to the possibilities of future discoveries in this branch of science. I still contend that, so far as our knowledge goes at present, we are justified in saying there is no such phenomenon. Some of the greatest investigators have carefully and laboriously experimented in relation to this subject, and so far the results have been purely negative in character. All our knowledge of the life-histories of animals and plants points to the fact that they are the offspring of individuals of the same type, and, proceeding on the sound scientific principle of explaining the unknown by the known, we are more than justified in saying that all animals and plants are produced in the same way. Until it is shown that certain species are produced spontaneously, I am justified in declaring there is no such phenomenon as spontaneous generation. With the future possibilities of development I had nothing to do. It is quite possible, perhaps probable, that in the future we may be able to raise our meat supplies spontaneously and thus do away with the necessity for imports from America; but at present we are correct in stating there is no such phenomenon, and in so saying we cast no slur upon the possibilities of the future. Mr. Hamson also objects to the statement that no living cell can be produced, save by the division of an already existing cell, which is really saying in different words there is no such thing as spontaneous generation. He refers to Sachs to show that the division of a cell need not of necessity occur in the production of a new one; but the cases he cites are not those of the production of new cells. In his first example it is only the cell-sac which is renewed, not the cell, which consists—according to Huxley—of sac and protoplasmic contents. The living portion remains unchanged, and we no more have a new cell than we have a new lobster when that crustacean casts its old covering and secretes a new one. Case number two is not an instance of the production of a new cell, but of the effacement of an old one; just as Trembley in forcing one hydra into another did not produce a new individual, but effaced an old one by incorporating it with another. In conclusion, I must thank Mr. Hamson for the compliment contained in his first sentence and for the kindly tone of his strictures.—*The Author of "Pond-Snails."*

French Books on Natural History.—Will some reader of Science-Gossip kindly send a short list of the more important French works on Natural History?—*W. J. V. Vandenbergh.*

Can Pigs Swim?—There is a very general notion about that a pig cannot swim; and that if piggy attempts the feat he "cuts his throat," and so comes to grief. Is this a well-established fact, or merely a popular delusion?—*W. H. J.*

EAGLES AND THEIR YOUNG.—Is there any foundation of scientific fact for the belief that eagles bear their young from their eyries upon their wings, in order to teach them to fly?—*J. H. Ingleby, Northallerton.*

WATER SNAILS.—With respect to the statement of the author of the paper on "Pond Snails" that appeared in these pages last year; in the first place I am greatly indebted for the extremely courteous reply, but I must deprecate the rapidity with which deductions are arrived at therein. I never meant to convey the impression that what I termed the "old belief," concerning the formation of the shell in mollusca, was altogether an "exploded statement." *Audi alteram partem* was the ground I took up, and a desire to give both views without bias inspired the intentionally cautious wording of the passage quoted from my paper, now two years old. Supposing, however, that I may have seen fit since that date to make up what I am pleased to call my mind on the subject, I fail to see the implied stigma attaching thereunto; for I hold that conservatism in science is quite out of place. With regard to the second point in question, I can only express my admiration of an author who can pin his faith on the somewhat dogmatic assertion of an eminent but by no means undisputed authority. Professor Ray-Lankester's statement that "the foot is essentially a greatly developed lower lip," occurs towards the commencement of his paper and before he begins to treat of the development of *Limnæa stagnalis* at all; nor does he again allude to the subject throughout his article, and he even passes over without comment Kiferstein's observation, which he quotes from a paper by that author in Braun's "Thierreich" (Bd. iii. p. 1230) and which reads as follows:— "Beneath the mouth the body now flattens itself out and forms a process . . . the foot." Yet on this solitary statement of Professor Ray-Lankester's our unknown author founds his observation that "it may be interesting to note, that what is known as the 'foot' of the snail is shown by this embryonic development be really an under lip." What I am anxious to obtain therefore is some proof of this statement, and up to the present I have searched unsuccessfully for it. Carpenter, Gegenbaur, and Balfour do not, so far as I can see, make mention of it in their Manuals; whilst Professor Huxley in his "Manual of the Anatomy of Invertebrated Animals" quotes Professor Lankester's paper frequently, but ignores his theory respecting the homology of the "foot," and when describing the development of Limnæa, distinctly states (p. 500) that "The foot commences as a papilla immediately behind the mouth," and again, referring to the class Gasteropoda, he says, "The mesosoma is generally prolonged into a muscular foot;"—no reference anywhere to this under lip theory, nor can I find any conchological friend to support it; but some, I believe, maintain that the foot in both Gasteropoda and Conchifera is a muscular extension of the mantle. Under these circumstances, when there is such want of agreement between professors, is it fair to us less well-informed students of Nature to put before us as facts, statements the correctness of which is not established? It is, I venture to think, a matter for regret that a large number of writers for the general public still seem to consider any admission of want of knowledge a crime, and hence are tempted to give forth to the world, as established truths, statements based on observations which subsequent research proves to have been erroneous. The next generation of writers flourish forth assertions of perhaps an exactly opposite and equally erroneous nature, and Science is dubbed by the unitiated as fickle, and scouted by many accordingly—and all through the zeal of well-meaning votaries. The day has surely come when dogmatism may be safely relegated to theologians, for with Science it should have no part. In making these remarks, be it understood I am not actuated in the smallest degree by any feeling of ill-will towards my unknown correspondent, who probably is better acquainted with the subject than I can ever hope to be; but I am merely protesting against what I conceive has hitherto been far too largely a fashion with popular writers.—*B. B. Woodward.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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. H. WELLINGTON.—What kind of "curiosities" is it you require to be named? We shall be glad to help you, either by referring to the proper books, or to name specimens you cannot easily find described.

J. SMITH (Kilwinning).—The spider you sent us is called *Tegenaria atrica.*

X. Y. Z. (Campden).—Bramble No. 1, *Rubus villicaulis.* No. 2, *Rubus rhamnifolius* (?). No. 3, a form of the true *Viola canina*, L.

J. S. (Bolton).—No. 1, *Funaria hygrometrica.* No. 2, *Tortula muralis*, L. Nos. 3 and 4, also Funaria, intermixed with Bryum.

J. E. A.—Thanks for your notes on "spiders," which shall appear at an early date. We shall be pleased to insert any further observations on the same subject.

G. R.—The subject of Reason in Animals was thoroughly discussed from both sides in SCIENCE-GOSSIP for 1879, and we could not afford space to reopen the discussion. Thanks for your able contribution.

E. F. L.—Several articles have appeared in our columns on "Collecting and Preparing Botanical Specimens," and on "How to make a Herbarium." The former is republished in "Notes on Collecting and Preserving Natural History Objects."

J. F. GEORGE.—Thanks for the specimen of earth.

L. FRANCIS.—The "markings" on the stone sent are the impressions of the bark of a fossil tree, called lepidodendron.

G. E. EAST.—The "Proceedings of the Geological Association" are sold by E. Stanford, Charing Cross, at 1*s*. 6*d*. each part. "The Quarterly Journal of the Geological Society" is sold at the Society's apartments, Burlington House, price 5*s*. The "Journal of Conchology" is published by Taylor Brothers, St. Ann Street, Leeds, price 1*s*.

"YOUNG BOTANIST."—Get Alcock's "Botanical Names for English Readers," published by Lovell Reeve & Co.

E. MALAN.—The sketch you sent us is undoubtedly that of the bee orchis.

E. J. E. CREESE.—We cannot tell the definite species of parasitic fungus by your rough sketch. It is evidently in fruit.

W. K. MANN.—You will find an index to the vol. for 1882 in the December number.

H. L. (Maidstone).—No 1 is *Lamium incisum*, Willd.; No. 2, pepperwort (*Lepidium campestre*, Br.); Nos. 3 and 4, the same species, though it is very variable, *Equisetum arvense*, L.; No. 5, hairy willow (*Salix lanata*, L.).

EXCHANGES.

WANTED, specimens of Lepidoptera, English or foreign, (must be suitable) for microscopic objects, named. Will give in exchange, mounted objects or material ready for mounting.—M. R. I., 51 Great Prescott Street, London, E.

FOR packet of zoophytes and marine algæ send stamped envelope to—J. Wooler, 11 Farm Road, Brighton.

The undermentioned unbound books, in good order, for cabinet for microscopic objects, to hold not less than 500:—SCIENCE-GOSSIP, from Jan. 1865 to Dec. 1878, Sept. 1876 missing; "Intellectual Observer" and "Student and Int. Ob.," Aug. 1864 to Jan. 1871, five or six coloured plates missing; "Popular Science Review," Jan. 1870 to April 1878; "Leisure Hour," Jan. 1880 to Dec. 1882. Or what offers?—E. H. Robertson, Swalcliffe, Banbury, Oxon.

WANTED, Rye's "British Beetles," in good condition; will give in exchange, J. G. Wood's "Common Objects of the Microscope," and Harper's "Glimpses of Ocean Life," coloured plates, new; or any suitable exchange. Also, J. G. Wood's "British Beetles," coloured plates; will give Coleman's British Butterflies," coloured plates. Wanted, Wood's "Insects at Home" and "Insects Abroad;" suitable exchange.—John McKay, 30 Hope Street, Glasgow, N.B.

SCIENCE-GOSSIP for 1878. Desiderata: British birds' eggs (side-blown, one hole), and Lepidoptera, numerous.—F. J. Rasell, 30 Argyle Street, St. James' End, Northampton.

WANTED, "Popular History of British Lichens," by W. Lauder Lindsay, M.D.—Arthur J. Doherty, 25 Barton Street, Moss Side, Manchester.

WANTED, "Notes on Collecting and Preserving Natural History Objects," by J. E. Taylor; will exchange Lankester's "Half Hours with the Microscope." Also wanted, "The Postal Microscopical Journal" for last year. — L. Francis, 20 Frogmore Street, Abergavenny.

FOSSILS.—A series of splendid specimens of Upper Silurian, including many Trilobites, Encrinites, &c., given in exchange for a good cabinet. State dimensions to F., 106 Finch Road, Handsworth, Birmingham.

WANTED, specimens of the Pre-Cambrian rocks of Lake district, and other localities, suitable for comparison with Charnwood Forest. Exchange. H. E. Quilter, 49 Earl Howe Street, Leicester.

DUPLICATES: Atalanta, Antiopa, Rhamni, Aegon, Ocellatus, Opiformis, Sambucata, Repandata, Pusaria, Elulata, Lithoxylea, Psi, Viminalis, Meticulosa, Chrysites, Libatrix, Marginata, Salicis. Desiderata: Paphia, Agliai, Adippe, Selene, Artemis, Athalia, Z. Minos, Trifolii, Meliloti, Lonoceræ, Tristata, Curtula, Reclusa, Trepida, Falcula, Humuli, Villica.—J. Bates, 10, Orchard Terrace, Wellingborough.

WANTED Davis's "Practical Microscopy," Cooke's "Ponds and Ditches," and Microscopic Fungi," or other Natural History books. Good value in choice micro slides. List sent on application.—E. Hurry, Chard, Somerset.

GOOD trolling or bottom-fishing rod, hardly used, to exchange for micro apparatus or books.—E. Hurry, Chard, Somerset.

WHAT offers for microphotographs, all French subjects, from the art galleries, mounted on polished glass slips? List free. R. Blakeborough, 50 Church Street, Guisborough.

WANTED correspondents in all parts of the world to exchange living specimens of reptiles and amphibia.—E. Ehnhart, 14 Gumpendorferstrasse, Vienna, Austria.

WANTED a good double or triple nosepiece, also a first-class condenser. Exchange well-mounted slides; sample slides sent if required.—George Ward, Wallwood Nursery, Leytonstone, E.

LIBERAL exchange in first-class objects, for polyzoa, *Anguinaria spatula*. Communicate before sending to E. Wheeler, 48 Tollington Road, Holloway, London, N.

WANTED side-blown eggs English or foreign, in exchange for griffin vulture, white stork, golden-eye duck, kite, capercailzie, buzzard, great bustard, and many others; also some foreign duplicate nests and eggs to exchange. Model of the great ant's egg wanted in exchange for eggs.—G. Widdas, Woodsley View, Leeds.

FOR unmounted hairs of orang-outan, chimpanzee, platypus, echidna, &c., send a stamped directed envelope to—George E. Mason, 6 Park Lane, Piccadilly, London.

BOOKS on Botany and Natural History in exchange for others on mosses, beetles and shells.—W. Macmillan, Castle Cary, Somerset.

ONE dozen well-mounted slides of starches, all different, and true to name, in exchange, together or separately, for other slides of interest.—D. Burford, Bowbridge, Stroud, Glos.

Helix sericea, Val. cristata, Suc. putris, Cyclos. elegans, Pupa secale, Plan. carinatus, and about forty other species in exchange for British or foreign shells. Lists sent. Unaccepted offers not answered.—F. Wotton, Adamsdown, Cardiff.

WANTED a copy of Hobkirk's "British Mosses."—A. E. Lomax, 56 Vauxhall Road, Liverpool.

TRANSVERSE section of hedgehog spine, mounted opaque, in exchange for another slide.—John Moore, 12 Parchester Street, near Clifford Street, Birmingham.

MARINE ALGÆ, wanted Odonthalia, Rhodomela, Bostrychia, Bonnemaisonia, Sphærococcus, Nemalion, &c., for *Delesseria Hypoglossum, Baccaria Whiggii, Polysiphona byssoides, Arthroclada villosa, Sporochnos pedunculatus, Lomentaria ovalis.*—J. Wooller, 11 Farm Road, Brighton.

CAREFULLY named Silurian and other fossils to exchange for others, especially chalk, greensand, oolitic and crag, also Devonian, carboniferous, &c. specimens; also an excellent ten guinea galvanic battery by Halse, to exchange for a good geological cabinet or well-mounted microscopic objects.—T. T. Gwom, Belmont, Wellington, Salop.

WANTED to exchange a number of second-hand books, several on chemistry. What offers?—J. H. M., 17 Walham Grove, Fulham, S.W.

OFFERED with an American unionidæ and British land and freshwater shells for a good *Mitra regina* or *Murex clavus.*—F. M. Hele, Elmgrove Road, Fairlight, Cotham, Bristol.

WOOD'S "Naturalists' Handbook," new, cardboard cells for opaque objects, and good slides. Want in exchange Natural Science books, good micro material and accessories.—J. C. Blackshaw, 57 Cross Street South, Wolverhampton.

A 4-DRAW telescope with 5 lenses, cost 17*s.* 6*d.*; will exchange for fossils.—F. B. Mason, St. Gregory's, Stratford.

DIATOMACEOUS earth rich in coxmodiscus, &c., from Calvert County, U.S.A., for a little Bermuda earth or polycistinæ.—F. J. George, Chorley, Lancaster.

WANTED foreign polyzoas. I shall be glad to correspond with any one who will be able to send me foreign polyzoas. I will give in exchange first-class slides or material. Spicules and micro-fungi sent in exchange for unprepared material only. See SCIENCE-GOSSIP for February.—J. Tempère, Storrington, Sussex.

EGGS of osprey, killdeer, spotted sandpiper, black-billed cuckoo, Colin, &c., in full sets, with data to exchange for other eggs. Offers requested.—W. Wells, Bladen Stone, Staffordshire.

WANTED, coins, medals, tokens, foreign stamps and post-cards. I offer in exchange good fossils from almost all formations, or seaweeds and other natural objects.—F. Stanley, 6 Clifton Gardens, Margate.

WANTED the three guinea edition of Sowerby's "British Botany," with coloured plates (last edition).—Edwin E. Turner, Post Office, Coggeshall, Essex.

ONE thousand foreign stamps for exchange, either in large or small numbers, for micro slides only, diatoms or insects preferred; accepted offers answered only. Particulars to F. E. H., 1 Harcourt Road, Wallington, Surrey.

WANTED, extremely rare foreign postage stamps and English silver coins, in exchange for butterflies, moths, beetles, birds' eggs and skins, and foreign shells.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

A MAHOGANY cabinet, 20 in. × 16 in. × 16 in. with 8 drawers, each 1½ in. deep, fitted with trays to hold over 1000 microscopic slides, or without trays suitable for egg or cabinet. Wanted good microscopic slides, scientific books, or useful article.—R. L. Hawkins, Ivystead, Hastings.

WANTED, *Helix nemoralis, hortensis* and *hybrida* from different localities, also any information about their distribution, or pamphlets about them. I will try to make a return.—Hugh Richardson, Ackworth School, near Pontefract.

BOOKS, ETC., RECEIVED.

"Snakes." By C. G. Hopley. London: Griffith & Farran.
"Flora of Hampshire." By F. Townsend. London: Lovell Reeve & Co.
"Studies in Microscopical Science," edited by A. G. Cole.
"Journal of the Royal Microscopical Society," Feb., 1883.
"Transactions of Yorkshire Naturalists' Union," Part. 4.
"Land and Water."
"Northern Microscopist."
"Midland Naturalist."
"Practical Naturalist."
"The Field Naturalist."
"The Young Naturalist."
"Natural History Notes."
"American Naturalist."
"Canadian Naturalist."
"American Monthly Microscopical Journal."
"Boston Journal of Chemistry."
"Good Health."
"The Botanical Gazette."
"La Feuille des Jeunes Naturalistes."
"Le Monde de la Science."
"Ciel et Terre."
"Cosmos: les Mondes."
"Bulletin de la Société Belge de Microscopie."
&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—T. T.—F. W. P.—J. B.—F. J. R.—J. S.—A. J. D.—W. G.—A. G. C.—F. H. P.—C. F. G.—B. P.—A. H. B.—L. F.—E. J. E. C.—G. A. B. D.—A. W. O.—A. S.—J. T.—H. L.—M. E. P.—W. D.—J. C. B.—T. T. G.—J. W.—J. M.—A. E. L.—F. M. H.—F. W. W.—J. H. M.—D. B.—W. M.—G. H. R.—G. E. M.—G. W.—H. M. D.—E. W.—G. W.—C. E.—F. E. H.—G. E. E.—E. E. T.—L. F.—F. S.—R. B.—F. B. M.—J. H.—A. O.—S. A. B.—F. J. G.—W. W. B.—E. I.—E. H. W.—E. H.—W. D. R.—P. M. C. K.—A. J. H.—W. K. M.—G. S. B.—D. B. G.—S. S.—G. S. S.—H. R.—R. H.—E. F. L.—H. E. Q.—F. T.—W. F.—O. P. C.—E. H.—J. E. A.—W. E. W.—R. G. M.—J. W.—W. J. R.—J. B.—G. R., jun.—S. A.—Dr. P. Q. K.—W. H.—J. S.—J. M. Sh.—E. H. R.—E. H.—B. T.—M. R. I.—H. E. W.—G. F. H.—G. B.—R. H. W.—F. R. M. S.—H. L., &c.

MIND AMONG THE LOWER ANIMALS.

By Dr. P. QUIN KEEGAN.

In reference to some notes that have recently appeared in SCIENCE-GOSSIP relative to reason and instinct, perhaps it may be proper to endeavour to sketch and elucidate as clearly as possible the actual constitution or condition of some of the higher types of mind among the lower animals. That many of these creatures possess exceedingly powerful and efficient senses, such as sight, hearing and smell, and, in a less degree, taste and general touch or sensibility, there can be no doubt. And there are strong grounds to conclude, that their more highly-endowed senses not only enable them to detect sensible qualities and effects of sight, sound, and smell, of which we are wholly ignorant, but also furnish them with a richer stock of what have been styled acquired perceptions. But these vigorous faculties convey a knowledge of objects in the concrete only. When, for instance, a dog smells or sees a piece of meat or other food, he does not recognise it as a piece of meat, &c. He does not know it by that or by any other name, he could not describe it as such: his mind does not expand to or embrace the general notion of "meat." He simply views it as this particular piece of edible matter, having a certain shape, colour, and smell, which his organism recognises as proceeding from something fitted for diet; and most probably every new piece of meat that is presented to his nostrils has to undergo the same process of sniffing, &c., before it is swallowed. There is no necessary connection, through memory or relation, between different particles of food offered to him at different times.

Moreover, the lower animals are endowed with the faculties of memory, reproduction and imagination (i.e. the imaging power of memory); but these powers are exercised only upon concrete objects of thought. The power of association of ideas is extremely vigorously developed among such creatures as the dog and cat; but the associated ideas generally come up according to the law of contiguity, seldom or probably never according to the law of correlation. A dog in his dreams, for instance, recognises by his barking and growling some memorial of a strictly concrete object previously known and experienced. Man, on the other hand, can remember or reproduce general notions or concepts, as well as concrete notions, i.e. we can consider and reflect upon the general notion of flower, bird, &c., as well as consider or reflect upon any particular flower or bird. Brutes have little or no self-consciousness, and their conscious life is, for the foregoing reasons, concerned chiefly with the concrete. The conscious life of man, on the other hand, is more frequently exercised upon general notions. This is a very important and fundamental difference; and it results therefrom, that the lower animals understand proper names only, and not common names. A dog can easily be taught to know the name of his master or his own name; but you might thunder the word fish a thousand times into a cat's ear and she would certainly hear what you said, but she would not understand what you meant. "Dogs," says Bowen, "can even be taught to know the names of particular places and buildings, so that they can understand and obey when they are told to go to the barn, the river, or the house. But it is always the particular barn, or other object, with which they have been taught to associate this sound or significant gesture as its proper name. Carry the animal to a distant place, near which may be a set of corresponding objects, and then tell him to go to the barn or the river, and he will not understand the command as applying to the new set of objects, but will immediately set off for the old building or place, with whose proper name alone he is familiar." As the German metaphysician has it, "a dog knows his master, but does not recognise him through his peculiar marks or attributes, and thereby does not properly discriminate him from other persons." That brutes possess the faculty of voluntary reminiscence is very doubtful. Hence the power of reflection is denied to them, and hence also any elevated form of conscious sagacity is with them impossible. From birds upwards, there appears a subtle power, which may be termed the symbolic faculty. It constitutes a most important and indispensable factor in the operations of the mind of the lower animals. It implies a knowledge, not merely of the concrete object itself as observed by the senses, but also that this object is representative or suggestive of something else. The master putting on his hat and grasping his cane, &c., suggests to the dog the idea of some particular delightful walk previously experienced, and he manifests by barking and frisking, the anticipation of enjoying such pleasure over again. This power operates through the association of ideas, and is strictly confined to the concrete, and does not embrace the wondrous symbolic power of human language and gesture, which is absolutely unique.

There is no doubt that brutes can compare one individual object or event with another, and thereby ascertain some relation between them, as that of similarity or difference, or quantity, &c. But this sort of acquisition, although it enlarges knowledge, has been regarded as a fact of observation merely, not of reasoning, properly speaking. The latter does not strictly enlarge our knowledge, it merely developes or unfolds or explicates it. Thus, for example, we acquire the knowledge that the elk is ruminant by reflecting upon the previously known proposition that all horned animals are ruminant. The lower animals cannot by an act of reasoning draw forth and prove their knowledge, or make it available for use in further inquiry. But they are sufficiently versed in that sort of knowledge which is concrete and particular, and not summed up into general truths. Some speculators maintain that "the animal intelligence can elaborate that class of abstract ideas that may be developed by simple feelings such as hunger." This kind of abstract notion is, however, strictly personal, so to speak; it does not embrace objects external to the animal itself. It is perhaps less frequently formed, even by man, than most other abstractions, it is of little service in advancing science or knowledge, and it is so constantly referable to particular instances, that it is almost hopeless to endeavour to demonstrate the reality of an abstraction at all. It is unquestionable, however, that there exists among brutes a faculty of special association, but it operates exclusively amongst concrete or particular notions, and it is probably due mainly to the special strength, comprehensiveness, and keenness of the faculties of observation of these animals. Hence they can learn to play dominoes, but not to play draughts, and many of them can recognise the time upon a watch, &c., yet cannot perform the simplest feat in mental arithmetic. Any problem that requires for its solution that several reminiscences must be conjured up at will is utterly beyond the scope and resources of the lower animal mind.

Such, it may be assumed, is the actual constitution of the higher forms of intellect among the lower animals. Now, in what manner does this intellect-power operate in the guidance of action? This is a question of exceeding interest, of extreme subtlety, and of no small difficulty. Let us, however, endeavour to carry the torch of explanation into the thick shades of doubt wherewith the theme is encompassed. The actual cause of any bodily action not merely spontaneous is, as we all know, some form of feeling or emotion; but in the actual performance or carrying out of this action, a faculty that has been termed "reason" officiates as a guide or pilot. The steam-power impels the ship, but the man at the helm directs its course. Now, rejecting for the time all consideration of instinct, which is invariably unconscious and mechanical, it may be admitted that animals possess "a power of gathering up the past experience into rules of conduct that guide them in their solitary or gregarious life." This power clearly results from the association of concrete ideas according to the law of contiguity. It is possible, however, that much of this experience is organic, i.e., the organism has the power of registering the results of previous impressions. Thus, in the working out of a design, birds "often learn to use special means when special ends have to be provided for." In these instances, it may occur that the innate power of the instinctive faculty may be able to spontaneously expand itself so as to meet existing circumstances; and it may be fairly doubted if such intelligential modifications of the instinctive tendency are due to conscious reason on the part of the animal. The unconscious instinct of nest-building exhibited by birds must necessarily be adapted, or must spontaneously adapt itself, to existing circumstances. The same unconscious faculty that induces a sand-marten to tunnel into a sand-bank, can also induce a jackdaw to build an extra support to a nest that had several times slid down a sloping window sill. It is barely necessary to observe, that the principal and more obvious actions of an animal, such as eating, sleeping, frisking, or wandering listlessly about, require for their guidance little or no power of intellect, as such. This latter faculty is more clearly exhibited in its function of pilot in these special actions, such as those of the dog, which so frequently challenge our admiration, and which are so commonly and ignorantly ascribed to instinct. These specially wondrous and remarkable actions are guided either by special association of concrete notions artificially produced by the training of man, or they result from imitation, which may be regarded as a sort of spontaneous training. Those domestic and other animals, such as the dog, horse, and elephant, that constantly associate with man, necessarily possess manifold advantages as regards this latter species of pilotage. Mankind in their actions and conduct may be guided by general notions; but there is no proof whatever that the lower animals can be influenced likewise. A man, for instance, may go to consult an unknown doctor, being guided to him by the general notion of a "good doctor;" but no dog or monkey was ever seen to go to an unknown baker's shop with the general notion of a "baker's shop" to pilot his steps. A man entering a strange town sees rolls in a certain window, and immediately concluding, by reasoning or perhaps by association, that there lies a baker's shop, he goes in and makes a purchase. But no dog or other animal is capable of such conduct: no dog ever proceeded to a strange baker's shop with a penny in his mouth in order to purchase rolls, unless he had been specially trained to perform the feat in regard to a certain baker's shop in particular, or unless his "bump of imitation" was particularly well developed. No doubt a dog, wandering in a part of the country where he has never been before, may on seeing a well forthwith drink if he be thirsty; but he does not recognize the spot as a well, or the water as water. He lowers his mouth and his senses tell him that there is water before him—and that's all. Every fresh perception of any particle of water is as it were a new perception to the animal, although the memory of former similar perceptions may or may not be added thereto. If the dog had to ask for the water otherwise than by simple "begging," or by making the usual canine signs, i.e., if he was compelled to explain by language or by common names what it was that he required, his powers would utterly fail him here, and he would assuredly forfeit his drink. The mind of the lower animals cannot possibly grasp the abstract or the general notion; it cannot by an act of will and by creative imagination call up and reflect upon different plans or methods of performing a certain contemplated action; and it cannot judge beforehand that certain means are fitted to accomplish certain ends, or are the most efficient enginery for the execution of those ends. Where an action depends in any degree upon mediate reasoning, or upon ingenuity (which is a sort of original practical reasoning), brutes are paralysed; they cannot budge if a general notion of any kind stands in the way. In all those instances where animals have been observed to use as means towards an end materials not forming part of their own organisation, the action is due to (1) a blind instinctive impulse innate, as it were, in the nervous structure of the creature; or (2) the power of association of ideas in its various forms of imitation.

Man can and frequently does deliberately and systematically act from principle, i.e., from a general notion of honesty, propriety, prudence, truth, righteousness, &c., applied to each particular instance that turns up; but brutes, having no general ideas or principles, and little or no command over their passions, are necessarily the creatures of impulse. This impulse is guided by the association of ideas, and being principally if not wholly an organic spring of action, is fresh or becomes wearied according to the particular organic condition of the animal; and thus perhaps may be explained the apparent regularity, sanity, and timely cessation of the actions thereof.

Having expatiated upon the positive functions and resources of the mind of the lower animals, let us now exhibit a catalogue of powers, feats, &c., which it does not display and cannot accomplish, and which the human mind does reveal and is able to execute. The lower animals do not possess the faculties of (1) self-consciousness, (2) constructive or creative imagination, (3) voluntary reminiscence or attention, (4) the intellectual use of language as a symbol of abstract thought, (5) certain mere elevation kinds of emotion, (6) freedom of the will. In consequence of their mental penury in the powers and functions now specified, the lower animals are unable and unfitted to accomplish the following important processes of thought, &c., viz., reflection, abstraction and generalization, and the use of language strictly so termed, induction and deduction, the construction of artistic conceptions, &c., virtue and religion. Moreover, the most important at least of the higher forms of the whole tribe of what are styled intuitions or primary truths are never formed by, and are utterly unknown to, these creatures. They possess no artistic sense, they have no refinements of human civilisation, they can cherish no ideals of the beautiful, picturesque, or sublime. They cannot exhibit religion or virtue or feel the weight of responsibility, i.e., they have no sense of good as good and of binding obligation, nor have they a sense of evil as evil, and as deserving of disapproval. In fine, brutes cannot by voluntary contemplation or otherwise modify in any way the relative force of different motives or appetencies. They cannot elaborate ideas of God, of infinity, of the beautiful, the lovely or unlovely, space, moral good, &c.

CAN PIGS SWIM?—The idea mentioned by W. H. J., at p. 70, is one of those absurd popular errors that have a knack of reappearing time after time, though constantly refuted. I have seen a pig swim, and I have known many instances at Warrenpoint where "piggy" took a header rather than be shipped for England. And so far from cutting his throat "the gentleman that used to pay the rent" performed the feat with an ease and speed that an Irish water spaniel might envy.—*H. W. Lett, M.A.*

THE COMMON ORCHIS (*ORCHIS MASCULA*).

Its Inflorescence.

By Edward Malan, M.A.

(*Continued from page* 57.)

NOW look at the next illustration of a single flower (fig. 52). It is a miracle of design: complicated certainly, but soon explained. The outer floral envelope is composed of three pieces, the same colour as the petals, and constitutes the *calyx* (A, A, A,) which arrangement is called ternary. The inner floral envelope, also of three pieces, is the *corolla*, the lower one being the *labellum* (B, B, B). This labellum is produced into the *nectary* (C), which passes on one side of the twisted *ovary* (D). From the base of the ovary a *bract* (E), forming a careful protection for the bud, arises. Inside this bract the bud reposes before it opens, with the nectary laid flat against the stalk, so that when the flower first appears it is topsy-turvy. The whole spike is enclosed in a *spathe*, which keeps it safe from frost and rain. The apparatus for perfecting a vast supply of seed is the next thing to notice. In the gape of the flower (*rictus*), and immediately between the helmet and labellum, the conformation of the flower presents the appearance of a throat. Protruding into the throat from above, a fleshy process is seen, called the *rostellum* (G), strangely resembling the human uvula. This contains the *pollinia*, two in number, or large waxy club-shaped masses of pollen, not yellow and powdery as in the buttercup and other common flowers, but free and bottle-green, connected by means of tiny elastic threads, and supported by a long filament, with a minute viscid disc at the end. These are the *anthers*, fitting into the anther-cells, from which as the anther-cells are merely folded longitudinally, they can easily be removed (A). The stamens and style are consolidated into one *column*, and the *stigma* is below and behind the rostellum. An enlarged illustration will make this most intricate plan clearer.

Now how is all this costly apparatus employed, and how is the flower of the common orchis fertilised? for self-fertilisation is out of the question. In 1840 the secret was not known, but it was supposed by Dr. Lindley and others, that the pollen-grains passed down into the ovules by means of the tissues, and it was not until 1862, that the late Charles Darwin, after years of laborious study, arrived at the truth. His description of the performance, which he says will not be endured by the general reader, leads to absorbing admiration of plant and man. He says ("Fertilization of Orchids," 2nd ed. p. 11) supposing a bee alights on the labellum, which forms a convenient landing-place, and thrusts its head into the little yawning throat of the flower, so as to reach the honey (propolis?) in the papillæ at the base of the nectary: it is scarcely possible, owing to the shape of the flower and its nicely-adjusted balance, not to touch the rostellum. Directly the rostellum is touched, a viscid drop exudes which sets hard and fast like cement, and when the bee withdraws its head, a pollinium is firmly attached. Then another flower is visited, and behold! instead of the pollinium remaining erect, in thirty seconds the viscid disc has dried, causing thereby the pollinium to sweep through an arc of nearly 90° in the direction of the apex of the proboscis, so that it exactly touches the stigma. For a fuller account, the reader is recommended Darwin's book.

In hopes of witnessing this exceedingly curious operation, I placed, on April 23rd, 1881, some bluebells, cowslips, and orchises out on the lawn, where crowds of bees were busy in beds of Egyptian cress, and pencil and paper were provided to check off arrivals. The result is too long to give here, but hardly had I settled down, when visitors began to arrive, and during an hour and a half, no less than twenty-eight bees, bumble and hive, approached the plants. Sir John Lubbock would be gratified to know that the bluebells only were visited. I investigated the pollen of the bluebell, cress, and cowslip, under the microscope, and found that of the cress and bluebell nearly homogeneous, and I was struck by the wisdom of giving bees long-focussed eyesight, which gains a variety of colouring for flowers, and

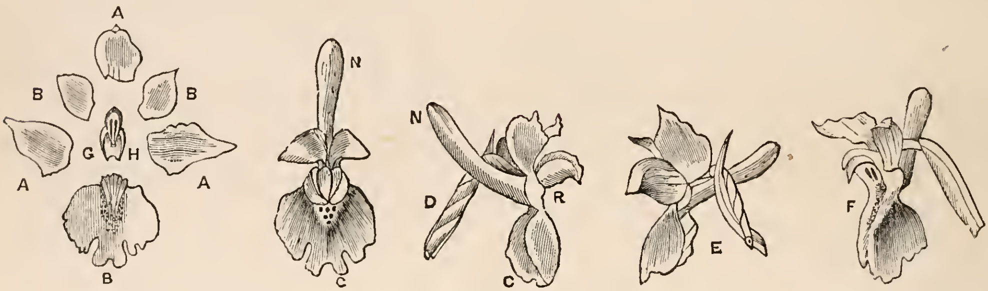

Fig 52.—A A A, sepals, same colour as petals; B B B, petals, light pink, with rostellum and anthers at G and H; C, labellum, with nectary at N; D, ovary, with nectary at N, labellum at C, and rictus at R; E, bract; F, fauces, with anthers showing.

the simple contrivance of making them confine their foraging operations on each journey to similar plants, which of course assists fertilisation. It is as simple as hunting for a book in a well-arranged library. On May 5th, 1881, the actual process was witnessed, for the first time, with extreme satisfaction; and also again in April last year.

It is quite impossible to discuss the probable end of the orchis in creation without glancing at the question of fertilisation. At first it seems very simple, if necessary, but as one proceeds, and the question breaks away, it becomes not only necessary but highly complicated. Few flowers are able to fertilise themselves, and without fertilisation no seed is set; this is a law which cannot be broken, and it is curious to watch the shifts and penalties flowers are put to, in order to prevent self-fertilisation; for although the stamens may be close to the pistil, as in the buttercup, there is generally some hindrance which renders it impossible. The banns are prohibited as rigidly as in the Prayer Book, and thus the brilliant hues, streaks and channels, as everybody now knows, are accounted for. The small globules of pollen must shed their subtle influence on the pistil, so that the vivifying fluid may pass to the ovules. The inanimate agency of the wind is employed for those trees which flower before insects are about, but the most effective plan is to utilise the services of insects and especially bees, and so largely is this done, that one is lost in amazement at the wonderful facility in developing an idea, because by this means there is such a clear gain in good, expansion and variety, and high design. And when it is ascertained that this is in necessary subordination to the facts of creation, then a whole panorama of Divine resource, power, wisdom, and forethought sweeps before us. It is then that Mary Howitt's lines reveal their true meaning. In connection with fertilisation, the colour of flowers comes in. It seems that flowers were created before bees, but that bees have highly modified flowers. If Mr. Grant Allen's theory about yellow preceding white, white red, and red blue in floral colouring, can be trusted, then the colour of the common orchis shows the class of insects for which it is intended. But why isn't it blue? Wait a minute. Perhaps, instead of being a useless flower, it may be found to serve a double purpose.

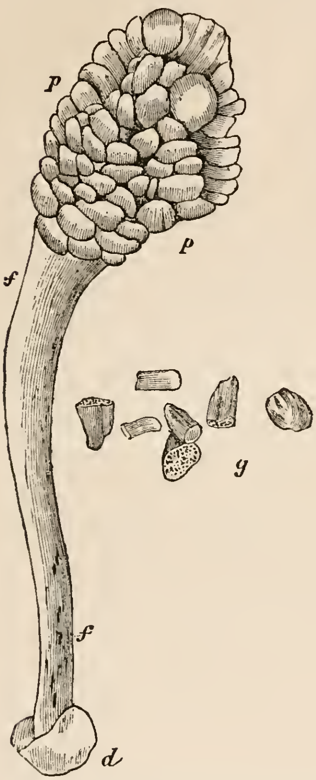

Fig. 53.—Pollinium, showing pollen-mass (*p*), filament (*f*), viscid disc (*d*), and pollen-grains detached (*g*). Magnified with ¼ in. power.

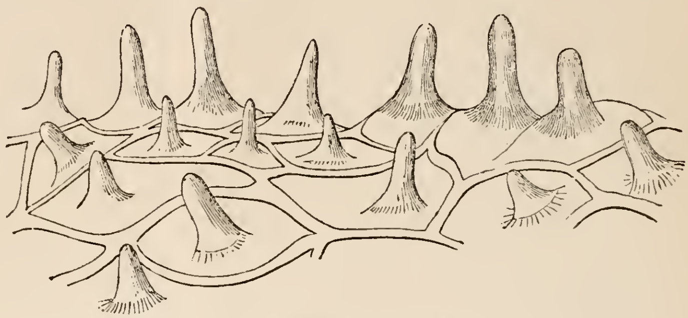

Fig. 54.—Papillæ, from inner surface of nectary. Magnified with ½ in. power.

To attract bees, flowers supply various condiments, of which pollen for bee-bread is the most abundant, and this is found chiefly in spring flowers, but the orchis supplies none. Next in importance is honey, which summer flowers produce; but the orchis supplies none, or at any rate so little, that Sprengel called the order *Scheinsaft-Blumen*, sham honey flowers. Lastly propolis is required, a sticky resinous fluid for fixing the combs and caulking the seams of hives; and this I believe the orchis provides. Now, at last, the object of the plant is discovered, and notice how this fits in with the whole economy of the plant. Bumble-bees, for whose especial benefit the orchis seems to exist, want less propolis than hive-bees, as they are not so abundant, and therefore the plant that supplies them need not be too common. Clover cannot thrive without bumble-bees, nor bumble-bees without cats. Can the common orchis thrive without spots? The various methods to check abundance and yet ensure supply have been noticed, and now the intricate machinery of fertilisation is better explained, for the plant is altogether too large for hive-bees. If this is so, clearly it is only fair to make bumble-bees fertilise the flower, and therefore it ought to be blue; but as if nature considered the supplying of bumble-bees alone not sufficient, the flower is red with spots on the labellum to feed flies. Anyone who has cultivated the orchis must have noticed the flies at work using their stopper-like proboscides, yet doing no good. Spiders soon find out how attractive the orchis is to flies. For it is a wonderful thing that the labellum, fauces, and nectary are all covered with minute papillæ, and the nectary on the lower surface only, which is splendidly adapted to flies. The flattened and wider end of the nectary enables the bee to sweep his proboscis to and fro, and thus the papillæ can be mown down, a motion well suited to rupture the rostellum. The white variety must be, according to Grant Allen, not so highly developed as the red, a fact which is borne out by the retrogradation noticed above. The flowers have a peculiar foxy odour in the red, whereas the white ones are scentless.

The *seed*, which is produced in countless abundance, but does not germinate in one season, and only under most favourable conditions, is contained in capsules opening in three valves. The capsules are the same as the ovary, the inner surface of which (*placenta*) has three separate ovule-masses attached at the sides, *parietal*. Every single seed is enclosed in a fine muslin case of fantastic shape, sometimes resembling a lady's scent-bottle, a horse-pistol, a stocking, a soda-water bottle, &c. Out of 50,000 seeds, perhaps one succeeds in bringing a plant to perfection.

The matter for consideration suggested by this paper is various, and I am not aware that it has appeared before. Whether correct or not, I shall be most interested in learning. At any rate, an attempt has been made to locate the common orchis' sphere of usefulness in nature.

FLUID CAVITIES IN METEORITES.

YOUR correspondent T. advises H. M. to submit his meteoric sections to a "competent judge" of meteorites, in order to settle the question of their genuineness. Will he be good enough to furnish me with the names of a few of these competent judges? I am not aware of the existence of a single individual who may in any sense be termed an authority on meteorites.

The study of meteorites is not only in its infancy, but it cannot even as yet be called an organised science, for it presents no clear and defined rules on which we could base an inquiry, and I may safely add that there is little probability that the immediate future will augment our information. The sum total of our knowledge of meteorites amounts at best to a mere record of the discovery and analysis (the latter not always exhaustive) of a very limited number of fragments or blocks of material, which have been either witnessed in the act of falling upon the surface of our planet, or which, by comparison with such authenticated specimens, are presumed to be of extra-terrestrial origin.

But the investigation of all the meteorites and supposed meteorites in our museums and private collections has not yet enabled the leading scientists to lay down a single hard and fast rule for testing a specimen, or to furnish a satisfactory answer to the question: "What are the essential and characteristic features of a meteorite?" It was at one time supposed that the presence of metallic iron constituted a convincing proof of the meteoric origin of a specimen, but that belief has received its deathblow since Professor Nordenskjöld has discovered huge iron masses in Greenland, whose origin has been clearly demonstrated to be terrestrial, masses in which the metallic iron is even alloyed with those two other metals, nickel and cobalt, which form so characteristic a feature in the iron of meteorites, giving rise to the so-called Widtmanstetten-figures, which appear on treating a polished surface with acids. Metallic iron has also been discovered in microscopical quantities in various basalts and other basic lavas, and Professor Judd, in his interesting work on volcanoes, states that masses, bearing the most striking resemblance to meteorites, and being composed of substances identical with those which constitute the latter, are sometimes ejected from volcanic vents in the shape of so-called volcanic bombs. These discoveries have practically extinguished the validity of the old convenient method of testing meteorites, and the foremost inquirers have become very careful and guarded in their language. The fallacy of all previous reasoning is obvious. If we consider the countless myriads of meteorites which are known to traverse space (the swarms of shooting-stars and even comets have been identified with streams of minute planetary bodies, moving in regular orbits through the solar system), these countless myriads which most probably present a vaster diversity of mineral combination in the aggregate than exists on this globe; and if, on the other hand, we consider the isolated few which have happened to fall on the earth—it appears an absurdity if, from the accidental composition of the latter, we were to determine what is possible and what is not possible in a meteorite.

So much for the value of the assertion that the meteorite of Braunfels cannot be a meteorite, because it differs in appearance from most known meteorites.

I repeat that the investigation, especially the microscopic investigation, of meteorites is quite in its infancy yet, and I doubt whether (with the exception of Dr. Sorby, perhaps) there is a single individual in this country capable of pronouncing an opinion on this complicated subject.

Sections of the meteorite of Braunfels have been submitted to Dr. Sorby months ago, and the "paper" referred to by your other correspondent, F.R.M.S., was virtually based on one or two quotations from the opinions of that gentleman. Dr. Sorby has simply stated that, as far as he had yet been able to examine one of the sections of this material, he felt inclined to doubt its meteoric character; and as his sole reason for this, he somewhat vaguely remarks, that it did not "look" like any of the meteorites he had examined, and added, that not a single one of the many supposed meteorites which had from time to time been sent to him had turned out to be a real meteorite. I must confess I cannot quite agree with Dr. Sorby, high authority though he is. Apart from the circumstances connected with the discovery of the meteoric mass (I must continue to call it so, for in my own mind I am quite convinced of its meteoric origin), which have been accurately described in the beginning of my paper, there are many other evidences which unmistakably tend to establish its meteoric character. In the meteorite you have a complete network of metallic iron, at least iron in a very low degree of oxidation, and I am not aware of any other mineral substance capable of receiving and retaining such an absolute metallic lustre or polish. The most important evidence is afforded by the crust surrounding the hand-specimens of this meteorite, this crust having a general test-feature in meteorites.

It would vastly swell this paper were I to mention every circumstance tending to prove that the meteorite of Braunfels is really a meteorite, and I must therefore content myself by referring your readers to the additional information which I have recently furnished in a letter to the Secretary of the Quekett Club, and which will probably appear in one of the earliest journals of the latter.

The specimens of "Quartzite" referred to by F.R.M.S. as having been exhibited along with the "so-called" meteorite, bore not the slightest resemblance to the Braunfels material, and, except for the presence of fluid-cavities (which constitute no argument whatever) it is difficult to understand the kind of analogy they were intended to furnish.

It seems to be an universal custom to decry anything novel, which may threaten to upset old-fashioned notions and certain fixed ideas, and in this instance the "authorities" have it much their own way, because the knowledge of the subject is limited to very few only. About two years ago, when Dr. Hahn made known his discovery of organic remains in certain meteorites found in Hungary, he was fiercely attacked by the "critics," especially of this country, and the very possibility of such a discovery was derided. Now, after more elaborate investigations, the truth of Dr. Hahn's assertions is clearly demonstrated, and the meteoric origin of his specimens is all but generally acknowledged. I quote this, not as proving anything in my case, but to show how common it is even for authorities to be in error.

HEINRICH HENSOLDT.

A CHAPTER ON SPIDERS.

As notes on spiders are not often contributed to your journal, a few may be acceptable to some readers. Some fragments of leisure have been devoted during the last two years to Arachnology, and at various times I have had from twenty to sixty spiders in captivity during summer months, and from six to a dozen during the winter.

The pugnacious disposition of most spiders is a great obstacle to the observation of their habits when together, as opposite sexes fight without scruple, and, if placed together, one or the other, in a short time, falls a victim to the natural ferocity of the order. The females (being in most species the larger and stronger) usually kill the males, and more often than not devour them. I have frequently endeavoured to keep them in pairs when nearly adult, but without success, except in the case of those few species which habitually associate. On one occasion, however, I captured a pair of adults (*Linyphia montana*), just at the time when they were dwelling harmoniously together, the reproductory organs in both being mature. (When spiders are full-grown, and after the last moult, of which there are several, the sexual organs are uncovered and the external characteristics are clearly seen with a moderate magnifying power.)

On reaching home my captives were transferred from the pill-boxes in which they were caught to one of the cells of a specially arranged cage, in which they speedily constructed a light horizontal web, somewhat differing from that spun when at liberty, and resumed domestic life in apparent disregard of altered circumstances. On the third day of their captivity I found the spiders attached to the under side of the web in coition, the male below the female, reaching round and over her abdomen, inserting each palpus alternately and at regular intervals into the epigynum.

I should perhaps mention here that the reproductive fluid did not flow from the body of the male into the palpal organ through any internal tubes, but was, I believe, taken into the palpus from the mouth. I cannot be positive that the fluid was received from the mouth, the position of the spiders preventing my observing this closely, but I am certain that it was received into each palpus before each insertion from some other part of the body. I think some species discharge the fertilising fluid on a little web, spun for the purpose, and dip the palpus into it.

At the moment of insertion the soft portion of the terminal joint of the palpus became distended, having the appearance of a minute bladder, and was used in some way as an injector, causing the flow of the reproductive cells, through the discharge tube of the male, into the spermathecæ of the female, from which the cells would pass through connecting tubes into the oviduct.

Unfortunately I was unable to pursue my investigations, and note the period elapsing between coition and the deposit of eggs, for although the female lived for nearly a month no eggs were laid, as is often the case when spiders are in captivity. The savage propensities in this instance ultimately asserted themselves in a provoking manner, and the female, after killing and eating her partner, leaving only his legs and a morsel of the harder skin of the cephalothorax, was found hanging dead in the web. When disturbed and caused to separate, the spiders did not manifest the same alarm as under ordinary circumstances, and returned to their original position after the lapse of a minute or two, the movements of both seeming to be guided by touch rather than by sight. From experiments I have made, I am inclined to think that the sense of touch is far more acute in spiders than that of sight, notwithstanding the number, and, in some species, the size of the eyes. I have taken a common house fly and gradually approached it to a spider, while it was struggling vigorously, not letting it touch the web, but the spider would take no notice; yet, immediately the fly was cast into the web, it was seized. I have cast a fly into a far corner of a web, and the spider, instead of making straight for the fly, would advance hesitatingly, feeling with the claws of the front legs, sometimes taking a step in the wrong direction, and occasionally reaching the spot too late, the fly having broken away by struggling.

I think your correspondent, E. Lamplough, must have mistaken the distended portion of the palpal organ for the minute drop of transparent fluid, as I fell into this error myself, before using a lens in examining the action of the spiders.

J. E. ARNETT.

Stourbridge.

ON BRITISH FRESH-WATER MITES.

By C. F. GEORGE.

No. VI.

I MUST now very briefly mention the soft-skinned division of Arrenurus. I have only met with a few examples of these mites as yet; those that I have found, though females, have been very small; they possess the same kind of mandibles as the mites in the other division, but the skin is membranous, and marked with lines, somewhat like those on our own fingers; the body is globular, and has no impressed line on the back; their colours are very marked; they have rather long hairs sparingly scattered on the body, and these project behind, so as to resemble those seen on the hard-skinned specimens, each hair seems to spring from, or close to, the openings of a gland: their legs, mandibles, and thigh-plates are of course chitinous, and they also have a chitinous plate on each side, external to the vulva. I have recognised but two species as yet; the first, I take to be *Arrenurus frondator* (Koch); the Y-shaped mark is white, and the other cœca appear to be in rough, roundish masses of green colour: the other somewhat resembles *Arrenurus rutilator* (Koch). The mandibles and legs are of a beautiful blue; the body of the mite of a deep yellow, the Y-shaped mark is white, and the other cœca are yellowish-

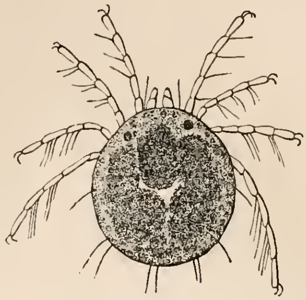

Fig. 55.—*Arrenurus frondator* (?) ♀, upper side ($\frac{2}{3}$ objective).

Fig. 56.—*Arrenurus frondator* (?) ♀, under side.

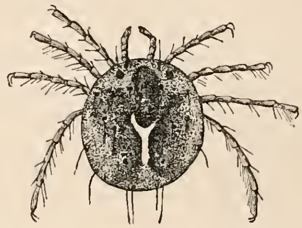

Fig. 57.—*Arrenurus rutilator* (?), ♀, upper side, ($\frac{2}{3}$ objective).

Fig 58.—*Arrenurus rutilator* (?) ♀, under side.

brown. The eyes of both these mites are of the colour of carmine. On dropping alcohol on one of the living mites, it ejected white threads, apparently of albumen, from the orifices of the glands near the hairs. I have observed the same things take place when other water mites were immersed in strong alcohol.

HERB BEVERAGES.—Will some reader of SCIENCE-GOSSIP say what plants are best for making herb beverages, and the best way to use them?—*Inquirer.*

THE PRE-CAMBRIAN ROCKS OF ENGLAND AND WALES.

By W. W. Watts, B.A., F.G.S., &c.

[*Continued from page* 59.]

THE succession of events in this area, while these rocks were being deposited, appears to have been as follows :—

Dimetian:
1. Depression of pre-Dimetian land.
2. Deposit of some sediment with some volcanic action.
3. Consolidation, metamorphism, and elevation.

Arvonian:
4. Land areas, with volcanoes, pouring out lava and ashes.
5. Metamorphism and Elevation.

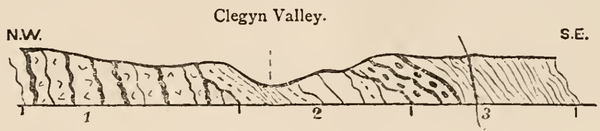

Fig. 59.—Section across St. David's Promontory (Hicks). 1, Dimetian; 2, Pebidian; 3, Cambrian; *f*, fault.

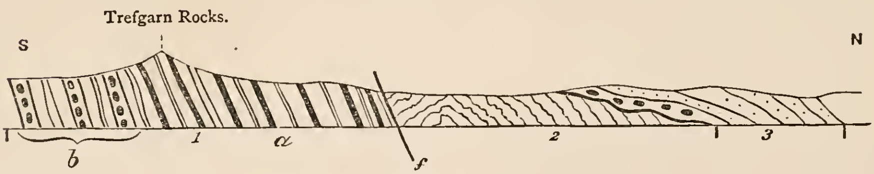

Fig. 60.—Section across Trefgarn, Pembrokeshire (Hicks). 1, Arvonian; *a*, Hälleflintas, *b*, Breccias; 2, Pebidian; 3, Cambrian; *f*, fault.

Fig. 61.—Section from Porth Nobla to Aberffraw (Callaway). 1, Hälleflinta; 2, Quartz-schist; 3, Limestone; 4, Grey gneiss, 5, Dankschist.

Pebidian:
6. Depression of land.
7. Deposition of materials during a gradual submergence.
8. Submarine volcanoes with pretty rapid depression.
9. Re-elevation and consolidation.

3. *North Wales.*—Dr. Hicks extended his conquests to North Wales, but here several other observers have followed and modified some of his results. I may mention Professor Bonney, Mr. Houghton, Professor Hughes, and Mr. Tawney. The same three systems appear to be represented, but it seems possible that the Arvonian and Pebidian are very closely connected here.

Dimetian.—These rocks occur at Twt Hill, Caernarvon, the Lleyn peninsula, and a few other localities, and are chiefly compact felspathic-granitoidite, so like granite that they were long-considered to be such.

Arvonian.—The granitoid rocks are flanked to the north-east of Caernarvon by a thick series of felsites, evidently lavas. A similar mass of felsitic lava occurs on the Llanberis lake, showing flow lines or fluxion structure, and containing one band of interbedded slate. Hälleflintas, breccias, and felsites occur in masses in the Lleyn peninsula, one important band flanking the Dimetian axis of Rhos Hirwain.

The Pebidian rocks cover the Arvonians with a certain amount of unconformability, and consist of grits, conglomerates, breccias, agglomerates, and slates. Many of them have a very beautiful appearance. These rocks seem to be thick where the Arvonian lavas are thin, and *vice versa*—giving some support to Professor Bonney's classification, which considers the lavas and ashes as only the upper and lower parts of the great Pebidian series. Both Dimetian and Pebidian rocks underlie the Cambrian beds unconformably.

The microscopic aspect of the granitoidite assigns to it a clastic origin, while the felsites are lavas, and the ashes and breccias are for the most part volcanic, and in some instances strikingly like those at St. David's.

Dr. Hicks has discovered what he considers to be Pebidian rocks in the Harlech Mountains, here again underlying the Harlech or Low Cambrian beds.

4. *Anglesey.*—Among the principal workers in this field, I may mention Dr. Hicks, Professor Hughes, Dr. Callaway, Dr. Roberts; but the geology of the county is so excessively complicated, and comparatively so little has yet been done, that it is impossible to reconcile the conflicting views. Professor Hughes

has been carefully eliminating the Silurian and Cambrian beds from confusion with the lower rocks, while Dr. Callaway has been engaged in classifying the pre-Cambrians, which he divides into two series, the gneissic and the slaty. He recognises five sub-divisions of the gneissic series:

1. Hälleflinta rocks (somewhat rarely seen).
2. Quartz-schist and quartzite, of which five examples are seen at Holyhead, and the South Stack lighthouse.
3. Grey gneiss, a beautiful porphyritic rock with grey or pink felspar crystals, often of great size.
4. Dark schist. Hornblende and micaceous gneiss associated with chloritic and epidote schists.
5. Granitoidite, of a compact granitic type, rarely showing foliation, but otherwise like the Twt Hill rock.

The slaty series seems to consist of slaty, ashy, brecciated rocks, sometimes like hornstones, with felspathic and quartzose grits, and some quartzites.

The age of these rocks is determined by the fact that the Cambrian beds are made up of fragments from the slaty, granitoid, and gneissic rocks; and besides this there is a striking resemblance between them, and the Dimetian and Pebidian series of St. David's, Caernarvon; and Shropshire. The gneisses and schists are, however, possibly older than these, but may be matched in the Malverns.

(*To be continued.*)

SKETCHES OF EMINENT NATURALISTS.

By Henry Lamb.

No. I.—JOHN RAY.

"I persuade myself that the bountiful and gracious Author of man's being and faculties, and all things else, delights in the beauty of His creation, and is well pleased with the industry of man in adorning the earth . . . with shady woods and groves, and walks set with rows of elegant trees, with pastures clothed with flocks, and valleys covered over with corn."—Ray, *Wisdom of God in Creation.*

JOHN RAY, the "founder of true principles of classification in the animal and vegetable kingdoms," was born at Black Notley, a pleasant undulating village, near Braintree, in Essex, on the 29th of November, 1627. His father, Roger Ray, was a blacksmith in the village.

Ray received a good classical education at the grammar-school at Braintree, and on the 28th of June, 1644, was sent to Cambridge. He was then in his sixteenth year. In 1649 he was made a Fellow of Trinity College; afterwards, in 1651, Greek lecturer, then mathematical lecturer. He was also junior dean, college steward, &c.

At Cambridge, Ray met with Francis Willughby, who became one of his private pupils there. Ray was always fond of natural history, but, being compelled through ill-health to take out-door exercise, he collected and studied the different plants which he met with in his walks round Cambridge, and from that time his life was devoted to its scientific pursuits. In 1667 he was elected a Fellow of the Royal Society, and contributed to their Transactions many valuable papers.

His first publication was a "Catalogue of the plants growing in the neighbourhood of Cambridge." In this work he described 626 species.

While residing at Cambridge he travelled over Great Britain in pursuit of botanical and zoological information, and was generally accompanied by Willughby. After leaving the University, these two naturalists travelled on the Continent. They sailed from Calais in April 1663; went through the Low Countries and Germany into Italy, returning by Switzerland and France to England in the spring of 1666. In this tour Ray attended to botany, and Willughby chiefly to zoology.

They discovered many new species of birds and fishes in Germany and Italy during these travels. An account of the tour was published by Ray in 1673.

In 1682 he published his "Methodus Plantarum Nova." Ray first proposed the division of plants into dicotyledons and monocotyledons. Although he fell into many errors in his system of classification, many of his divisions were adopted by Jussieu, Brown, De Candolle, and others, in forming the natural system.

His "Catalogus Plantarum Angliæ" first appeared in 1670. This formed the basis of all subsequent works on the flora of this country. Ray's largest botanical work was a general "Historia Plantarum," published in 1686. In this work he collected and arranged 18,625 species, which included all the plants which had then been described by botanists.

He also wrote several works on quadrupeds, birds and insects.

Of his works on zoology, Cuvier says: "They may be considered as the foundation of modern zoology."

Linnæus, Buffon, and others borrowed largely from the works of Ray.

In 1679 Ray settled in his native place, where he died on the 17th of January, 1704, at the age of 77, and was buried in the parish churchyard, where there is an obelisk erected to his memory.

He married in 1673, and left three daughters. Ray distinguished himself, not only by his great scientific knowledge, but also by his "love of virtue" and his gentleness of manner—qualities which shone brighter and brighter to the latest period of his life.

Great Grey Shrike (Lanius Excubitor) near Croydon.—A female bird of this species was caught by a bird-catcher at the bottom of Croham-hurst last November, and was sold to Mr. Thorp, our local naturalist. It was in very good condition and plumage.—*F. L. B.*

MICRO-FUNGI BATHONIENSES.*

No. I.

IT occurred to me, after writing my papers on "Botanical Rambles round Bath,"† that it would be well to pursue a like plan with the Micro-Fungi of the district. I, therefore, during parts of the year 1881, added to my list of the fungi I had already found here, and went carefully over old ground, in order to be certain of localities.

In these papers I purpose to give the result of my researches hitherto, with the understanding that, at present, they are to be considered in no way complete or exhaustive.

The same locality, so rich with many flowers, will be also found to furnish not a few micro-fungi. I mean the lane leading from the top of Bathwick-Hill to Hampton Down.‡ Here, just at the entrance to the path leading through a small coppice, I found on a fir-tree *Peridermium pini*, May 1879. So abundant was this fungus, that it was apparent to any one there was something wrong with the leaves of the tree.

This was a good find, as *P. pini* is only occasionally met with in England, though it is common in Scotland.

This fungus is a worthy addition to the cabinet; it has many points of interest.

Besides the interesting structure of the peridium, which is easy of examination in this particular fungus, *P. pini* also has the largest spermatia yet examined.

Dr. Cooke informs us that they have a length equal to $\frac{1}{2500}$ inch, but their width is rarely more than $\frac{1}{15000}$, while in some the length does not exceed the width of those just named.§ I offered this fungus in SCIENCE-GOSSIP for July, 1879, and as but very few availed themselves of the opportunity to possess a specimen, I have still some to give away to any one who sends a stamped and directed envelope to 4, Darlington Place, Bath.

In the same lane may be found *Æcidium ranunculacearum* on the leaves of *R. ficaria* and *R. repens*.

On May 20th, 1879, I found *Æ. Viola* on the banks of the road leading to Claverton, but it was by no means plentiful, and I have not found it largely distributed in this locality. *Æ. Tussilaginis* on *Tussilago farfara*, sides of Brass Knocker Hill, and for the most part wherever the leaves of the plant are found.

Æ. Taraxaci on leaves of *Leontodon Taraxacum*, banks of Canal, Limpley-Stoke; by no means plentiful.

I have once or twice found *Æ. quadrifidum* on *Anemone coronaria*, in the gardens of Turleigh Villa, but I have not met with it elsewhere.

Passing on to Puccinia, I have only noted *P. Saxifragarum* on *Adoxa moschatellina*, and *P. Umbelliferarum* on *Bunium flexuosum*. Both are plentiful in the lane leading to Hampton Down. *Lecythea Rosa* I find every year on a sweet-briar hedge in Turleigh Villa Gardens, in great plenty.*

Trichobasis Geranii on *Geranium molle*, banks of Avon and Kennet Canal, Limpley-Stoke.

These, then, are just a few forms which may be found during the early months of the year.

In my next paper I shall furnish a list of other specimens, to be found later on in the year.

I hope that others will follow my example, and endeavour to gain a knowledge of the micro-fungi of their district.

The work will be found one of pleasure, and may be of much use, for it has been most truly remarked by one of our greatest naturalists, "that that district produces the greatest variety which is the most examined."†

CHARLES F. W. T. WILLIAMS.

Bath.

(*To be continued.*)

* [We are sorry that pressure of matter has obliged us to hold over these valuable papers for a long period, but their appearance at this time of the year will prove very seasonable.—ED. S.-G.]

† SCIENCE-GOSSIP, 1880, pp. 229–274.

‡ SCIENCE-GOSSIP, 1880, p. 229.

§ Cooke's "Rust, Smut," &c., p. 25, 3rd edition.

* SCIENCE-GOSSIP, 1880, p. 230.

† White's "Selborne," Letter xx.

NOTES ON THE SCHIZOMYCETES.

[*Continued from Vol. XVIII. page* 276.]

No. V.

XI. SPIROCHÆTA, Ehrenberg. Cells united in long slender threads, which present a considerable number of close spiral turns. The threads are very actively motile; in fact they swim forwards or backwards, rotating round their longitudinal axis, and can moreover bend themselves in the most varied manner. Not forming a zooglœa, but often felted in dense tufts.

Distinguished from Spirillum by the long, closely wound, flexile threads.

52. *S. plicatilis*, Ehbg.
Spirillum plicatile, Dujardin.
Spirulina plicatilis, Cohn.

Threads very short and slender, with numerous close spirals; articulated; blunt at the ends, 110–225 μ long (according to Rabenhorst), diameter of the single joints (and thickness of the threads) $2\frac{1}{4}$ μ, according to Ehrenberg.

In bog-water, among algæ.

This species is said by Koch to be distinguished from the others especially by the doubly undulated contour of its filaments. But still filaments with a simple spiral are very abundant.

53. *S. Obermeieri*, Cohn.

Morphologically almost the same as *S. plicatilis*, perhaps only distinguished by the fact that the threads are pointed at both ends.

In the blood of persons suffering from *febris recurrens*, and probably the cause of the disease.

The threads of *S. Obermeieri* are either extended in a straight line, and wound in regular spirals, or else they bend themselves, moving with extreme rapidity in the most varied fashion, so that the spirals appear of unequal size, especially at the most strongly bent places. This species is found in the blood of those suffering from intermittent fever, and in fact only during the recurring fever periods, or for a short time thereafter. In the intervals of freedom from fever they disappear.*

54. *S. Cohnii*, Winter.

Very similar to both the foregoing species, but always shorter, and for the most part more slender,

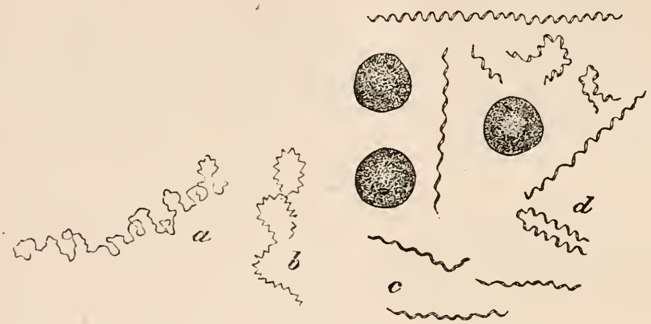

Fig. 62.—*a* and *b*, *Spirochæta plicatilis*; *c* and *d*, *S. Obermeieri* (*a* and *c* after photographs by Koch; *b*, after Cohn; *d*, after Weigert). In *d* the blood corpuscles are represented; the bent threads show the form assumed shortly before the cessation of the fever.

Fig. 63.—*Spiromonas Cohnii* (after Warming).

Fig. 64.—*a*, *Spirillum rugula*; *b*, *S. undula*; *c*, *S. volutans* (*a* and *c*, after Cohn; *b*, after Koch's photographs).

than *S. Obermeieri*, and besides, like that, pointed at both ends.

In the slime of the teeth; discovered by Cohn; figured by Koch, (Beitr. zur Biol., vol. ii. pt. 3, pl. xiv., fig. 8).

55. *S. gigantea*, Warming.

Threads cylindrical, blunt at both ends, about 3 μ thick, with numerous spiral turns, the height of which is 25 μ, the diameter 7–9 μ. Flexile. The articulations are not visible, but at times the threads break up into joints.

In sea-water.

The longest specimens showed sixteen turns; flagella have not been discovered.

XII. Spiromonas, Perty. Threads "flattened like a leaf, twisted round an imaginary longitudinal axis." Multiplication by transverse division.

56. *S. volubilis*, Perty. "Colourless, translucent, smooth, without any obvious differentiation, motion pretty swift, combined with a quick revolution round the axis about which the leaf-like body is twisted. Body often twisted very little, never forming more than a circumference. Length $\frac{1}{120}$–$\frac{1}{160}$''' = 15–18 μ."

In stagnant bog-water and putrefying infusions.*

57. *S. Cohnii*, Warming.

Cells flattened, but sometimes faintly angular, acutely pointed at both ends, each with one flagellum, with 1½ (seldom more) turns. Spiral elongated, 6–9 times as high as its diameter, 9–20 μ in height, 1·2–3·5 μ in diameter. Breadth of the cells 1·2–4 μ. Colourless, often with one or two longitudinal striations.

In stinking, very much decomposed water.

XIII. Spirillum, Ehrenberg. (*Vibrio*, Cohn; *Ophidomonas*, Ehbg.) Cells cylindrical or slightly compressed, simply arcuate or spirally twisted, rigid, with a flagellum at each end (? whether in all species). Multiplication by transverse division, the daughter-cells for the most part soon separating. At times also a zooglœa is formed; spore-formation similar to that of Bacillus.

I unite with the genus Spirillum, the Vibrio of Cohn, and the Ophidomonas of Ehrenberg. The genus Vibrio in fact cannot be sharply defined, since flagella have also been found in it. Cohn himself has already united Ophidomonas with Spirillum. Warming also combines all three genera. Although the name Vibrio has priority, still I have preferred the designation

* It is a question whether this be not the same as the preceding species, merely transplanted into a different habitat.—Tr.

* This is often considered as an Infusorian. See Saville Kent's "Manual," p. 244.—Tr.

Spirillum, because gross misuse has been made of the former, especially by non-botanists, so that it is better to let it lapse altogether.

58. *S. Rugula* (Müller).
Vibrio Rugula, Müller.
Melanella flexuosa, Bory.

Cells 6–16 μ long, about $\frac{1}{2}$–$2\frac{1}{2}$ μ thick, either only simply arcuate, or with one shallow spiral, bearing a flagellum at each end, actively rotating round its longitudinal axis; the cells are often felted in dense swarms. Height of the spiral generally 6–10 μ, diameter ·5–2 μ. Spores always at the end of the cell, globose.

In bog-water, and various infusions; also in the slime of the teeth, &c.

According to Warming, individuals occur the spiral of which reaches a height of 13–20 μ and a diameter of 2·5–5 μ.

59. *S. serpens* (Müller).
Vibrio serpens, Müller.

Cells half as broad as in the foregoing species, 11–28 μ long (according to Rabenhorst), ·8–1·1 μ thick, with several, usually three or four spirals; often united in long chains; with a flagellum at each end. Also frequently forming swarms. Height of the spirals 8–12 μ, diameter 1·2–3 μ.

In various infusions.

The dimensions recorded by Rabenhorst (23–28 μ long) presumably refer to threads composed of several cells. According to Warming, the height of the spirals is said to be sometimes as much as 22 μ.

60. *S. tenue*, Ehbg.

Cells very slender, 4–15 μ long, about $2\frac{1}{4}$ μ thick (according to Ehrenberg), with at least $1\frac{1}{2}$, usually, however, 2, 3, 4 or 5 spirals. Height and diameter of the spirals about $1\frac{1}{2}$–4 μ, or the diameter amounts to half the height. Moving very swiftly, but also often almost motionless and felted in dense swarms or masses, or united in a zoogloea.

In various infusions.

According to Warming only 1 μ thick, and the spirals at times 8–10 μ high, with the diameter $\frac{1}{8}$–$\frac{1}{10}$ of the height. There appears to be some confusion between *S. tenue* and *S. Undula*.

61. *S. Undula* (Müller), Ehbg.
Vibrio Undula, Müller.
V. prolifer, Ehbg. (Infus. p. 81, pl. v., fig. 8.)

Cells 8–12 μ long, 1·1–1·4 μ thick (according to

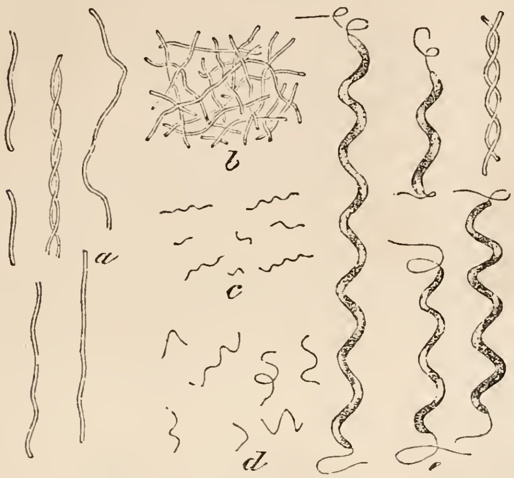

Fig. 65.—*a, Spirillum serpens; b*, the same, felted in a "swarm"; *c, S. tenue; d, S. undula; e, S. volutans* (after Cohn), × 650.

Fig. 66.—*Spirillum Jenense* (after Ehr.) × 600.

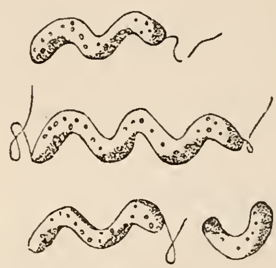

Fig. 67.—*Spirillum sanguineum* (after Koch), × 600.

Fig. 68.—*Spirillum undula* (after Dallinger).

Rabenhorst); spirals wider than in the foregoing, 4–5 μ high; each cell for the most part embracing only ½ or 1, seldom 1½ to 2 or 3 spirals; a flagellum at each end. Very actively motile, at times also forming a zoogloea.

In bog-water and various infusions.

Ehrenberg gives for *S. tenue* a thickness of $\frac{1}{1000}$ of a line, for *S. Undula* only $\frac{1}{1080}$ of a line; at the same time he says in the description: "Sp. fibris valde tortuosis brevibus, *validioribus*."

According to Warming *S. Undula* is more variable than was formerly admitted. The spirals are often elongated, so that the cell appears almost straight; accordingly the height of the spirals varies from 3 to 10·5 μ, the diameter amounts to ¾ or $\frac{1}{10}$ of the height, the thickness of the cells ·6–1·3 μ.

Var. *litorale*, Warming.

As much as 3 μ thick, spirals elongated, each 5–10 μ high, diameter ⅓ or ⅙ of the height.

On the shores of the Baltic Sea.

62. *S. volutans*, Ehbg.
Vibrio Spirillum, Müller.
Melanella Spirillum, Bory.

Cells slightly attenuated towards the ends, gently rounded, 25–30 μ long, about 1½–2 μ thick; each cell with 2½–3½ (seldom more) spirals, the spiral 9–13 μ high, 6½ μ in diameter; a flagellum at each end.

In various infusions, as well as in bog-water among algæ.

According to Warming the spirals are often elongated, so that the cell appears almost straight; the diameter then amounts to only 1·5–4 μ.

Var. *robustum*, Warming.

Thickness 2–4·5 μ, height of the spirals 10–20 μ, diameter 1–3 μ. Usually with 1½ turns. Sometimes with two flagella at one end.

In sea-water.

63. *S. sanguineum* (Ehbg.), Cohn.
Ophidomonas sanguinea, Ehbg.*

Cells cylindrical, only seldom attenuated at the ends, 3 μ or more thick, of various lengths, with usually 2, seldom ½ or 2½ spirals. Height of the spirals 9–12 μ, diameter about ⅝ of the height; a flagellum at each end. Cell-contents coloured by numerous reddish bodies, with many sulphur granules.

In putrefying brackish water [and pond water?]

According to Warming the longest specimens reach 65 μ; the height of the spirals 15–37 μ, while the diameter amounts to ½ or ⅓, or in small specimens $\frac{1}{7}$–$\frac{1}{14}$ of the height.

64. *S. violaceum*, Warming.

Cells either crescent-shaped (and so without a complete turn) or with 1 or 1¼ spirals, broadly rounded at the ends, with a flagellum at each. Cell-contents violet, with few sulphur granules. Height of the spirals 8–10 μ, diameter 1–1·5 μ, thickness of the cells 3–4 μ.

In brackish water.

* According to Saville Kent, the *Ophidomonas sanguinea* of Ehrenberg is a true monad, and not identical with Cohn's *Spirillum sanguineum*. See "Manual."—Tr.

65. *S. Rosenbergii*, Warming.

Cells with 1 or 1½ turns, 4–12 μ long, 1·5–2·6 μ thick, colourless, but with extremely numerous strongly refringent sulphur granules. Spirals 6–7½ μ high, of very varied diameter, which amounts at the most to half of the height. Moving actively and in the most varied fashion, but, as it seems, without flagella.

In brackish water.

66. *S. attenuatum*, Warming.

Cells strongly attenuated at the ends, usually with 3 spirals. The middle spiral is large and close (height about 11 μ, diameter 6 μ), the end spirals are elongated (10 μ high, 2 μ in diameter). Thickness of the cells 2 or 1·2 μ.

In sea-water.

67. *S. Jenense* (Ehbg.)*
Ophidomonas Jenensis, Ehbg.

Cells obtuse at both ends, with flagella, olive-brown, 40 μ long, about 3⅓ μ thick, with ½–2½ spirals.

Whether this is really a distinct species is hard to say, so long as it is not found again in the original locality. Possibly it is identical with *S. volutans*.

W. B. Grove, B.A.

(*To be continued.*)

* Saville Kent classes this as a true monad. See "Manual."—Tr.

THE DANISH FOREST.

By John Wager.

III.—The Distribution of the Wild-Growing Trees.

In Denmark, as in other countries, most of the different species of wild-growing trees have their different localities, in which the one species affecting the soil, or acted upon by other circumstances, prevails more than another; while some species may even be almost or altogether absent from certain tracts. Dr. Vaupell devotes a long chapter to this subject, which is here compressed into more limited space.

Beech is at home on a calcareous soil, and grows best on argillaceous sandy marl, the prevailing soil of nearly all the fertile parts of Denmark. Yet it grows also on heavy clay, and is the predominant tree on all wooded boulder-sand. The growth of the beech on such soil is peculiar to Denmark, and is dependent on the preparation which other trees, previously growing upon it, have made; planters well knowing that on first planting such sand-hills they must not begin with the beech—spruce being usually chosen, though Scotch fir would be better. Beech-woods avoid swampy grounds and peat-mosses, but otherwise beech can grow in Denmark on any soils where the natural conditions for tree-growth are present. In Jutland it forms woods as far north as the soil will permit any woods to grow, close below the Scaw, in latitudes where in other countries it begins to be sporadic merely. Yet the beech is not so absolutely dominant in Jutland towards the west and the east; though the ruling tree in many of the woods to the west of the proper forest-belt, especially in those of considerable size, in many of the smaller woods, composed of oak, birch and aspen, it is less frequent, or quite absent. Such woods where beech is scarce or absent, are not only small, but outlying, and by elevation or otherwise exposed to the repression of the west winds, or other ills; but in those of larger extent, which do not suffer from west winds, wet soil, or ill-usage, the beech is either the ruling tree, or on the way to become so at no distant date. It is steadily extending itself in the westerly woods; but the isolated position of certain woods renders its access to them difficult. For this reason it is absent from the natural woods of Bornholm, not having yet, in its course from west to east, advanced so far.

The *Oak* is found interspersed in beech-woods, and forms also pure oak-woods in Jutland on boulder-sand, and upon the islands on fertile clay. In the natural oak-woods of the islands the trees stand wide apart, usually lifting their broad heads above dense underwood, chiefly of hazel and whitethorn; thus affording a glimpse of the form of Denmark's best old oak-forests, of which our forefathers left us few remains. The oaks, too, which are here scattered through the beech-woods, at the rate of less than one to about five oaks to the acre, among beeches of one hundred and forty years old, are the offspring of those ancient woods of oak; on the east coast of the peninsula oaks are also scattered among the beeches, but in general both these and oak-woods are rarer than upon the islands. The free use of oak timber formerly has caused the disappearance of many an oak-wood, for oak does not renew itself so readily as beech, the young plants being more easily repressed by other kinds of trees which invade the grounds. Consequently the oaks have left the fertile east coast for interior sites, where the soil, being in general boulder-sand, and the isolated position, check the advance of the beech. Some have therefore concluded that in Jutland the oak has its habitat on the boulder-sand, and the beech on the boulder-clay; but such preference of the oak is opposed to its habit on Zealand and the smaller islands, where the oak-woods usually rest on fertile soil. In Bornholm, where the oak has not come under the domination of the beech, it is plentiful, and both pedunculata and sessiliflora are found there, but the latter most frequently.

Of *Birch* there are several kinds in Denmark, regarded by Linnæus and others, not as different species, but as varieties of the white birch. The most common is the forest-birch (*Betula verrucosa*), distinguished by its fissured bark and other marks from the northern white birch (*B. glutinosa*). To the last, the dun-birch (*B. pubescens*) is allied, though in general it is a mere bush on the mosses; *B. Carpathica* is also allied to the white birch, and can attain to a tree, but is rare.

The birch forest, even more than the oak, has suffered diminution during the lapse of time. Stems found in peat-mosses witness to its great extension in former ages; but now, whether associated in woods or standing singly, the birch has been excluded from the best forest tracts by the nobler tree-species, and only retains its hold on localities which, either from isolation or sterility, are favourable to the beech. As a wild forest-tree, it has almost or entirely disappeared from several of the islands; and even in Vendsyssel, the most northerly part of Jutland, birkenshaws have given place to beech-woods, though it maintains itself on swampy grounds. It is found also in parts of the interior of Jutland, but it nowhere on the peninsula forms an important constituent of the woods.

The birch of the peat-mosses is marked by striking peculiarities; its stems, often more than two feet in diameter, are swathed in beautiful, smooth, white bark; while the bark of the birches now growing in North Zealand (where beautiful groups exist) fissures as soon as the tree attains a diameter of little more than half a foot. The leaves, catkins and winged fruit also of the fossil and the forest-birch differ; the former agreeing most nearly with the genuine northern white-birch, common to the Scandinavian peninsula, the northern part of the Russian forest, and the hills of Middle Europe; while, on the other hand, the forest birch (*B. verrucosa*) predominates on the plains of Germany. It is only from the mosses of North Zealand that material for a thorough comparison has been obtained by Dr. Vaupell; he notes also the tendency of the birch to run into varieties.

Alder.—The red alder (*Alnus glutinosa*) occupies swampy parts of the forest, especially in beech-woods where the small or large marshy depressions which frequently occur are usually filled with alder-woods, or alder-mosses. Though red alder affects moisture, yet individual trees are found on hard soil, where they often attain a greater age and finer form than on swampy ground. In recent times, as before intimated, such mortality has befallen the alders that in many wooded tracts they have quite given place to other species of trees, especially on the small islands and a great part of Funen and Zealand; they still flourish on the east coast of Jutland and Slesvig.

The white alder (*Alnus incana*) is admitted into the Floras as a Danish tree, and certainly no foreign tree has taken faster or more flourishing hold of the soil, from which indeed it is difficult to rid it; for when cut down close to the roots, these strike out so many shoots that more space is covered than sufficed for the parent tree. It is common in the state forests of

North Zealand, but does not grow wild in more northerly districts; it is wanted in Jutland, and also in the south-western provinces of Sweden, first appearing again on the borders of Norway. Awhile since it was a good deal planted, but has fallen into disrepute as inferior to red alder and ash, and it is now chiefly used for planting on sandhills and heaths.

Ash, next to beech, has been most favoured by the effects of modern husbandry and forest-culture. Into the fertile woods of South Zealand, and the smaller islands especially, it penetrates and forms considerable growths; also in the greatest part of Lolland's forest-tracts; and in those woods of Falster which have a similar soil, as well as on Moen it has a wide extension. But it is not so common in those of Funen, and the soil of North Zealand is unfavourable to its growth. It is rarer, too, in the forest districts of Slesvig and South Jutland up to the Veile-fjord; its most important extension on the peninsula beginning north of Aarhus and continuing through the fertile woods along the coast of the sub-peninsula of Grenaa. North of Rander's fjord it appears in several moist woods. On Bornholm it has a wide extension.

The *Elm* (*Ulmus montana*) is widely diffused over Bornholm, but in the rest of Denmark appears only sporadic in the woods. It cannot bear moisture as well as the ash, but on firm ground affects the same kind of soil; though as fruitful as the ash, where they grow together the ashes far exceed the elms, except in some of the woods of Funen, where the rule is reversed. On Samsö the elm was formerly the chief constituent of the woods.

Hornbeam, of all Danish trees, most resembles the beech, and being similarly capable of enduring shade, can thrive in company with it better than any other tree; moreover, it can endure a moister soil. It is found sporadic in the beech-woods all over Denmark, except in the north of Jutland. In some of the southern woods, and there only, it is sufficiently self-sowing to predominate and oppress the beech, especially in Lolland, where the ground is moister than usual in Danish woods; in the Alminding forest on Bornholm, where it has not been subjected to the rivalry of the beech, it is also abundant.

Of *Maple*, three species are found in Denmark; the sycamore, the common maple (*Acer campestre*), and the Norway maple (*A. platanoides*). Sycamore, which the Germans say is not hardy enough to develop fully in North Germany, grows luxuriantly upon Als, and the parts of Slesvig adjacent to that island, but apparently does not advance into Jutland. It is frequent also in southern parts of Funen and Zealand, and over the islands to the south of these; yet it may have been originally planted.

The common maple, either as a tree or a bush, is at home in the coast woods of the islands, from Als in the east to Moen in the west, but rapidly declines towards the north. In North Zealand, however, there are trees with boles which girth forty-three inches; some of those on Als are fifty-four feet high. In Jutland it is very rare, and restricted to the south of the Rander's fjord.

The Norway maple is moderately common on Moen where it is associated with oak, ash, elm, and hornbeam. It is also found in some of the Zealand woods, and between Kolding and Ribe in the south of Jutland.

The *Lime* (*Tilia parvifolia*).—Although this tree advances into Norway, it has in Denmark its peculiar home in the south and south-easterly parts, extending into Scania, Sweden. It is found on Bornholm and Moen; and is common in the woods of Lolland, where also it decks with low growths numerous grave mounds in a part of the island. Remains of its leaves and fruit are plentiful in the Lolland peat-mosses. Among other islands it is not uncommon in the south of Zealand, where at least one tree girths forty-eight inches in diameter of bole. In North Zealand it is rare, but less so in Jutland and Slesvig. It seems to have a partiality for the small islands, on some of which it forms groves. Its timbers being of poor quality, planters discourage its growth; it suffers, too, from encroachment of the beech, and most frequently does not ripen its seed.

The *Aspen*, in the same degree as the birch, is a light-requiring tree, and cannot bear over-shadowing; like the birch, too, it was common in the forests of former times, if not to the same extent. Meantime, it has kept its ground better in the beech-woods; not from greater power of self-sowing, but because, like the lime, its roots possess great tenacity of life, and more than those of any other tree can send out buds. It is, however, more frequent in the small woods which have not come under the domination of the beech, as in the peasants' woods on Bornholm; in Hald, an oak-wood near Viborg, in Jutland, also fine examples of it are found. On the heaths, too, it is common among the oak-scrub, and sometimes solely covers the ground; but on such meagre soil its leaves are but one-third the size of those in Hald wood. Where ling has been cleared away, the vacant spaces often become overgrown with shoots of aspen, from old roots previously hid, but strongly retentive of life. In some of the forests with good soil it flourishes numerously, both dispersed and in groups; but the planters strive to rid it, its timbers being of little worth.

(*To be continued.*)

Sporting Blackbirds.—These are now in the grounds of The Brook villa, three miles from Liverpool. These blackbirds, one with a white feather on each side of its tail, one with a white wing, and one with a perfectly white breast. They were first seen last summer.—*W. B.*

MICROSCOPY.

"The Journal of the Postal Microscopical Society."—Part five of the second volume of this journal is to hand, edited by Mr. Alfred Allen. It contains papers on "The Exhibition of Magnified Objects," by Dr. C. P. Coombs; "The Microscope in Medicine," by J. B. Jeaffres; "A Method of making and mounting Transparent Rock-sections for the Microscope," by John Smith; "The Maggot of the Blow-fly," by A. Hammond, F.L.S. (illustrated by some exquisitely drawn plates); "Half-an-hour at the Microscope" with Mr. Tuffen West, F.L.S. (beautifully illustrated); selections from the Postal Microscopical Society's Note-book, &c. This is the best part yet issued, and we are pleased to note the progressive character of the journal under its able editorship.

"Journal of the Royal Microscopical Society."—The February part of this ably-edited journal contains papers as follows: "Observations on the Oribatidæ," by A. D. Michael; "On the use of Incandescent Electric Lamps, as accessories to the Microscope," by C. H. Steam; and "On a Minute Form of Parasitical Protophyte," by Mr. G. F. Dowdeswell. The latter describes a form of bacillus he had found in the lung of a mouse infected with septicæmia, and states it as his belief that the number in which these organisms may exist in the blood of an infected animal is incalculable, and may even be greater than in the case of Davaine's septicæmia in the rabbit, where the author had found that in some cases one drop of infected blood contained upwards of three-thousand millions of them! The journal contains, besides the papers, the usual encyclopædic epitome of recent contributions to microscopical science.

"The Micrographical Dictionary."—We have received parts 18, 19, 20, 21 of the 4th edition of this important work, bringing it to a conclusion. Microscopic workers are fully aware of the high value it possesses, and what a vast repertory of information it contains relating to microscopical research. But younger students may not be cognizant of its importance to them as a hand-book, and to them we commend it in the strongest and most commendatory terms. The present edition is edited by Dr. J. W. Griffith, the Rev. M. J. Berkeley, F.R.S., and Professor T. Rupert Jones, F.R.S. It is illustrated by fifty-three plates, and more than eight hundred woodcuts. The publisher is John Van Voorst, 1, Paternoster Row.

Highbury Microscopical and Scientific Society.—The members of this society last month presented to their honorary secretary one of Crouch's Premier Binocular microscopes, with rotating stage, removeable substage, four objectives, Wenham's achromatic condenser, and numerous other accessories of the latest design. The instrument bears the following inscription: "Presented to Bernard H. Woodward, by the members of the Highbury Microscopical and Scientific Society, as a token of their appreciation of his services as honorary secretary, January, 1883."

ZOOLOGY.

Helix obvoluta.—Mr. Tomlin asks (p. 67) for localities where this shell has been taken. The following short list includes, I believe, all the places which have been recorded, but I shall be glad to be corrected if it is incomplete. Proceeding from west to east,—Winchester, Buriton, Stoner Hill, Up Park, Singleton, Graffham and Duncton. The range is thus a narrow strip of country about thirty-five miles long and about six wide, following the line of the downs. Mr. Tomlin would do good service by tracking it westward towards Salisbury.—*C. Ashford.*

The Dugong.—A fine specimen of the Dugong, or sea-cow (*Halichore Indicus*), from the Indian Ocean, measuring seven feet from the snout to the tip of the crescent-like tail, has just been received, together with the skeleton at the Museum, Owens College; a few words upon which may not be out of place. It belongs to the Sirenian group of Mammalia; only one other species in this suborder is now known to be living, the manatee; they are very closely allied to the cetacea. The bones of the skeleton are remarkable for their heavy, close, ivory-like texture, thus adapted for its peculiar life in the ocean-bed, where it feeds upon sea-weeds. The hind limbs being absent, the pelvis is rudimentary, and it possesses no sacrum, whilst the fore-limbs are converted into a pair of flippers, or swimming paddles. The mammæ are situated on the chest. This species has two sets of teeth; the molar teeth are $\frac{5-5}{5-5}$ when young, but reduced to $\frac{2-2}{2-2}$ in the adult; the incisors, said to be present in the young, are wanting in the mature animal. Many of the figures in our popular books are incorrect, especially about the head; the snout is prominent and fleshy, whilst the lower portion of the upper jaw is bristly. This, conjoined with the pectoral teats, aided by the flippers, has caused them, when observed at a distance with the upper part of the body out of the water, to be mistaken for the human form. In this way not a few stories of mermaids have arisen, and it is not at all improbable, says Scoresby, that the walrus has afforded foundation for others, equally wonderful. I have seen a sea-cow, in such a position that it required little imagination to mistake it for the human being, in fact, the surgeon of the ship actually reported it as a man swimming with his head out of the water. The Portuguese give the manatee a name signifying woman-fish, and the Dutch sailors call the Dugong, Baardmannetje, or little bearded man. One singular species belonging to this group, the rhytina, is now extinct, having been hunted down within a very recent period. It was first seen about 1750, in Behring's Island, near the coast of Kamtchatka; it was here where Behring was wrecked, and he described it as abounding with the rhytina. The last was seen in 1768; it was estimated at twenty-five feet in length, and twenty feet in its greatest circumference. The skin was hairless, but very thick and fibrous. Steller, who described the species, states he was struck with the enormous size of the stomach, being six feet in length, and five feet in breadth, distended with masticated sea-weed. The sea-cow has not far to remove in search of food, hence the difference in specific gravity (betwixt this species and the whales) in the bones. The latter pursue a living prey, but it requires an effort on the part of the dugong to reach the surface of the water.—*J. F. R.*

"THE WEATHER OF 1882."—Mr. Edward Manley, F.M.S., honorary secretary of the National Rose Society, has issued a valuable memoir on the above subject, more particularly as observed in the neighbourhood of London. The comparison of the weather of that anomalous year is made in all respects with that of an average year. Much care and pains have been taken in the matter, and there can be no question the work will be a valuable addition to meteorological literature.

"THE BUTTERFLIES OF EUROPE," by H. C. Lang, M.D., F.L.S. (London: Lovell Reeve and Co.). Part xii. of this beautiful work is out, containing descriptive and illustrative sketches of the various European species of Argynnis and Melitæa.

HEMEL HEMPSTEAD NATURAL HISTORY SOCIETY.—The annual report of this flourishing society for the year 1882 has just appeared. It includes a total of eighty-eight members, and is distinguished by the number of field meetings held during the summer and autumn. Public lectures were delivered during the winter months by Dr. J. E. Taylor, the editor of SCIENCE-GOSSIP, on "Volcanoes" and "Coal;" by J. Saunders, Esq., on "Flowers," and by J. Littleboy, Esq., on "Migrations of Birds." These lectures are thrown open to the public, and have been largely attended.

FROGS IN IRELAND.—The island of Rathlin, which lies three miles off the north coast of co. Antrim, was carefully explored last year by Mr. S. A. Stewart, M.B.S.E., of Belfast, with a view to correcting the lists of its fauna and flora. The examination made was thorough, and resulted in eliciting the interesting fact that the common frog is unknown in the island, though abounding on the mainland. There are several small lakes and other spots in Rathlin suitable for batrachian propagation, but for some reason *Rana temporaria* has not yet emigrated. On referring to Bell's "History of British Reptiles," p. 86, and "Edinburgh Philosophical Journal," vol. xviii. p. 372, it will be found that frogs, though everywhere disseminated through Ireland, were formerly unknown there, and were introduced about two hundred years ago by a Dr. Guithers, one of the Fellows of Trinity College, Dublin, who is said to have procured frog's spawn from England and placed it in a ditch in the University Park, whence the species spread over the entire country. Evidence exists of frogs having been extremely rare, and of one being exhibited as a show in the north of Ireland in the middle of the last century.—*H. W. Lett, M.A.*

TROUT IN NEW ZEALAND.—It may interest some of your readers to hear that trout are multiplying rapidly in our New Zealand rivers. A fine fish, turning the scale at 10 lbs., was caught in a tributary to the Wanganui river very recently. As it is not more than seven years since ova were first deposited in the river, it speaks well for the adaptability of our streams for nurseries and breeding grounds of this prince of freshwater fishes. Government very wisely protects both trout and salmon by a licence.—*Charles Hardy, Wellington.*

"ANOTHER BOOK OF SCRAPS RELATING TO NATURAL HISTORY."—By this title Mr. Charles Murray Adamson has published a series of thirty-six lithograph illustrations from pen and pencil sketches of wild birds. They are exceedingly vigorous and natural, although merely outline sketches, and proclaim the artist to be a true naturalist, possessed with acute observing power. The sketches relate chiefly to aquatic bird life.

BOTANY.

PODOPHYLLUM.—In re-arranging my collection of vegetable dissections a few days ago, I observed that *Podophyllum Emodi* is one seed leaved, and fearing that somehow it might have got a wrong label, I had a large root dug up. It was entirely underground, but the flower stalks were formed, about two inches in length, and just peeping into the light. On dissection, the stalks, rhizomes and roots everywhere are seen to indicate one seed leaf. Throughout them are abundance of starch, and signs of the presence of a resin or gum-resin. Podophyllum at present is considered to be two seed leaved, and is placed about the beginning of the natural arrangement, but there has been great uncertainty as to a reasonable position for it. Some botanists, as Lindley and Balfour, place it among the Ranunculaceæ; some, as Asa Gray, among the Berberideæ; and others, as Loudon, in an order by itself, Podophyllaceæ, with the remark that on the one hand it is nearly related to Nymphæaceæ, and on the other to Berberideæ. On recognising the fact that the plant is monocotyledonous there will be little difficulty in giving it a satisfactory place, which should be near the Smilaceæ, or perhaps among the Trilliaceæ along with Paris and Medeola. *P. Emodi*, the Asiatic species, thrives very well in this part of Scotland, and produces great crops of its large bright-red fruit, yielding a plentiful supply of seeds which vegetate freely. I am not aware whether the podophyllin, now so considerably employed in medicine, is extracted from this or from the Canadian species, *P. peltatum*. If from Emodi, the vigorous growth of the plant appears to indicate that it might be profitably cultivated in this country. *P. peltatum* is not so robust here, and dies out in six or eight years. It would be very interesting if some of the readers of SCIENCE-GOSSIP could tell whether the podophyllin of commerce is obtained from *P. Emodi* or from *P. peltatum*. Perhaps a third species exists. In an enumeration of plants (undescribed) I notice, 1, *P. peltatum*, N. America; 2, *P. diphyllum*, Virginia.—*John Sang, Kirkaldy.*

PROLIFEROUS SUNDEW.—Mr. Step will find several notes on budding leaves in Drosera. I recall, now, an illustrated paper by M. Naudin, in the "Annales des Science Naturelles" for 1840, xiv. p. 14, and a note on a Proliferous Sundew in SCIENCE-GOSSIP for 1873, p. 259, by Mr. Laver. A somewhat similar specimen is stated to have been exhibited by Mr. Cross, at a meeting of the Chester Society of Natural Science, in 1876 ("Nature," xv. p. 18). I have noticed the same thing once or twice in New York State.—*W. J., Madison, Wis., U. S. A.*

DAVID DOUGLAS.—The numerous friends and correspondents of David Douglas will hear with regret of his decease, which took place at the Edinburgh Royal Infirmary, on the 13th of February last. Douglas was a hammerman by trade, but, in consequence of his successful devotion to botany, some friends used their influence to gain him admission as an attendant to the Edinburgh Museum of Science and Art. It was noticeable how quickly he assimilated the biological information thus newly brought before him, and whilst not abandoning the study of plants, made rapid progress in comparative osteology and in the British fauna. Of late he had devoted the greater part of his leisure time to the study of beetles. As an evidence of the thoroughness which marked his work, he had begun Latin to enable him to interpret the diagnoses. That he was a man of ability, gifted with a quick eye, and a sound judgment; and that he was a man of character, sincere and free from bitterness, none who knew him well could fail to perceive, and had he lived, notwithstanding the great drawback of want of early education, there can be no doubt that he would have made his mark in the department of study to which he was devoting himself. As an attendant, he was punctual and diligent, and gave to students and visitors freely of the information which he had acquired. His published work is almost wholly contained in the pages of SCIENCE-GOSSIP. His most interesting communication was on the discovery of the male flowers of Anacharis in Britain. In addition, he contributed various notices of the occurrences of rare plants in fresh localities, or upon new plant varieties, chiefly from the neighbourhood of Edinburgh. He was an active member of the Science Gossip Botanical Exchange Club, the published reports of which bear testimony to his discrimination and zeal.—*T. S., Edinburgh.*

[It is with much regret that we hear the news of the death of this singularly modest and accomplished botanist. His life is an illustration of what the humblest individual can accomplish in the wide domains of Science.—ED. S.-G.]

"BOTANY NOTES."—With this title Mr. A. Johnston has written a capital little hand-book for students preparing for professional examinations in medicine and science. The present part deals with systematic morphology, and arranges, in a very compact and succinct manner, the multitudinous details of this important department of botany.

EPPING FOREST.—The Highbury Microscopical and Scientific Society passed the following resolution at their meeting held on the 8th of March: That this society desires to enter its most earnest protest against the proposed railway to High Beech, believing it to be entirely opposed to the true interests of the great bulk of the people, inasmuch as it will tend to deprive the forest of that exclusively sylvan character which it is most desirable to perpetuate. [We should be glad if every scientific society in and about London would loudly protest against the spoliation of this natural history recreation ground.—ED. S.-G.]

GEOLOGY.

NEW FORM OF RECENT CRINOID.—Among fossil invertebrates few can have played so important a part in primary and secondary times as the fixed crinoids, stalked radiate animals of the class Echinodermata. They are very scantily represented now. When Guettard, in 1755, found a live pentacrinus it was quite a scientific event, and this species was the only known modern representative of the group. Within recent years, however, the number of living species has been raised to fourteen. Among the animal forms brought up with the dredge during the recent cruise of the "Travailleur," off the coast of Morocco, is a new fixed crinoid, making the fifteenth. It has been named *Democrinus Parfaiti*, after M. Parfait, commander of the "Travailleur." M. Perrier has described it to the Paris Academy. It is distinguished from other forms chiefly by the composition of its calyx, which is formed of five long (so-called) "basals," making a sort of funnel. These are separated by a circular depression from five rudimentary, alternating "radials," on which are five free radials bearing as many arms. In no other fixed crinoid is the width of the calyx so small relatively to the stalk. This new form of crinoid is thought to be of considerable morphological significance.

The Liverpool Geological Society.—Part 4, vol. iv. of the Proceedings of this well-known society have been published, containing papers by Mr. D. Mackintosh, F.G.S., on "Traces of an Interglacial land-surface at Crewe;" "Marine beds and peat beds at Hightown," by Mr. J. M. Reade, F.G.S.; "Mammalian remains from ditto," by Mr. F. J. Moore; "The Subsidence of Land in the Salt Districts of Cheshire," by Thomas Ward; "The Carboniferous Limestone and Sandstone of Flintshire," by G. H. Morton, F.G.S., and "The Base of the New Red Sandstone around Liverpool," by the same author.

The Metamorphic Rocks of Ross and Inverness-shire.—The following communication was read at a recent meeting of the Geological Society by Henry Hicks, M.D., F.G.S. The author described numerous sections which have been examined by him in three separate visits made to the north-west Highlands. In some previous papers, sections in the neighbourhood of Loch Maree had been chiefly referred to. Those now described are to the south and south-east of that area, and occur in the neighbourhoods of Achmashellach, Strathcarron, Loch Carron, Loch Trishm, Attadale, Stronoe Ferry, Loch Alsh, and in the more central areas about Loch Shiel and Loch Eil to the Caledonian Canal. In these examinations the author paid special attention to the stratigraphical evidence, to see whether there were any indications which could in any way be relied upon to prove the theory propounded by Sir R. Murchison that in these areas fossiliferous Lower Silurian rocks dip under thousands of feet of the highly crystalline schists which form the mountains in the more central areas. On careful examination he found that in consequence of frequent dislocations in the strata, the newer rocks were frequently made to appear to dip under the highly crystalline series to the east, though in reality the appearance in each case was easily seen to be due to accidental causes. Evidences of dislocation along this line were most marked; and the same rocks, in consequence, were seldom found brought together. He recognized in these eastern areas at least two great groups of crystalline schists metamorphosed throughout in all the districts examined, even when regularly bedded and not disturbed or contorted; and they have representatives in the western areas, among the Hebridean series, which cannot in any way be differentiated from them. These he called locally by the names, in descending order, of Ben-Fyn and Loch-Shiel series. The former consist, in their upper part, of silvery mica-schists and gneisses, with white felspar and quartz; in their lower part, of hornblendic rocks, with bands of pink felspar and quartz, and of chloritic and epidotic rocks and schists. The Loch-Shiel series consists chiefly of massive granitoid gneisses and hornblendic and black mica-schists. Thirty-three microscopical sections of the crystalline schists and the overlying rocks are described by Professor Bonney, and he recognises amongst them three well-marked types. In No. 1 he includes the Torridon sandstone, the quartzites and the supposed overlying flaggy beds on the east side of Glen Laggan. These are partially metamorphosed, only distinct fragments are always easily recognizable in them in abundance. In No. 2, the Ben-Fyn type, the rocks are crystalline throughout, being typical gneisses and mica-schists. In No. 3, the Loch-Shiel series, he recognizes highly typical granitic gneisses of the Lower Hebridean type. Dr. Hicks failed to find in these areas at any point the actual passage from group 1 to group 2; neither did the same rocks belonging to group 1 meet usually the same rocks belonging to group 2. The evidence everywhere showed clearly that the contacts between these two groups were either produced by faults or by overlapping. Group 3, placed by Murchison as the highest beds in a synclinal trough, supported by the fossiliferous rocks, the author regarded as composed of the oldest rocks in a broken anticlinal. They are the most highly crystalline rocks in these areas; and the beds of group 2 are thrown off on either side in broken folds. These, again, support the rocks belonging to group 1. The author therefore feels perfectly satisfied that the crystalline schists belonging to groups 2 and 3, which compose the mountainsin the central areas, do not repose conformably upon the Lower Silurian rocks of the north-west areas with fossils, and that these highly crystalline rocks cannot therefore be the metamorphosed equivalents of the comparatively unaltered, yet highly disturbed and crumpled, richly fossiliferous Silurian strata of the southern Highlands, but are, like other truly crystalline schists examined by him in the British Isles, evidently of pre-Cambrian age. In an Appendix by Professor T. G. Bonney, F.R.S., Sec.G.S., on the Lithological Characters of a series of Scotch Rocks collected by Dr. Hicks, the author stated that he observed in the above series, as he had done in other Scotch rocks lately examined by him, three rather well-marked types:—one, where, though there is a certain amount of metamorphism among the finer constituents forming the matrix, all the larger grains of quartz, felspar, and perhaps mica, are of clastic origin; a second, while preserving a bedded structure and never likely to be mistaken for an igneous rock, being indubitably of clastic origin, retains no certain trace of original fragments; while the third, the typical "old gneiss" of the Hebridean region, seldom exhibits well-marked foliation. It is sometimes difficult to distinguish between the first and second of these; but this the author believed to be generally due to the extraordinary amount of pressure which some of these Scotch rocks have undergone, which makes it very hard to determine precisely what structures are original. Even the coarse gneiss is sometimes locally crushed into a schistose rock of comparatively modern aspect. The least altered of the above series the author considered to be the true "newer-gneiss" series of the Highlands, but both of the others to be much older than the Torridon Sandstone.

NOTES AND QUERIES.

The prospect of a sharp Winter.—As regards abundance of holly berries, and hips and haws being a sign, I do not believe in it, as I have often found it quite the reverse; and last winter it certainly was so with us, the weather being remarkably mild, and holly berries and hips and haws were very abundant here, and, what is very unusual, many of the holly berries remained on during the following summer up till about the middle of September, so that during the summer of 1882, I had in my garden holly-trees with some of the sprigs having not only the red berry of the previous winter, but also the summer blossom, and later on sprigs with the ripe and the green berries on them.—*Thomas Kingsford, Canterbury.*

A recent Earthquake Shock.—"Fortunately," says Professor Duncan, F.R.S., "in the United Kingdom only very slight shocks of earthquake are felt on very rare occasions, and usually these are restricted to certain parts of the mountainous districts of Scotland, the north-west of England, and Wales. But it has happened that a very decided shake has been felt, reaching from Kent into the Midland counties, doing, however, little or no damage. Slight as may be the shake of one, if one is felt, it is never forgotten, for the body is slightly lifted up, or moved forwards, and returned to its original position, and the mind is surprised with the energy existing within the earth, which performed the unusual operation." So to say, this "unusual operation" once more made its appearance on the 16th of January, 1883. The shock was very distinctly felt at Abergavenny. The vibration was accompanied by a momentary sound, resembling the distant roar of artillery or thunder, and continued for a few seconds. The shock seemed to affect the coal mining districts in a far greater extent than other parts. At Blaenavon, a coal-mining district, about six miles from this town, the vibration was so great that the inhabitants left their houses, thinking that it was an explosion in the works.—*Lester Francis, Abergavenny.*

Climbing Powers of the Dormouse.—Last summer, whilst walking in a plantation near Leeds, I disturbed a dormouse. It was under some leaves which I turned up with a stick. It ran off, and I followed it, as well as I could. I ran it some way and at last lost sight of it, at the foot of an oak-tree. I once thought it had ascended the tree, but I was not aware that these animals could do so, so I concluded he had doubled round the tree and hidden. Two or three days after I was with a friend in the same wood, nesting. He noticed a nest in a fork of the same oak and went up to it. It proved to be a blackbird's nest, with three eggs in. The nest showed unmistakable signs of mice having been there; the hay being bitten off and arranged over the top, so as to form a nest, two holes eaten through the side, and other trees. My companion disturbed the covering and brought the eggs down. They were hard "set." The nest was visited again, but seemed quite deserted. I have no doubt but that the mouse I saw had its nest in this tree, for I can swear to the tree being the same in both cases. The mice had intruded on the nest when the old bird had begun to sit, and she had left it in disgust. Any information on the subject of the climbing power in mice would oblige—"*Petrarch.*"

A Giant Potato.—While in the country last summer, I saw a potato (champion) which had attained the height of thirteen feet. Can our readers tell me whether this often occurs?—*R. H. Wellington.*

Local Names.—The stoat is in this neighbourhood called the "Clubstei." Is this a mere local name? And why has this name been given to the stoat?—*J. H. Ingleby, Northallerton.*

The Tides.—In treatises on tides it is generally stated that the tide on the side of the earth opposite to that on which the moon is exerting its influence, is caused by "the earth being drawn away from the water," and thus causing an appearance of the water rising. Will some of your correspondents explain what is meant by this phrase? Its literal meaning is simply impossible.—*W.*

Dredging in Menai Straits.—Would any of the readers of Science-Gossip who have had any dredging experience in the Menai Straits, kindly let me know the result? Is it a good dredging ground, and where would be the best place to stay at? Would Penmaenmawr do? I have tried Llandudno Bay, but was much disappointed. Also are there any books published on the natural history of North Wales, particularly the marine zoology?—*W. J. R.*

Birds sent to New Zealand.—I have somewhere read of small birds, such as finches, linnets, &c., being sent over to New Zealand for the purpose of destroying the insects which infest the crops there. Can you oblige by telling me if this be true, and if so, what birds are sent? I have a particular reason for desiring to know if yellow-hammers have been sent to New Zealand.—*Hon. Curator, Cardiff Museum.*

Puss Moth, &c.—I should be much obliged if some reader of this paper could inform me of the reason of the last pellet of excrement of the larva of vinula (puss moth), invariably being partially red; also I am anxious to find out where I can get "tea paper" for re-papering entomological cabinets and at what price.—*T. A. Dymes, The College, Eastbourne.*

Fossil Oysters, &c., at Peckham.—It may interest some of your readers to hear that on digging for a well in this neighbourhood (Peckham Rye, Surrey), recently, the excavators, at a depth of twelve feet below the surface, came upon a mass of broken cockle-shells imbedded in stiff yellowish clay; lower down there was a quantity of other shells, resembling the common periwinkle, and, lower still, oysters whole, in some of which, on being opened, the oyster was found converted into flint.—*W. T. Greene, M.D., F.Z.S., &c.*

NATURAL HISTORY NOTES.—*Autumn Primroses.*—On November 2, 1882, while driving between Cushendun and Cushendall, I observed a Primrose in flower; it was growing on a bank (facing west), by the roadside. *Seasonable Notes.*—Starling singing October 8, 1882, Cushendun. Thrush singing in Leeson Park, Dublin, December 3, 1882. 1883: Cushendun, frog-spawn, February 1. Snowdrops and hepaticas, January 16. Ribes bursting into leaf, January 25. January 31, fuchsias, and hawthorn showing signs of vegetation. February 8, gooseberries sprouting. February 10, hazel catkins bursting into fl., and primroses and dandelion in fl. February 12, crocus in fl. 23rd, celandine and coltsfoot in fl., Daffodils in fl., February 22. Ribes in fl., February 21. House-fly and blue-bottle seen, February 26. Specimens of tortoise and white-butterflies seen (in houses where they seemingly hybernate), in January and February. Swifts seen, September 2, 1882, at Cushendun. Cuckoo seen near the Rock, co. Tyrone, September 9, 1882.—*S. A. Brenan.*

POND LIFE IN WINTER.—I wish to add my testimony to that of the Rev. H. Carrington Lake that there is abundance of (microscopic) life in ponds during the winter months. For several winters I have examined pond-water in this locality, and have found almost as much life there as in summer. I have always found cyclops, daphniæ, vorticellæ, *Rotifer vulgaris*, *Pterodina patina*, *Cothurnea imberbis* and many others. Last January I found some tardigrada, and last week some stentors. I have never been fortunate enough to find *Volvox globator* in this locality, though I am always looking for some.—*Louisa M. Bell.*

THE LATE TRANSIT OF VENUS.—I noticed the cauliflower stalk of Venus—just inside sun's disc. Proctor says this is the puzzle of astronomers. Possible solution of this. First, no telescopic lens has a true mathematical curve, as the metal changes with every variation of temperature, and there are also the errors of manufacture. This is one defect. Secondly, Dr. Litton Forbes, lecturing at the United Service Institution, July 2, 1882 (see U.S.J.G. vol. 26, No. 118, page 821), describes there what he calls astigmatism, that is, the mesial and longitudinal curves of the human eye, are in an abnormal condition. If you hold out your hand before one bright light, bringing the thumb and fore-finger as close together as possible without touching and look between them, then the black drop of Dr. Forbes (see U.S.J., page 827), will be seen plainly as a dark bridge between the fingers. This is the cauliflower stalk of Venus.—*A. H. Birkett.*

ORCHIS MASCULA (p. 53).—I don't understand Mr. Malan's statement that the orchis bears no pollen. I have often looked at it. Like some others, it adheres together in a heap. Is it not so?—*Edward Henry Scott.*

SPONTANEOUS GENERATION (p. 70).—Will some advocate of this, it seems to me, absurd idea, tell me how there can be spontaneous generation when there is nothing to act spontaneously?—*Edward Henry Scott.*

LAND-SHELLS NEAR WINCHESTER.—The following are some of the rarer sorts of gasteropoda found within two or three miles of Winchester, during the last season: *A. lacustris; B. perversa; C. rolphii; B. leachii; B. obscurus* (white var.); *C. elegans; Helices aculeata, lapicida, obvoluta, sericea, Cantiana; P. fontinalis; P. carinata, contorta, nitida; V. pygmæa; Z. crystallinus, fulvus, radiatulus; P. vivipara.* Altogether Winchester can boast of sixty-five species out of the total number of British mollusca, or rather more than half, and probably there may be several others, e.g. of the Vertigos and Pupæ, still to be observed. The watery nature of the ground affords locality for numbers of freshwater shells, and the chalk attracts special land-shells, so that there is a double field for observation.—*B. Tomlin.*

SEA BIRDS NEAR CAMBRIDGE.—Mr. A. H. Waters mentions in your February number the fact that many sea birds are observed round Cambridge in the winter. During the summer months, usually, I think, before rain or stormy weather, sea-birds may be heard passing continually for a considerable time over the town by night. And at Abingdon, ten miles over the Gogmagog Hills, I have observed gulls wheeling over the valleys in August. May this not be an instance of instinctive habit and inherited memory in birds from the time when north of the Cam was the Isle of Ely, and the wide fens (then undrained) clothed either bank of the river? It is stated in Charles Kingsley's "Prose Idylls" that the tide was evident within ten miles of Cambridge in bygone days. If this is not the correct explanation, I fail to see what can induce sea-birds to travel so far inland during the summer as well as the winter months.—*A. S. E., Cambridge.*

PIGS SWIMMING.—I believe that there is about as much truth in the saying that a pig cannot swim, as there is in another old saw, i.e., "That a pig sees the wind." I have seen pigs swim across a pond when they have been taken to be well washed. Pigs, although they like to "wallow in the mire," enjoy a bath and a scrub, and fatten better when well washed. Some wash their pigs in buttermilk, I allude to gentlemen who keep fancy pigs, and the poor people in water; if near the seashore, they always try to give the pig a salt-water bath before they put it up to fatten. The pig's forelegs are curiously formed and placed, so it is just possible that the creature could not swim a long distance so well as a dog can. It does not strike out well, and I have heard the saying W. H. I. quotes as to a pig's cutting its own throat in swimming very often in South Wales, but not a scratch did I even see on the throat of any piggy that was thrown into the "Bryn Mor pond for a swim."—*Helen E. Watney.*

VINEGAR EELS.—Surely these little things are like "paste eels" and "wheat eels." Is not the right name "nematoid worms," or entozoa? Some people I know, term them Vibrios; but I lately read that this term was a misnomer, and I in another work saw that Vibrios were now considered to be microscopic plants, "Algæ of the tribe of Oscillatoriceæ." One thing is certain, good vinegar, that is vinegar free from mucilage, and possessed of the proper addition of sulphuric acid, is free from the vinegar worm or eel. Paste eels are most unnatural monsters, they eat their mothers up alive, and then run about inside her skin until the latter bursts, allowing them to escape from their "prison house." I believe the vinegar worm does the same, but no doubt some of the scientific readers of SCIENCE-GOSSIP will be able to give Mr. Smith a clear explanation.—*Helen E. Watney.*

VINEGAR EELS.—The small eel-like animals mentioned by W. Finch, jun., as occurring in vinegar, belong to the species *Anguillula acetica*, or the "vinegar-eel." They always swarm in enormous numbers in bad, stale vinegar. The dark internal matter probably is their digestive system. Closely allied to them are the well-known "paste-eels," *A. glutinis* and *A. fluviatilis*, found in rain-water amongst confervæ and desmidiaceæ, in wet moss, &c. Another species is met with in the ears of wheat affected with a blight, termed the "cockle." They all belong to the order Nematoidea (from the Greek, "a thread)," which order also includes the dreaded *Trichina spiralis*, of the class annelida.—*J. Beecham-Mayor.*

Eels in Vinegar.—The eels which W. Finch, jun., saw in the vinegar he examined under the microscope in all probability were the common *Anguillula acetica*, which, however, appear only in vinegar of an inferior quality. Should he be able to obtain a copy of the "Popular Science Review," No. vi. p. 213, he will there find a very interesting article on the vinegar eel, by Jabez Hogg, F.L.S., as well as a valuable tinted plate, showing the various stages in the life of one of these curious creatures; the drawing is by Mr. C. Whilley.—*Rev. W. A. Pippet, Rokeley, West Cowes.*

Double Oranges.—On two occasions I have come across a double orange, similar to that described by Mr. Parrott. The one I saw had the small orange growing at the stalk end of the larger one, and was also surrounded by the white pulp. It was about an inch in diameter, and was easily separated in five or six "liths." It contained no seeds.—*S. M. Wellwood, Glasgow.*

Rooks.—The wonderful sagacity of rooks has often been commented upon, and I am now witnessing a remarkable example. Close to my residence on the banks of the Teme is a small rookery; five or six pairs have of late years built their nests on a fine elm, growing on my side of the stream. On the other side a larger number have built in several poplars. The unusual floods have undermined the opposite banks, and one tree has fallen into the river. This seems to have alarmed the old occupants, and, although on my side, the birds have built as usual, on the other, they assemble in great numbers, have destroyed nearly all their old nests, but do not make fresh ones, and the daily commotion is quite remarkable; they evidently fear that the destruction of their homesteads is imminent. Four days later, the river has gone down nearly two feet, and three pairs of rooks are building their nests.—*G. C.*

Gold Fish in Spirit.—On Saturday, the 3rd of March, I placed in a bottle of spirits of wine a gold fish, which had died in my aquarium. I understood that, by placing any dead animal, fish, &c. (fresh), in spirits, it would be kept from decomposing, and also would retain its natural colour, in short, would remain just as it was when introduced into the bottle. Yet this fish, which I put into spirits, has, strange to say, lost all its colour and is now of a dirty white, and, to all appearance, is decomposing, being covered all over with a white film, just as it would if left to decompose in water. I should be pleased if any readers of this paper would kindly explain this.—*W. Finch, jun.*

Norwich Naturalists' Field Club.—The members of the above club held their annual exhibition of specimens in the committee room, Chapel-in-the-Field, on January 26th. The exhibits were very numerous, and consisted of animals, birds, fish, reptiles, plants, and insects. Three microscopes were kindly lent and exhibited. The exhibition was well attended and was a great success.

Early Flowering of Lamium Galeobdolon (Cranby).—Yellow Archangel. On the 18th of February, 1883, I gathered a specimen of the above, one flower of which was quite open, and many buds on the point of opening. I gathered the *Adoxa Moschatellina* (L.) for the first time this season on the same day.—*D. Noell Stephens, F.L.S.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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.

G. A. K. begs to thank "A Manchester Pythagorean," for the list of books on the above subject he has so kindly given.

A. J. A.—Your specimen is the commencing growth of the well-known "cellar-fungus" (*Tasmidium cellare*).

S. C. Cockerell.—The objects you sent us from a ditch are the valves of *Cypris elliptica*, a species of Entomostraca.

A. Ogilvie.—The leaves of *Arum maculatum* are frequently spotted with lightish spots, from partial absence of chlorophyll.

F. H. Streatfield (Pau).—The peculiarity of your anemone is that the leaves were affected by petalody—that is, had been practically converted into petals.

A. Laban.—The so-called "louse" on swine is a species of Ixodes, nearly resembling the dog-tick (*Ixodes ricinus*).

C. H. Waddell.—Get the Rev. W. A. Leighton's "Lichen-flora of Great Britain," &c. You may obtain a second-hand copy of W. Wesley, bookseller, 28 Essex Street, Strand. Papers on Collecting and Preserving Lichens appeared in Science-Gossip for 1872.

Dr. J. Needham.—We have searched in vain for a description of your fish parasite, but can find nothing at all resembling your rough sketches. It is very likely a new form. Have you mounted the specimen? If so, please send us the slide.

A. Draper.—Your freshwater shell is the young of *Dreissina polymorpha*, a bivalve now naturalised in England. It is believed to have been imported by timber ships from the Baltic.

EXCHANGES.

A large quantity of microscopic slides for exchange. Wanted books, lantern apparatus, &c.—F. S. Lyddon, 2 Oakland Villas, Redland, Bristol.

200 species of British shells, also Science-Gossip for 1880, 1881, and 16 numbers of 1879 and 1882 offered for other British shells, minerals, fossils, or microzoa. Lists exchanged.—E. D. Wilson, 18 Low Pavement, Nottingham.

Wanted, British and foreign land and freshwater, also British marine shells. Will give in exchange fossils from the chalk, or other shells.—Sydney C. Cockerell, Glen Druid, Chislehurst.

Various books offered in exchange for ancient seal impressions.—W. H. Tunley, 8 Albert Road, Southsea.

Wanted, any violets, except *V. palustris*. Fresh specimens preferred, in exchange for rare or critical British plants.—E. Straker, Kenley, Surrey.

Partly silver mounted muzzle loader gun, 3½ vols. "Intellectual Observer," Nos. 48-68 inclusive, a few lias fossils. Wanted, microscope, fossil cabinet, fossils, or books.—J. Floyd, Stratford-on-Avon.

Wanted, a few good pieces of brain coral and others in exchange for grand new "Natural History," 36 col. plates, and new bamboo fishing-rod, or cash, if cheap.—J. Ellison, Steeton, Leeds.

British shells for British or foreign land and freshwater shells, or European butterflies or nocturni.—T. D. A. Cockerell, Bertha House, Ethelbert Road, Margate.

Wanted, Machaon, Sinapis, Rhamni, Hyale, Paphia, Aglaia, Adippe, Polychlorus, Io Cardui, Galathea, Davus, Rubi, Quercus or Adonis, in exchange for rare foreign stamps, send for sheet on approval.—F. A. Skuse, 143 Stepney Green, London, E.

Scorpio Gervasii, Gonyleptes, Scolopendra, and various large insects from Chili (in spirit) offered for good microscopic or lantern slides. Send list to H. E. Freeman, 1 Templeton Road, Finsbury Park, N.

SINGLE and double stained botanical preparations. Selected and arranged Diatomaceæ, &c., for good unmounted material. Large Echinus and Cidarus spines wanted.—W. White, 7 Warden Place, Nottingham.

"DAVIS' on Mounting," &c., for two or three mounted slides, hydra budding or parasites wanted.—Henry Beech, Lincoln Road, Peterborough.

A GOOD field-glass German silver mounts, length when out, 28 in. dia. of O.G. 16 lines for micro apparatus. Books or material polariscope wanted.—Henry Beech, Lincoln Road, Peterborough.

WANTED, good foreign or English coleoptera or parts of ditto suitable for microscopic objects, sponge spicules, Polycistinæ or vegetable hairs in exchange for well-mounted objects. Quantities prepared.—M. J., 51 Great Prescot Street, London, E.

WANTED, well-set specimens of *Pieris Brassicæ, P. Rapæ, P. Napi, Lasiommata Egeria, L. Megæra, Hipparchia, Tithonus, Cœnonympha Pamphilus, Polyommatus Argiolus, P. Alexis, P. Ægon* and *Pamphila sylvanus*. In exchange for stamps, other insects, &c.—G. H. S., 143 Stepney Green, London, E.

WANTED, a few full-grown living *Helix fusca*. Land shells offered in exchange.—C. Ashford, Christchurch.

WANTED, to exchange 800 well-assorted foreign stamps for cases for butterflies, &c. What other offers?—A. P. S., 143 Stepney Green, London, E.

WELL-mounted slide of scale of Dee Salmon, splendid polar object, for other good slide; desideratum Polycystina.—John R. Marten, Cottage Hospital, Red Hill.

WILL exchange a well-mounted specimen of *Polyxenus Lagura* for six well-set specimens of any of the following butterflies, *Pieris Brassicæ, Euchloe Cardamines* (female), *Lasiommata Egeria, L. Megæra, Hipparchia Hyperanthus* or *Thecla Quercus*.—F. A. Skuse, 143 Stepney Green, London, E.

WANTED, model of great auk's egg in exchange for other birds' eggs, both English and foreign. Would like to exchange lists of duplicates with any collectors, especially of foreign eggs.—George A. Widdas, Woodsley View, Leeds.

WANTED, side-blown eggs of peregrine, hobby, stonechat, goldcrest, woodlark, goldfinch, twite, woodpeckers, sandpipers, herons, ducks, and many others; rare eggs offered in exchange. Please send lists to—W. Wells Bladen, Stone, Staffordshire.

VERY fine specimens of the great wartz and smooth newts in exchange for other live stock.—Edmund Tye, High Street, Stony Stratford.

WANTED, fossil ferns and leaves from coal measures; will give flint scrapers from Suffolk in exchange.—A. G. Wright, Newmarket, Suffolk.

PENNING'S "Field Geology," 2nd edit., revised and enlarged, new. Wanted, Miller's "Footprints of the Creator," latest edit., or Figuier's "World before the Deluge," must be in good condition.—A. G. Wright, Newmarket, Suffolk.

EGGS wanted, in sets of kittywakes, puffin, golden plover, red-breasted merganser, dunlin, white wagtail, &c., in exchange for cettis warbler, ostrich, osprey, belted kingfisher, &c. Send lists to—T. C. Burrows, Hope House, Hanover Square, Leeds.

EMU'S egg, fine specimen, from Sydney, for good specimen of ostrich or rare British egg; also a few rare British eggs for others equally good.—R. Standen, Goosnargh, Preston, Lancs.

WANTED, Cox's "Manual of the British Coleoptera" (second-hand).—E. P. Dyball, 54 London Street, Norwich.

DUPLICATES: Edusa, Sibylla, Paphia, Aglaia, Adippe, Euphrosyne.—Desiderata: Blandina, Cassiope, Davus, Athalia, Artemis, Betulæ, Pruni, Argiolus, Acis, Arion, Adonis, Artaxerxes, Actæon, Comma.—A. E. Gibbs.

TRACINGS and carefully-executed copies of rare drawings and plates of natural history objects in exchange for mosses or other micro objects. Correspondence invited by—H. R., 47 Marsland Road, Walworth, London, S.E.

BOHN'S translations of Homer and Herodotus, also Gill's "Myths and Songs of the South Pacific Ocean," offered in exchange for Rev. L. Jenyns' "Observations in Natural History," or any of Gosse's works.—H. R., 47 Marsland Road, Walworth, London, S.E.

A COLLECTION of British moths for exchange; micro slides or offers. For particulars apply—"The Beeches," Circus Road, St. John's Wood, London, N.W.

WANTED, herbarium or microscopic specimens of British mosses and lichens, in exchange for foreign animal and bird skins, insects, &c.—George E. Mason, 6 Park Lane, Piccadilly, London.

HAVE some *Helix hæmostoma*, and SCIENCE-GOSSIP for 1880 and 1881, unbound, to exchange for foreign shells.—Rev. H. W. Lett, Lurgan, Ireland.

DUPLICATES of *Arg. galathea* and micro slides, for insects or plants not in collection.—G. H. Bryan, Thornlea, Trumpington Road, Cambridge.

BRITISH birds' eggs to exchange for others, or geological pecimens.—James P. Page, Kingsbury Street, Marlborough, Wilts.

EXOTIC Lepidoptera.—Duplicates: *Orn. minos*, ♂ and ♀: *Papilio Hector*; Diphilus; Polydorus (fair); Demoleus; Agamemnon, Nereus; Eurimedes, var. Mylotes, Bates; Helenus; *Hel. glaucippe; Danais Erippus*; Alcippus; Montrouzieri (fair); *Minetra Gambrisius; Amauris Damocles; Dia. Anthedon* (fine); Dinarchæ, Hew. (fine); *Eurycus Cressida* (fair); *Harma Theobene*, ♂ and ♀; Canis, ♂ and ♀; *Urania rhipheus* (fine); *Morpho Sulkowskyi*; Cypris (fine); also many others.—Desiderata (Exotic Lepidoptera only): *Orn. Arruanus*, ♂; *Pap. Ascanius*, ♂; Æbalus; Mezentius; Choridamus; Dionippus; Leucaspis; Buddha; Palinurus; Perianthus; Blumer (Bois); Crino; Dædalus; Montrouzieri: *Morpho Godartia*: Aurora; Rhetenor; Anaxibia; Menelaus; Telemachus; Adonis; Nestira; Didius; Metellus; Peleides; also many others. Correspondents please write in English: numerous letters, &c. (some registered), remain unanswered through being in foreign languages.—J. C. Hudson, Railway Terrace, Cross Lane, Manchester.

WANTED, micro-books, appliances and slides in exchange for histological-pathological diatoms and other slides of general interest.—F. L. Carter, 20 Trafalgar Street, Newcastle-on-Tyne.

WANTED, correspondents abroad to exchange micro-material.—F. L. Carter, 20 Trafalgar Street, Newcastle-on-Tyne.

GEOLOGICAL cabinet wanted. Offered, books or cash. Send measurement.—E. W., 21 West Bar Street, Banbury.

I WILL give SCIENCE-GOSSIP for 1880, 1881, 1882 (cost 12s) for Staunton's "Manual" (2 vols.) or Cox's "Manual of British Beetles," or any good book on lepidoptera or coleoptera.—William P. Ellis, Park Side Farm, Enfield Chase, Middlesex, N.

OTHER British land or freshwater shells offered for specimens of *Helix pisana*, Müll.—Jessie Hela Fairlight, Elmgrove Road, Cathern, Bristol.

WANTED, a good specimen of a bronze celt from the Fens or elsewhere. Also Palæolithic, Neolithic or bronze remains of other sorts. Good fossils will be given in exchange.—Ernest L. Jones, 84 Norwich Street, Cambridge.

BOOKS, ETC., RECEIVED.

"Diseases of Memory." By Th. Ribot. London: Kegan Paul & Co.

"The Life and Work of Charles Darwin." By Professor Miall. Leeds: R. Jackson.

"The Study of Meteorology." By Robert H. Scott. London: Kegan Paul & Co.

"Ants and their Ways," By the Rev. W. F. White. London: The Religious Tract Society.

"Micro-Photography." By A. C. Malley, B.A. London: H. K. Lewis.

"Studies in Microscopical Science," edited by A. C. Cole.
"Annual Report, Dulwich College Science Society."
"Report of South London Entomological Society."
"Journal of Conchology."
"Land and Water."
"Northern Microscopist."
"Midland Naturalist."
"Practical Naturalist."
"The Field Naturalist."
"The Young Naturalist."
"Natural History Notes."
"The Naturalists' Monthly."
"American Naturalist."
"Canadian Naturalist."
"American Monthly Microscopical Journal."
"Boston Journal of Chemistry."
"Good Health."
"The Botanical Gazette."
"La Feuille des Jeunes Naturalistes."
"Le Monde de la Science."
"Ciel et Terre."
"Cosmos: les Mondes."
"Revue de Botanique."
"Bulletin de la Société Belge de Microscopie."
&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 12TH ULT. FROM:—C. F. W. T. W.—Dr. P. Q. K.—W. B. G.—J. E. A.—F. L. B.—D. M. S.—M. J.—G. H. S. R.—G. D.—H. B.—J. D. A. C.—F. S. L.—A. S. E.—A. B.—H. E. W.—W. M.—F. A. S. R.—G. A. K.—C. A.—A. P. S.—E. H. S.—E. T. S.—T. J. W.—J. R. M.—J. E.—J. F. R.—H. E. F.—T. S.—J. A. F.—A. H. B.—W. T.—E. S.—W. H. T.—A. O.—J. L.—L. M. B.—T. T.—S. A. B.—Dr. W. T. G.—S. C. C.—T. A. D.—E. W.—W. W.—A. J. A.—A. de S. G.—F. A. S.—H. H.—H. H. D.—J. B. M.—G. E. M.—H. J. R.—G. A. W.—W. L. B.—W. B.—A. G. W.—C. H. W.—A. R. G.—A. P.—H. W. L.—E. P. D.—C. H.—W. F.—R. S.—G. H. B.—J. D.—S. M. W.—A. J. B.—J. C. H.—L. H. S.—W. A. P.—E. S.—W. W. B.—A. L.—C. J.—G. B.—E. C.—F. L. C.—E. A. W.—W. P. E.—E. L. J.—D. B.—J. H.—H. F.—A. W. O.—H. M.—J. P. P., &c

A DAY'S MOUNTAIN RAMBLING IN NORTH WALES.

By WILLOUGHBY GARDNER.

THE 5th of September dawned drearily enough, with a strong east wind blowing; but as I had just arrived at Conway in North Wales for a short holiday, I was not to be deterred by this fact from setting out on a long-projected expedition.

Forming a triangular space upon the map between Conway, Bangor, and Bettws-y-coed, lies a wild and barren tract of mountains, the highest of which, Carnedds Llewellyn and Dafydd, are only a few feet lower than Snowdon itself. From its recesses flow Afons Dolgarrog, Porthlwyd, Dhu, Llugwy, and various smaller streams into the Conway river, which forms its eastern boundary; on its south-west side it is abruptly bordered by the pass of Nant Francon, running from Capel Curig to Bangor, and to the north-west lies the sea. The principal lakes of the district are Llyns Dulyn, Melynllyn, Eigiau, Cwlyd Crafnant, and Geirionydd.

This large and almost pathless expanse of country is, with slight exceptions, quite in its primeval state, and completely without cultivation, beyond perhaps a mile inward on an average from the high roads which surround its three sides. The southern corner is crossed by a mountain track running from Trefriw to Capel Curig, and the only other roadway cutting through it is one from Aber to Tal-y-cafn Ferry or Llanbedr, through the lonely pass of Bwlch-y-ddeuvaen. This road has been in use from "time immemorial," and in days gone by was doubtless one of the principal thoroughfares in this part of the country, starting as it did in Roman times from Deva (Chester), traversing Flintshire and Denbighshire, via Varium, and over the Conway to Conovium (a Roman station still traceable near Tal-y-cafn), it crossed the mountains through the pass of Bwlch-y-ddeuvaen to Aber, and then followed the coast to Segontium (Carnarvon). Earlier than the Roman era it was doubtless a British trackway, and at either end, at Aber and Tal-y-cafn, may still be seen an artificial mound, possibly a tumulus, covering the remains of warriors slain in some great battle for the possession of this, one of the chief highways into Snowdonia. At a later period these mounds were used as the sites of fortified posts for the defence of this important pass, and at Aber, so late as the time of Llewellyn the Great, a castle stood upon the spot. Besides these defensive mounds, the road is overshadowed at Aber by the strongly-fortified bluff of Moel-y-Gaer, and at the other end, above Llanbedr, the Celto-British intrenchments, perched on the top of Pen-y-gaer, frown over the plain below.

It was this ancient road that I purposed following, if not its whole length from Aber to Tal-y-cafn, at any rate for some distance, branching off afterwards into the high lands to the right; eventually, however, I abandoned the old roadway for the more enticing fields of exploration in the mountains towards Carnedd Llewellyn.

The day was not a very desirable one, owing to the cold east wind above mentioned, but still it had the advantage of being dry, which for mountain exploration is everything. I armed myself with satchel, containing provisions for the day, insect net, pill and other boxes for natural history specimens, sheets of blotting-paper for ferns, and (being a bit of a dabbler in the fine arts) paints and sketching block; over my shoulders I also slung my mackintosh, rolled up tight in a strap. In my pocket I carried a small telescope, ordnance map and compass, the two latter highly necessary; and hoping to find some wonderful stream or lake in which to ply the avocation of the angler, I tied my fly-rod up tight in its canvas case to use *en route* as a staff, and put my fly-book in my satchel; last, but not least, I put on a very strong pair of boots for the rough stones, streams, and boggy land I should have to cross.

Thus equipped, I set off by the first train from Conway to Aber, arriving there about half-past eight. On getting out of the train the clouds looked low and gloomy up the pass I intended travelling; but still being by nature of a sanguine temperament when out for a holiday, I hoped for the best. Leaving the station, I could not help being struck by the then comparatively insignificant and innocent-looking nature of the little stream which crossed under the railway line, and could hardly imagine that it could ever do so much damage as it did some few summers ago, when, suddenly swelled to a roaring torrent by heavy rains, it completely washed away the line, thereby causing no small inconvenience to the traffic. Half a mile up the road I reached Aber; turning to the left by the church, and then again to the right, I entered rather a narrow lane leading up to the glen. Once upon this road, one feels upon historic ground, for it is the one mentioned above, leading through the pass of Bwlch-y-ddeuvaen, which has been used from earliest times, and has been traversed successively by Ancient Britons and conquering Romans, Saxons, and Normans.

The first object of interest is "Y Mud," a small conical hill behind some cottages at the side of the road. This artificial mound, to all appearances, originally a tumulus, possibly covering dead warriors who have fallen defending the glen against the invader in very early times, had in the ninth century a fort upon it, and subsequently a castle and palace of the later Princes of Wales. This castle was the scene of a tragical tale, much dwelt upon by Welsh historians—the murder, by Llewellyn of Iorwerth, of a powerful Norman baron, William de Breos, for intriguing with his wife Joan, a daughter of King John of England. Here also Prince Llewellyn is said to have received the summons of the English king to surrender the Principality. Close by is an old house of Henry VIII.'s time, "Pen-y-bryn." Leaving the village the glen soon becomes narrower, and at one place in particular the high cliffs on the right of the road approach very close to the edge of the stream, which tumbles along among all sorts of romantic boulders on the left; one can well imagine what a difficult pass it must have been to force, when sturdy Welshmen held the heights above on both sides. On top of the rock on the other side of the river the ancient fort of Maes-y-gaer can still be traced, and looks well-nigh impregnable from below. Rounding a corner one soon comes to a bridge, Pont Newydd, about a mile from Aber, where the road crosses the stream and runs on in an easterly direction towards the Bwlch-y-ddeuvaen; notwithstanding the temptation to continue along it and investigate the remains of ancient habitation, burial-places, and other relics of antiquity to be met with on the route, I determined to follow the course of the stream and visit the famous Aber cascade, as I had never seen it; so leaving the road behind, I set off along a footpath through hazel coppices towards the north. These coppices looked as if they would prove fine hunting grounds for Lepidoptera; but being only a little after 9 A.M., and the wind in the east, I could not find anything worthy of note. In a short time the cascade came in sight, and a wonderful specimen of its kind it is too, looking in the distance just like a silver thread running down the face of the dark precipitous rock. Further to the right is another waterfall of similar appearance, but inferior in volume; the path gradually ascends all the way, eventually crossing a ridge, from which a fine view of the cascade can be obtained, and also, if you look behind you, a still finer view presents itself, for down the glen you see the blue waters of the Straits and a bit of Anglesea in the distance, between the high hills on either side. Almost the only bit of sunshine I was to be favoured with during the day here burst forth and lit up the distant prospect with a kind of electric-looking light, which was very striking and beautiful. After crossing this ridge, the path descends, and you get amongst large boulders, and finally down to the stream itself, which runs from a small pool at the foot of the fall, where the water dashes headlong down an almost precipitous rock a height of 70 feet. Here, it being three miles from Aber, I rested myself on a boulder stone, amidst most romantic and delightful surroundings, listening to the roar of the water coming down the rock above. Had it not been for the remains of those seemingly indispensable accompaniments of the British tourist and sightseer, viz. empty bottles and sandwich papers, one might have fancied oneself in some fairy country far from the haunts of men; but these relics strewn about, and the well-worn stones and paths at the foot of the cascade, compelled the idea that at a later hour of the day the scene would not prove nearly so lonely and romantic; as it was, on leaving, I met a solitary tourist wending his way to the fall, the only human being I was to see for the next six hours.

Looking at my ordnance map, I determined that my next destination should be a mountain tarn some three miles east as the crow flies, but much farther as a human being is obliged to walk, called Llyn an Afon, nestled at the foot of the steep precipices of Y Foel Fras. To gain this end I first thought of scaling the rock beside the cascade, and making my way up the valley above; but I came to the conclusion that it would be rather impracticable, so decided to retrace my steps for a short distance towards Aber, and then cross the hill to the east, where it was not so steep. I was also desirous of visiting the valley on the other side for the purpose of inspecting an ancient stone, then called the Arrow Stone (Carreg-y-

Saethau), covered with scores and scratches, which tradition says were made by the Welsh Chieftains sharpening their arrows and swords upon it, while swearing allegiance to their king. A little way down the path I espied a wire railing of very recent date running some way up the hillside, so thinking it would prove a fine help in the ascent, I commenced my climb alongside it. The railing was composed of upright iron posts with horizontal wires running through them; and, curious to note, the hollow beneath the top wire of nearly every post was tenanted either by a long-legged spider or an earwig. What the former subsisted upon I cannot imagine, for the situation seemed far too airy for many insects to be about, and in fact I did not see a fly of any kind, although I entertained hopes till the last post of finding some rare Lepidopteron or Coleopteron ensconced in the hollow instead of a spider! Finally reaching the top of the ridge, a fine bird's-eye view of the surroundings presented itself to sight. Down the valley to the north the stream wandered through the coppices into the glen to the sea; towards the west hills upon hills appeared, the one behind the other, many with carns on their summits; to the south the ridge I stood upon rose higher and shut off any more distant prospect; while to the east, after noticing the road I had formerly left winding on towards the Bwlch-y-ddeuvaen, the most prominent object was a mountain on the other side of the valley, composed of three peaks, the nearest of which had a most singular appearance, looking just as if Jove, seated up in the clouds, had recently poured down a quantity of loose earth and stones in the form of a conical heap! The valley below, stretching up towards the south-east, looked bare and wild enough for anything; a small stream ran along at its bottom, and at the other side a mountain track was traceable leading to a sheep pen about a mile further up. One could well imagine what a fine meeting-place this was for the sturdy British Chieftains of early days who assembled here to swear fealty to their sovereign lord, and death to their country's enemy, while sharpening their weapons upon the far-famed Arrow Stone; but much as I should have liked to have still further realised the scene by inspecting this relic of bygone days itself, and standing on the exact spot where these interesting ceremonies were enacted, I was unable to find the stone, for boulders of all sorts and sizes were to be met with all over the place, and after some little search I had to give up the idea of finding the right one as hopeless. I then turned my steps towards the Llyn; keeping pretty high up above the stream on its southern side, I pressed on over the greensward with which the hillside was covered, having occasional brooks to cross, but meeting with no serious impediment. The scenery here was very wild and lonely, and, indeed, well bears out the description I have read of its being one of the wildest valleys in Wales. There was not a living thing to be seen, but an occasional mountain-linnet, which I put up in my progress; the severe desolation of the scene was no doubt enhanced by the presence of the east wind, which would keep any birds or animals there might otherwise be hid away in their various retreats. The valley turned off continually to the right, and I rounded point after point, and crossed ridge upon ridge without catching a glimpse of the wished-for Llyn. Nothing was to be seen but bare mountains on both sides, and the little stream running along at the foot of the valley, without anything in the way of vegetation larger than a bed of rushes every now and then by the side of its course. It is a grand feeling to stand alone in a valley surrounded on all sides by these staid and solemn mountains, where all is hushed and still, especially to one just fresh from the noise and stir of a great city, where all is change continually. Here one sees around one rugged crags and grassy slopes which have slumbered on from age to age unaltered. Men come and go, build great cities, become mighty nations, which rise to great honour and decay away again till they are almost lost to sight, while these remain the same; truly and well have they been called the "everlasting hills." And yet they are not always so, through the successive cycles of time they do change; these hill-tops are slowly, but surely, being crumbled away by the successive frosts and storms which they experience. These valleys are being deepened quite imperceptibly to us, but none the less certainly, by the little trickling streams which run along their bottoms; and countless other agencies are wearing away and building up, so that in future ages our valley will look very different to what it does now. Again, if we look far back into the æons of the past, we must think of the period when these hills were buried deep in seemingly eternal snow and ice, or again when the same portion of the earth's surface was covered with a tropical growth, or was successively under either the deep or shallow waters of a torrid or a frigid sea. All these changes our mountains have experienced, passing slowly and imperceptibly from one condition to another, in what we can only try to realise as the "eternity of the past;" although to our present perceptions, and compared to our human and finite achievements, the hills, above all things, seem indeed everlasting in their changeless endurance.

(*To be continued.*)

P. MACHAON.—Are there two broods of *P. Machaon* in the year? I heard this question asked the other day, but it did not get a satisfactory answer, so I now ask it again, and hope some of the learned readers of this paper will answer it fully. If there are two broods, at what time of the year are the eggs of each hatched?—*Enquirer.*

RECREATIONS IN FOSSIL BOTANY.

REPRODUCTIVE ORGANS OF FOSSIL PLANTS.

By James Spencer.

No. IX.

HAVING given a brief account of a few of the common fossil plants found in our Halifax coal strata, and which are also common in the Oldham beds and elsewhere, before proceeding further with these sketches, I wish to draw the reader's attention to another class of objects which are in a great measure confined to this neighbourhood, many of them not having been recorded in any other locality.

Besides the common Lepidodendroid fruits and spores, some of which I have already alluded to, there are many other spores and conceptacles found in our coal strata. Some of these are exceedingly beautiful objects under the microscope, and also of considerable interest to the fossil botanist.

The objects I now wish to draw attention to have been described, by Professor W. C. Williamson, under the generic name of Sporocarpon.

Sporocarpon elegans.—This is a seed-like object, of about $\frac{1}{55}$ in. in diameter, or of about the same size as the common fringed macrospores. In its mature state, the sporocarpon wall is composed of a regular series of hour-glass shaped cells, which are imbedded in a plastic substance; it is furnished with numerous long hollow spines. These spines are merely prolongations of the hour-glass shaped cells, and each has an opening or mouth into the interior of the sporocarpon. The sporocarpon has a central nucleus, which is composed of a thin structureless membrane, containing a protoplasmic substance, which has been developed in many of the specimens into round cells or spores; the young state of the sporocarpon (fig. 70).

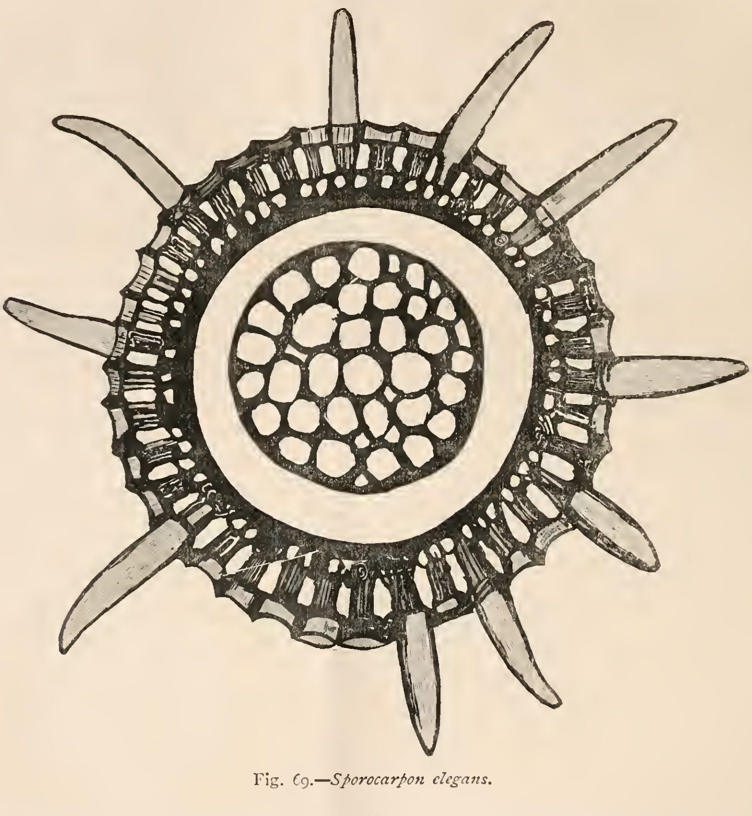

Fig. 69.—*Sporocarpon elegans.*

Three stages in the development of this organism have been observed, all of which are connected together by intermediate links. In the transverse section of the youngest known state of this sporocarpon, the wall is composed of a single layer of wedge-shaped brick-like cells arranged on their smaller ends. Many of these cells have their ends perfectly square, and in every respect, save in size, might have served as a model for some of the fire-bricks used in lining chimneys and furnaces.

The inner ends of the cells, that is, those forming the inner surface of the spore wall, are all square, and such was probably the case with all the outer ends in the first instance, when the sporocarpon was formed. The first departure from this uniform type of cell consisted in a few of the exterior ends becoming raised up into a triangular shape.

Sporocarpon compactum.—Other specimens show a gradual development of the outer ends of the cells, until at length all the ends have become angular, and then they gradually change into a convex form.

A tangential section of the sporocarpon in this form is a magnificent object under the microscope, and somewhat resembles the flower of the common daisy, but of course it has no relationship with that

"Wee modest crimson-tipped flow'r."

This is the form which was originally described under the name of *Sporocarpon compactum*, but which is now known to have been one of the earlier forms of *Sporocarpon elegans.*

The next stage in the development of the organism was begun by the formation of mammillæ, or minute points in the centre of the convex ends of the cells. These gradually enlarged, and were prolonged into hollow spines. While this was going on, the lower part of the cells, or those forming the sporocarpon wall, were being transformed into the peculiar hour-glass cells above mentioned, which were united together by a plastic substance that became converted at the inner surface of the wall into cellular tissue.

While this development of the spines was in progress, the protoplasmic substance forming the

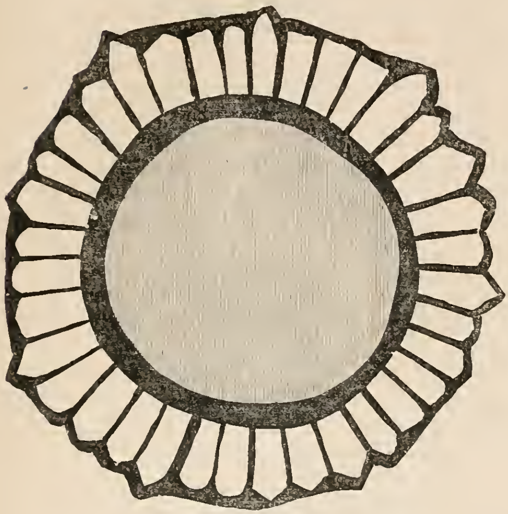

Fig. 70.—*Sporocarpon elegans* (young state).

Fig. 71.—*Sporocarpon compactum* (*S. elegans*).

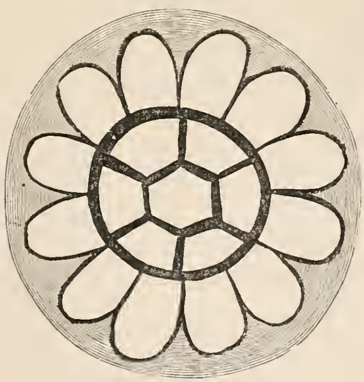

Fig. 72.—*Oidospora anomala.*

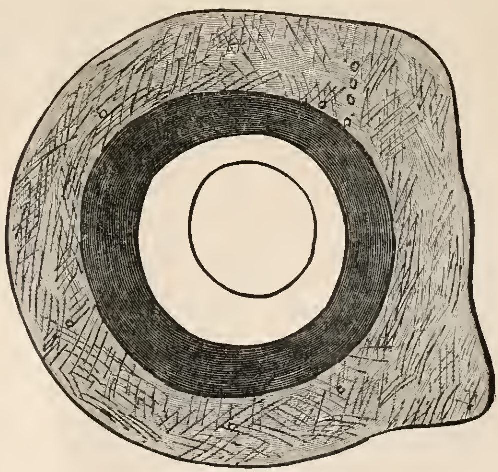

Fig. 73.—*Sporocarpon pachyderma.*

nucleus of the sporocarpon was being gradually transformed into round spore-like cells. This is the form first described under the name of *Sporocarpon elegans*.

When the organism reached maturity, probably all the cells forming the sporocarpon wall were converted into spines, which soon after appear to have become very brittle, and to have broken off easily, or become detached; in consequence of this, specimens with fully matured protoplasmic cells seldom have many spines attached. Such specimens, however, show most clearly the structure of the sporocarpon wall and the peculiar character of the "bottle-neck," or hour-glass cells, and their connection with the spines.

We have not the least idea as to the parent-plants to which these beautiful organisms belonged. Whether they may prove to have been one of the numerous forms of spores, and originally enclosed in the sporangia belonging to the cone of some unknown form of Lepidodendroid plant, or they are true seeds, is at present unknown. But judging from what we know of certain similar organisms, the former is more likely to have been the case.

Oidospora anomala.—This is a very minute, but very pretty organism, and bears some resemblance to *Sporocarpon compactum*, and on that account it has been suggested that it may have been the very young state of that organism. But for several reasons I cannot accept this conclusion, one of them being on account of its great rarity. The main objection to that suggestion is the great difference in structure between the two objects. Notwithstanding the fact that *Oidospora anomala* is one of the smallest organisms we met with, being even smaller than many of the protoplasmic cells seen in the interior of *Sporocarpon elegans*, yet it is as perfectly formed as any of the larger organisms.

It has a round body, to which are attached a number of thin membraneous appendages, which very much resemble the petals of some of the more delicate flowers. In the transverse sections of my specimens there are twelve of these petal-like expansions surrounding the body of the organism. They are perfectly free, being only attached to the body by their bases, while their edges are frequently seen to overlap one another. The wall of the spore is thin, and apparently divided into seven segments (as seen in transverse sections), which is quite a different feature to what obtains in any known stage of *Sporocarpon elegans*. As stated above, the spore wall, in the earliest known state of the latter organism, is a massive structure formed of brick-like cells, firmly united to one another; it seems to me, therefore, highly improbable that structures so radically different as these could belong to one organism. It is, however, much more easy to say what they are not like, than to form an opinion to what class these organisms really do belong.

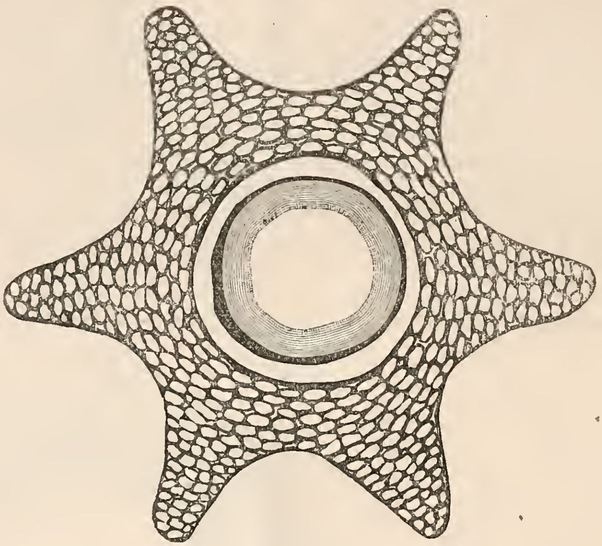

Fig. 74.—*Sporoscarpon asteroides.*

Sporocarpon asteroides.—This is another peculiar seed-like object, and about the same in size as *S. elegans*, but much more variable in its leading outlines. It has a central nucleus, which is enveloped in two membraneous coatings. The sporocarpon wall is a comparatively thin structureless layer. This is surrounded by a fleshy mass of cellular tissue, that ends out a number of triangular arms. In the true transverse section there are six of these arms (fig. 74), which gives the organism that star-like appearance from which it derives its specific name of *asteroides*. It is a very rare sporocarpon, and has been named and described from specimens from my cabinet.

Sporocarpon pachyderma.— This sporocarpon, at the first glance, appears to be one of the plainest and most uninteresting in the whole lot; but further examination shows that it possesses certain features which render its study of peculiar interest. It is about the same in size as *S. elegans*, and has a central nucleus enveloped in one or two membraneous coats. The sporocarpon wall is thin and structureless; but this is surrounded by what looks like, under low powers, a mass of structureless tissue of a deep brown colour. From the fact that these organisms generally occur in closely aggregated groups, and owing to the apparent structureless character of their investing tissue, it is difficult to make out the exact form which they assume. But when they occur singly, as in some of my sections, they are seen to be of a roundish form, but not exactly spherical. When this investing layer is examined under a high power, say $\frac{1}{6}$ or $\frac{1}{8}$ in., the interesting discovery is made that it consists of an intricate mass of branching tubes, which very much resemble a mass of fungoid mycelium. That they are not of fungoid origin is pretty certain, and from the fact of their generally occurring in clusters, I am inclined to think that they are a young stage of one of the other sporocarpons (*Sporocarpon Traquaria*), which I shall describe in my next paper.

Halifax.

NOTES ON NEW BOOKS.

OF all the obligations under which the student of science has been placed, he feels few more gratefully than the continued issue of the volumes of the "International Scientific Series." No fewer than forty-six have now been presented to the public, each written by the best man who could be thought of, independent of nationality, for true science is cosmopolitan. But we venture to say none of this valuable series will be regarded with greater respect than the last issued: "Elementary Meteorology," by Robert H. Scott, F.R.S., the head of the Meteorological Office, and under whose direction the weather forecasts familiar to all newspaper readers make their daily appearance. This book is devoted to the science of the weather. Everything relating to that fickle subject—instruments for measuring and calculating, methods of observation and inference, &c.—are dwelt upon in simple but attractive detail. The instruments are very properly described first; for, as the author well says, "the entire superstructure of reasoning in meteorology rests on the foundation of accurate observation" by their means. In Part II. of the book we have an account of the geographical distribution of the different phenomena, which will serve as a general introduction to the science of physical geography as taught in other text-books. We heartily recommend Mr. Scott's book to all students of natural phenomena, but especially to those who have taken up physiography and geology.

Man before Metals, by Prof. N. Joly (London: Kegan Paul, Trench & Co.), is another of the International Series. In many respects it is a remarkable book, among others because it claims a very high antiquity for the human race, and yet the author declares himself a devout and orthodox Catholic, showing that religious faith and belief in scientific hypotheses are not necessarily contradictory. As a book to read and enjoy, that before us excels many others of the series. It is written in a very animated style, and deals with the picturesque incidents connected with the appearance of primeval man upon the globe. It is profusely illustrated, and, as the author's reading has been very extensive, the student will find this book a complete summary of all that has been discovered and said respecting the antiquity of man, in every part of the world.

Flora of Hampshire, including the Isle of Wight, by Frederick Townsend, M.A., F.L.S., &c. (London: L. Reeve & Co.) This is a valuable addition to English botanical literature. The subject is dealt with on the broadest lines. Thus we find the position, soils, waste and forest lands, elevation, drainage, rainfall, geology, &c. of the district first treated upon. Hampshire is one of the most interesting geological areas in Great Britain, and the botany of a country is in close dependence on the geology. The mere fact that the New Forest lies in Hampshire prepares us for a rich botanical treat. The Isle of Wight is only a geological fragment of Hampshire, quite as varied in its natural productions. Mr. Townsend divides Hampshire and the Isle of Wight into twelve botanical districts, and he gives a coloured map showing their extension. Every species of flowering plant, and also the well-marked varieties of each species, is given, together with its locality, references to authorities and publications. The Cryptogamia are dealt with in an equally careful and methodical manner. The "Notes on the Districts" contain some thoughtful remarks; and a valuable chapter is that on the comparison of the flora with that of the neighbouring counties, and of Hampshire mainland with the Isle of Wight. Mr. Townsend has done his work carefully, lovingly, excellently.

Snakes: Curiosities and Wonders of Serpent Life, by Catherine C. Hopley. (London: Griffith and Farran.) A very handsome and a very interesting book. It is written in the genuine spirit of a true naturalist, which sees "nothing common or unclean." Snakes have long been the favourite objects of dislike and horror. In Miss Hopley they have found an apologist and even a champion. The habits, structures, relationships, &c. of snakes are dwelt upon with a charming naturalness. This is a book to read and to enjoy.

Colin Clout's Calendar, by Grant Allen. (London:

Chatto and Windus.) We have no fault to find with this book except its title, which conveys no idea of the rich treat all lovers of natural history will find in it. It is made up of 39 chapters or essays, originally contributed to newspapers, but which we are glad to see reproduced in their present form. Perhaps no living scientific writer possesses the scientific imagination so fervently as Mr. Grant Allen. Everything he discusses receives some original side-lights. Nobody has so largely availed himself of the fruitful suggestions of the doctrine of evolution as he; and no other writer has shown how important that doctrine is to explain matters otherwise unexplainable.

Ants and their Ways, by the Rev. W. F. White. (London: The Religious Tract Society.) This work is also a reprint of papers which have appeared elsewhere, and is largely a very cleverly condensed account of the recent discoveries of Lubbock, McCook, and others. It is very well written, and altogether a great improvement on the kind of books issued as gift-books by this society.

The Amateur's Aviary of Foreign Birds, by W. T. Greene, M.D. (London: L. Upcott Gill.) We have frequently been asked to recommend a book like this before us, and we shall for the future recommend Dr. Greene's. As all our readers are aware who have read the author's communications in the columns of SCIENCE-GOSSIP, Dr. Greene is an ardent ornithologist, and well skilled in the habits of caged foreign birds particularly. All the different kinds of beautiful foreign birds are here figured and described; their food, ailments, &c. are particularised; their breeding habits, habitations, &c. all detailed, so that no aviarist can get wrong. The illustrations are of a very excellent kind. We regret this useful little book was not provided with an index.

Micro-Photography, by A. C. Malley, B.A., M.B., &c. (London: H. K. Lewis.) We have here a very useful and much wanted little manual. The author has written it in order to encourage the practice of micro-photography. It deals with the properties of lenses, &c., microscopic illumination, mounting, section cutting, staining, and also gives a description of the wet collodion and gelatino-bromide processes. Not the least valuable portion is that devoted to the best methods for preparing microscopic objects for micro-photographing. There is a plate of actual micro-photographs facing the title-page to show what can be done, the objects selected being a section of the lung containing *Bacillus anthracis* × 420 diam., *Surirella gemma* and *S. Spencerii* × 1000 diam., central portion of *Aulacodiscus Kittonii* × 1500 diam., and scales of *P. Argus* butterfly × 320 diam.

Physics in Pictures, with explanatory text, prepared by Theodore Eckardt, translated by A. H. Keane. (London: Ed. Stanford.) This is a reproduction of certain German books intended for ocular instruction in schools and families. The coloured pictures are both attractive and effective, and the scientific principles they are intended to convey at once to the brain by means of the eye are very patent. They are admirably fitted for the purpose they are intended for.

The Life and work of Charles Darwin, by Prof. Louis Miall. (Leeds: Richard Jackson.) Prof. Miall has republished his lecture, delivered to the Leeds Philosophical and Literary Society last February, under the above title. It is an admirable summary of the life of a truly great man, written in strong sympathy for the noble spirit which has so recently passed away from our midst.

THE DANISH FOREST.

By JOHN WAGER.

IV.—THE DISTRIBUTION OF THE WILD-GROWING TREES.

[*Continued from page* 88.]

SCOTCH *Fir*.—Pine-trees, the chief constituents of the forests of neighbouring lands, have now in Denmark only a nurtured life. The Scotch fir, once a native tree, widely extended over many districts, has disappeared as a wild growth, and the conditions of the soil have become so unfavourable to it that its extension in the forests by natural sowing is impeded by many difficulties. On peat-mosses, however, Scotch firs which have descended from plantations may sometimes be found.

The *Yew* (*Taxus baccata*) does not pertain to the Danish flora, yet, being indigenous in all neighbouring lands—Norway, Sweden, Germany, and England—we are led to the conclusion that it must once have grown in Denmark also; especially as it has disappeared from many parts of Germany where it formerly grew.

Juniper (*Juniperus communis*) has great extension over hilly forest tracts, where the ground is sandy, and is therefore most common in Jutland. It is common also in the wooded districts of Bornholm, and on the chalk cliffs of Moen; while in many districts, even where the soil appears favourable to its growth, it is either altogether absent, or very rare.

Brambles, *wild Roses*, and the *Holly*, are not very arboreal species, but deserve mention, because by their abundance they contribute greatly to the character of some of the woods.

The bramble group may be met with in all Danish woods, but it appears, in numerous varieties, with the greatest profusion on the south-eastern coast of Jutland. There it covers all openings in the woods, penetrates among scrub and underwood, fills hedges and ditches with its bow-formed thorny sprays, and by preventing young trees from springing up on spaces cleared by the axe or the wind, renders it difficult for the beech-forest of the peninsula to renew itself. The wooded hills around the fjords by Kiel, Flensborg, Kolding, and Veile, are especially its home; from hence it diminishes in every direction —westwards, northwards, and eastwards among the islands, although plentiful at intervals in some of the woods, and chiefly on the island of Funen. Moen also is rich in varieties of the group.

The rose tribe follows, on the whole, the course of the brambles, being especially rich in numbers and varieties where they are most abundant, and towards the end of June profusely adorning the hedge-rows along the skirts of the woods. The rose is not, however, so characteristic of the east coast of the peninsula as the bramble; occurring in certain other districts, for instance around Elsinore, abundantly as there.

The holly, on the contrary, forms a decided mark of distinction between the woods of the peninsula and those of Zealand, being quite absent from the latter, and so exuberant in nearly all those on the east coast of the former as to render forest-culture difficult. Although not easily reared in gardens, in woods where it finds itself at home it has great power of extension; partly by means of roots which creep underground and send off branches, and because of all Danish trees it alone can defy the shade of the beech. While the bramble is so troublesome to cultivators when the open scrub changes to beech-forest, such change can only impel the holly to assume, on all sides, a horizontal instead of a vertical growth, its leaves still retaining their rich, glossy, dark green tint. It is especially abundant and luxuriant in the woods to the south-east of Kolding, and between the Kolding and the Veile fjords, keeping closely adjacent to the sea; a holly in the neighbourhood of Veile measures twenty feet in height, and its stem is nine inches in diameter at more than four feet from the ground. It is found also in the central parts of Jutland, and as far northwards as the borders of the Lümfjord. Eastwards its frequency rapidly diminishes; in the woods on the west coast of Funen, south of Middelfart, it is as plentiful as on the opposite Slesvig coast, but rare in the rest of the islands. It existed, however, less than a century since, in places from whence it has since disappeared.

Few plants elucidate the mildness of winter climate better than the holly, for it is the winter cold that determines its northern limit. In Norway it advances up to Söndmöer (lat. 62°), while in Germany its northern boundary line passes through Göttingen, Strassburg, Munich, Vienna, and through the south of Hungary to the Crimea. Its absence from Zealand and the small islands is not, however, to be attributed to the coldness of their winter climate, but to their position; the holly, coming from the west, not having yet, in Denmark, advanced so far to the east.

As the holly and the rank growth of the bramble are peculiar to the west of Denmark, so there are no fewer than five species of trees peculiar to the east, namely to Bornholm. They are the white beam, the intermediate white beam, the griping-fruited service-tree, the cotoneaster, and the alpine red currant.

The wild cherry (*Prunus avium*), and the wild pear (*Pyrus communis*), are found in several parts of Denmark; but the latter at least, notwithstanding its thorns, and a difference in the form of its leaves and fruit, is most likely the garden pear run wild. Unlike the known indigenous trees, it has no native Danish name. The stem of a wild cherry on Als, has a diameter of fourteen inches.

The mistletoe is rare in Denmark, both as regards locality and number of plants. It has been observed on the apple, the common maple, and the lime; Lolland and South Zealand are parts where it is least rare.

The trees hitherto mentioned, present in their extension one or other peculiarity which may furnish material for consideration. There are other species which in their local occurrence may certainly present peculiarities, but these are so slightly significant, that it is not far from the truth to say that the species are extended over the whole land. They include various willows, the sea-buckthorn (not in forests), the wild snow-ball, alder, honeysuckle, cornel, ivy, gooseberry, currant, black-currant, purging buckthorn, spindle-tree, sloe, bird-cherry, apple, hawthorn and rowan.

NATURAL HISTORY JOTTINGS.

Oviposition and Description of the Ivy Aphis.

OCTOBER 9th, 1882.—Having just completed a perusal of the section bearing upon the Ants in Sir John Lubbock's new work entitled "Ants, Bees and Wasps," and met with his account and descriptions of the ova of the aphis, I remembered that in the autumn of 1880 (September 30th) I had observed comparatively large and oblong ova on the leaves of some ivy-plants close to and even amongst the aphides in feeding them, and which I at the time thought would be the ova of some one of the hoverer-flies or Syrphi, deposited there so that the young might be in the midst of their food as soon as hatched, and that these ova passed through brown colour from pale yellow into shining jet-black, and, somewhat to my surprise, did not hatch while I continued my observations. Consequently, this forenoon I revisited the aphis-infested ivy-plants, in the full expectation of again meeting with these ova and finding them to be, not the ova of a Syrphus, but of the ivy aphis; and, surely enough, there they were, in greater numbers than on the former occasion, and under the same conditions and colours; and rambling over and amongst the stout and shining apterous oviparous females were several lean, lanky individuals, also apterous, which I at once, from prior observations on the aphis of a sallow, detected to be males. There were only one winged aphis, and a few pupæ, observed; and the majority were immature apterous individuals: during the last week in August winged aphides, as well as pupæ and apterous viviparous females, were numerous.

Cutting off a twig that had upon it many oviparous females and a few males, as well as plenty ova and some larvæ, I brought it home and put it under observation. Also, I took a *clean* young shoot of ivy and put it into a bottle with water, placing thereon a few of the stoutest oviparous females, and isolating them; also, put one into a small box. On the following day on examining the isolated shoot, I found that half-a-dozen ova had been deposited on the upper surface of its leaves; and in the box was found one ovum. Later, more ova were deposited by isolated individuals. Moreover, more than once while I have had the aphides under direct observation, a female has deposited an ovum, the process being slow and giving plenty of time for minute observation: had I not already been aware that these were oviparous females, I should certainly, on a casual glance with the naked eye, have thought that a young aphis was being ushered into existence, and not an ovum; in size and general outline the two, during delivery, are not so much unlike each other. That the smaller lean apterous aphides accompanying these oviparous females are males, there has been evidence clear enough, since most of them paired some time after being brought within doors, the first two on the second day; hence it seems evident they were in waiting on the full sexual evolution of the females. Of one couple that I isolated *in copulâ*, the female afterwards deposited ova.

The ova are deposited in greatest numbers on the upper surface of the leaves; and in less numbers on the under surface and in the axils of the leaves, as well as amongst the adventitious roots, or rootlets, of the young shoots. They are, when first deposited, of a pale yellow colour, smooth, shining, semi-opaque, with contents apparently homogeneous, and are covered with a very sticky substance which securely attaches them to the object upon which they are laid. In form they are oblong, and are 1-45th of an inch in length by about one-half that in breadth. They become shining jet-black in four or five days after deposition, having passed through deep yellow and brown.

Description of the ivy aphis.—Apterous viviparous female: length, 2–32nds inch; stout, and moderately nimble; colour of the entire body is a red-brown, the dull purple hue being caused by a general coating of bluish-white meal or very fine short down; limbs, pale colour, nearly white, with black knees and feet; the antennæ and rostrum are of the same ground colour as the limbs, and have their extremities also black; the cornua and the caudal appendage are black. Pupa: of same length, as nimble, but less globose and lighter in colour than vivip. fem., more especially in the largely developed thoracic region, which is pale greenish-yellow; wing-cases dusky, nearly black; the limbs, antennæ, rostrum, cornua and caudal appendage coloured as in female; is also meal or down-covered, giving the purple bloom: all the wingless brood have this purple bloom: very young ones possessing it, though at birth they are without it—are naked, and are then of a reddish or orange-brown colour, the limbs, antennæ, rostrum, and cornua being delicately colourless and purely transparent. Imago (winged form): darker, nearly black; the head, thorax, antennæ, cornua and caudal appendage are black, the abdomen dark brown, nearly black; the limbs and rostrum as in vivip. fem. and pupa, only darker; is without the meal or down; length, 2–32nds inch. Apterous oviparous female: in size, form and colour is similar to the vivip. fem.; excepting that when full of ova and about to lay it is more rotund or swollen, and has the dorsum shining, which is probably due to distension by the comparatively large ova, and the posterior portion of the abdomen beyond the cornua prolonged taperingly considerably; after the deposition of an ovum, the posterior projecting rings of the abdomen are retracted. Apterous male: in colour, is like the imago; in build, is lean and lanky, linear and much shorter than the other four forms, being only 3–64ths inch long, while the limbs and antennæ are longer and stronger; the antennæ are fully as long as the body. In all, the cornua are well developed, slightly tapering and cylindrical, and a little curving.

Are the winged individuals of this species of aphis viviparous females, evolved for the dissemination of the species? From observations on an aphis that here attacks a tall hawkweed (*Hieracium*), it appeared very probable that the cycle of aphid existence began on it as early as June 17th in winged viviparous females, which, then alone, were on the following day accompanied by many small apterous larvæ.

Sir J. Lubbock is of opinion that those aphides that are attended on and milked by the ants are not only protected by them, but that they are probably benefited by having their emissions of honey-dew removed by the ants. However this may be, I have observed that when unmolested by the ants the aphis of the ivy *forcibly ejects* to some distance the drop of liquor immediately on its welling up, as does the aphis of the sycamore; and it is perhaps reasonable enough to suppose that by their continued caresses the ants provoke prematurely these anal emissions of the coveted liquor, or honey-dew, which they at once secure.

What is the function of the well-developed cornua in this and many other species of aphis? Certainly not that of secreting the pellucid liquor which the ants so covet, and which in the aphis of the sycamore falls upon the upper surface of the leaves beneath those under which the insects lurk; this is *anal.* Can they be the extension and termination of the respiratory system? In all the species that I have observed in which the cornua were developed less or more, I never yet saw moisture exude from or stand on the summit of these organs; and for days together I have had the ivy aphides under observation when they were being numerously attended on, caressed, and freely milked by both a red and black species of ant, this being, I imagine, a crucial period.

CHARLES ROBSON.

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A STUDY OF THE VARIATION OF *VANESSA URTICÆ* AND OF SOME OTHER BUTTERFLIES.

By A. H. SWINTON.

TO the evolutionist, thinks Mr. Mosley, varieties may prove of the utmost interest as pointing to races gone before, or as offering indications of the approach of a new species. "Are there not," he says, "some occasions when we can call to our memory instances where the type has given place to the variety, and the variety in turn has become the type?" Who knows not, for instance, the little brown *Argus agrestis*, that out over the pasture-lands mingles its warm nutty-brown, dashed with orange spots, among the clear sapphire sparkle of the droves of blue butterflies that start up before the footsteps? Twice in the year it greets us: once when the spring rains are heavy, and the thick boughs resound to the song of the robin; and again at autumn, when the grass is scorched and dry, and the clearer sky is tracked by floating thistle-down. Go north to Edinburgh and traverse the Saxon-speaking lowland as far as Aberdeen, and you will there see appear once a year another blacker butterfly with a clear white fleck, like a piece o' the gowan, on its wing, and no more of those bright orange cairngorms than you may see displayed on the hinder wing of the female of the commonest blue: and yet this less canny thing is nothing more than a local alpine variety of the same rural butterfly, whose name has the advantage of being a celebrated typographical error. In my school-days wiseacres had it a species; and well I remember an excursion to Arthur's Seat, and mad-cap hunt all over the Queen's Drive, and down among the moist meadows gleaming with dragon-flies, in search of the then far-famed Artaxerxes, which of course never turned up; no, not when I had dared the last "no trespass" board, and found myself arrived opposite a garden gate, where, horror of horrors, a lassie was taking the evening air.

But insects not alone do and have varied on certain spots recluse, they change likewise in time, and either circumstance is greatly dependent on the existing climate. Many whites, blues and Vanessæ, array themselves at periods of the year in alternate spring and summer dress, the most noteworthy of these being the butterfly denominated by the French *La carte géographique*, which, as Boisduval first remarked in the year 1828, flaunts at spring in the most vivid of fawn colours, and then for the rest of the summer appears draped in black, branded on the wing with a different check; becoming thereby as changed in aspect, as though the fritillary in the woods had produced a White Admiral butterfly as its progeny. Should, however, a drier or a more humid season arrive, then another pattern-variety may be looked for, intermediate in character: such a season was 1865, unusually open and dry on the Continent, when many butterflies and moths produced an extra brood. That the epithet *géographique* has in more ways than one been happily conferred on *Vanessa levana*, and that such changes of costume may be often geographical quite as much as tweeds, mantles, cinctures, hats or turbans are, may be gathered from the fact, that white-bordered Camberwell beauties, which have become a race in Sweden, farther south appear similarly, but as a passing spring variety of the buffones; and even the redoubted Artaxerxes afore mentioned, or at least an intermediate form, has been produced abnormally at Brighton during July 1856. Other instances of seasonal varieties appearing from time to time in Central Europe, and establishing themselves as local races on its northern and southern confines, might be noticed; but there still remains a most interesting field of labour in this direction, that cannot but recommend itself to the attention of the entomological tourist, resident abroad, and the biological worker.

And if time and place mean change, and insects are thus disseminating themselves in new races, who would not desire to investigate farther the harmonies that loom on the gloom; and in the vacillating play of colour and pattern to cast each horoscope, and so trace the long butterfly pedigree coming down to us from that remote period, when the savage forest stretch of India and America had not receded from European acres where they lay blended; or the flora and fauna, so to speak, undergone their last selection and become as we now see them; rural with heather and dog-roses, oak woods, corn-fields and willowed brooks? As the mathematician, then, draws his base line, and measures the angles it makes with those remote periods whose position and relations he is desirous to ascertain, so let us employ the recognised systematic and geographical arrangements of butterflies, and by their means co-ordinate some of those ancestral features that greet us, as we turn backwards on the Lethean stream of time towards this ancient luxuriousness of wildered nature wantoning in its prime.

Identical in part with the present home of civilisation and culture, the European Asiatic region of insect life lies embosomed as a great natural park, situated, shall I say ? between the sixtieth and fortieth degrees of north latitude. Fenced in on the side of the south by the cicatrised scar of an old volcanic rent in the earth's crust, you may trace its bounds by a yoke of snowy peaks stretching away from the Pyrenees to the soaring Himalaya ; on the east and west it bathes its boundary in the sea waves, and away to the north it is enclosed by a line extending from the sunken chain of the Aleutian Islands, through the watershed of the Russian rivers, to meet the grassy undulations of the Cheviots. Not however as an arbitrary limit gaining import, as marking a line of fiery commotion and cloudy pillar during the

Fig. 75.

Tertiary and at older periods of the world's history, would this virtual boundary present so great a claim for consideration, as in its roughly indicating a climatic centre that here harmonises with the physiographical, from whose area the stream of life appears to have flowed, and by gradual transition passed into other and external forms ; just as we may witness the insect fauna of England blending into that of the Grampians and dark Loch Rannoch.

From among the tinsel of a gaudily decorated box, purporting to come from the slopes of the eastern Himalaya, I the other day had the curiosity to pick out some of those butterflies and moths that most reminded me of our English sorts. Here they are. Swallow-tails, not differing from those of the Cambridgeshire fen-land save that some of them dwindle to small dimensions. Brimstone butterflies, deceptively like the familiar harbinger of primroses and violets, but for their size and brightness, conjoined with a scorched-brown-papery look beneath. Clouded yellows that might have fed up in the nearest clover field, save that their orange is fiery and Eastern, and that their wing-spots beneath present white flecks. Queen of Spain fritillaries, queens if they be, imposingly large and rather grimy looking. Hawk moths, ermine moths, and red underwings in long array, alien where they are alien, in here a line and there a tone maybe. The pride of the case we now arrive at in a better fly of very dubious appearance. Who knows not the difference between a Painted Lady and Red Admiral ? "Widiculous," as the late Mr. Sothern used to say. Yet here is a butterfly, distributed from China to Teneriffe, that exactly matches the colours and unites the shape of each, and yet it is neither. In order that any one may note this circumstance and make comparison for himself, I furnish a figure of the under side—a crucial test.

When the butterfly (fig. 75) was first shown by

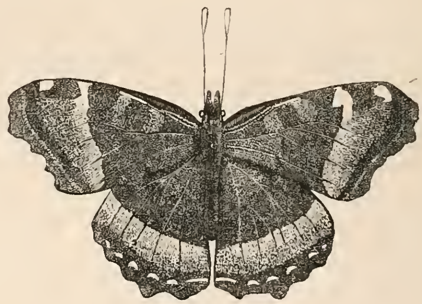

Fig. 76.

Weaver to the Rev. Mr. Bree, he reputed it an instance of a hybrid race. But doubtless at that time the distribution and variation of species was little studied ; so that if we now cast a retrospect on the history of the Painted Lady, widely disseminated and yet spreading in periodical migration, and so highly variable, that in Brazil and Australia it seems to have established, as Mr. Hewitson more than hinted, distinct races, the moral we arrive at is, that the butterfly or its direct ancestor is quite as likely to have been farther modified into the various local forms of the Red Admiral class that exist, as to have crossed with one of them ; the only apparent alternative being, that *Pyrameis callirhoë*, the Red Admiral of the Sikkim valleys, is the ancestor of our Red Admiral (*Pyrameis Atalanta*) and of the Painted Lady (*Pyrameis cardui*). One of these premises must to a certainty be true if $a + b$ is a and b, or if two parts make a whole in Callirhoë. My friend Mr. F. W. Kirby informs me that certain groups of butterflies are reputed recent, and doubtless when a thorough study of this branch of the Vanessides can be made, its generation will prove recent indeed among butterfly races.

Had the box been sent from any other place verging on the boundary zone of the European Asiatic, or, in technical language, the Palæarctic region; from one of my well-wishers, say, resident in Siberia, North America, China, Persia, Syria, Algeria, or the Canaries, the result would have been the same; even the remote island of the Mikado, as Mr. A. G. Butler most kindly brought to my notice the other day, containing strange giant races of our well-known night-fliers of the lantern and sugar-pot. In this case the water expanses of the Kamtchatkan and Mediterranean seas do not materially affect the distribution; but had the box been from parts more remote, the species would have been less allied in character to those that fly around us in the woods and meadows, the most distinct and specialised region with little doubt proving to be the forests of the Brazils.

Since we conclude from entomological observation, as from the record of the rocks, that an incessant extirpation and variation of species has combined with the agency of man in rendering the surface of Europe what we see it, it becomes not a little curious should we find in the butterfly fauna a tendency, under certain conditions of climate or otherwise, to fluctuate in the direction of these bordering forms. Let us take, for example, our small tortoiseshell. This butterfly, as I have already noticed, towards the north and east of the European area as on elevations in this country, scarfs itself in black and dispenses with its two wing-flecks. It likewise from time to time evolves another variety, an example of which I have just netted on the Surrey hills, that shows a yellow line running exteriorly to the black band. But only once unite these characters in an individual, and there is no evidence that such permutation is not in harmony with experience; and you will have presented to the mind a butterfly that a mere touch of the tar-brush would render undistinguishable from the somewhat scarce tortoiseshell of Canada, *Vanessa Milberti*, God. In order that comparison may be made by any variety breeder, who, having obtained his black-banded tortoiseshells, has yet greater aspirations, I give a figure of this insect from a specimen kindly sent me for the purpose by Dr. Haydon from the far off Hudson's Bay (fig. 76). As another example in passing, I might mention the American gooseberry moth, buff with black bands, and the caterpillars of our own gooseberry destroyer (*Abraxas grossulariata*) which, similarly pied, produces buff and black-banded moths occasionally.

Besides fluctuating in the direction of outlying races, butterfly forms approach and recede on the European area; a familiar instance occurring to me in a large tortoiseshell only lately bred from a brood of the smaller kind by Mr. William White, of the Epping Forest Field Club. Was it a large tortoiseshell or not? doubtless many have already inquired, and were they also large tortoiseshells obtained previously by Mr. Tawell from a brood of the same butterfly? Well, in the first instance I believe the matter is not unprecedented; and if we accept Professor Huxley's definition, and consider every butterfly form as virtually having a constant part of its organisation *A* in common with others, and a variable difference *n*, then there can exist no doubt, as I picture to myself, but that the butterfly has really relapsed into the type of the larger strong-winged sort, and reverted probably to an older form. For I think the matter will bear of being fairly resolved in this way. As Mr. White justly remarks, our large brown tortoiseshell is very much more constant in its wing-design than the smaller species is. The female is also pre-eminently single-brooded, laying her eggs during the sunny hours of spring, when alone elm-leaves are sappy and palatable to caterpillars; whereas her lowly congeners, floating about the succulent nettle patches, can there reproduce in many a ruddy generation throughout the warm summer months. As far as I can determine from my album of water-colour sketches, that variety of small tortoiseshell caterpillar that has the yellow lace, approaches closely in appearance the usual form of caterpillar belonging to the larger butterfly; and as all such finery tarnishes and turns black here in the hedges about the first of August, I consider these yellow-banded caterpillars as typically a summer form; and Urticæ and Polychloros, united in most cabinets by intermediate sports, to be the extremes of variation.

Some will doubtless conclude from this, that when glacial summers were, the short season only permitted of the existence of a one-brooded butterfly; and that as brighter years dawned, more broods were produced and variation ensued by seasonal varieties becoming permanent. Others again may think, the variation came about when the species first took to feed on the more succulent plant; and that this is, of course, merely a matter of adaptation, any may prove for themselves by mixing fresh elm-shoots with the nettle-leaves, and in this way inducing the caterpillars of the small tortoiseshell to relinquish their proper food for that of their congener. But as extremes will by no means negative means, and as some other existing butterflies as regards colour, shade, and pattern seem to lie between Urticæ and Polychloros, it would seem here a common ancestry is indicated, butterfly distinctions being invariably fine spun even, to the initiated. Indeed I conceive if any one will make a study of a perfect series of the group as now known, he will come to observe how it parts into a subdivision of butterflies, that like our native Comma, have a scollop in the fore wing. If he then single out two very similar butterflies with this ragged appearance, *I. album* and *V. album*, inhabiting Europe and Northern America respectively, he will come to observe how we may on the one hand trace the gradation of colour and pattern to Polychloros and the butterfly aptly termed Californica, and on the other hand, pass by gradual transition to the north Indian counterpart of Urticæ, Cashmirensis, to Urticæ itself, a little more modified in colour; and lastly to Ichnusa and Milberti, which appear as two diverging branches from Urticæ. The matter, drawn up in a diagram, will at least serve to show how closely variation, where it may be grasped, corresponds with geographical distribution, while it likewise suggests to the thoughtful a line of past modification and descent. For further information I must refer the reader to Mr. White's paper in the "Transactions of the Epping Forest and County of Essex Naturalists' Field Club for June 1881," with remarks by Messrs. Meldola and Butler.

BOTANISING AMONG THE SAND-HILLS, ISLE OF WIGHT.

By C. Parkinson, F.G.S., &c.

St. Helens' Spit, an extent of sand lying at the mouth of Brading Harbour, Isle of Wight, is one of the best botanising localities that we have in England. It has been estimated by Dr. Bromfield and other botanists that over 200 species of wild flowers grow on these forty acres, and it is certain many of our rarer plants may be gathered there either in June, for the greater number, or August for a few which flower late. Many of the trifoliums may be gathered here. *T. arvense* (hare's-foot trefoil) is abundant, growing among the loose sand in great quantities. *T. suffocatum* also buries itself in the sandy road, near a small wooden house at the water's edge; it is a plant which is explained accurately by its name, the stalkless heads appearing suffocated or choked in growth. *T. subterraneum* (subterraneous trefoil) is common among the grass, with about three small white flowers to each head, the whole plant creeping close to the ground, and therefore easily overlooked. *T. striatum* (knotted trefoil) is also among the sandy grass; the plant is downy, with pink, sessile heads, occurring sparingly here and there. *T. scabrum* is also hairy and procumbent, with sessile and nearly round heads of pale pink flowers, in company with the last, only a commoner species. *T. glomeratum* (round-headed trefoil) differs from scabrum in being smooth, having smaller leaves; the round, deep-red heads are stalkless, and the leaves often marked with white. These, with two or three commoner forms, make St. Helens' Spit well worth a few hours' search, even if nothing else grew in the same place. In June any botanist will be able to gather specimens of all the above named. *T. suffocatum* is the most difficult to meet with, and I would earnestly beg collectors to gather sparingly, so that the species may not be exterminated with us.

On the sand-hills facing the sea, *Œnothera biennis*, the evening primrose, grows in some profusion. Hooker and many of the authorities state that the Œnothera is not truly indigenous with us, that it was introduced from N. America. In any case, I can absolutely state that on St. Helens' Spit, facing the sea and a considerable distance from any cottage or garden, the evening primrose is flourishing as truly wild now as any plant can be. Here we find the Œnothera growing year after year in a seemingly wild state, but, on the other hand, botanical writers tell us it must have escaped from gardens or been otherwise introduced. How long must this evening primrose remain before we may call it truly wild?

Convolvulus soldanella (sea bindweed), a handsome rose-coloured flower, with fleshy angular leaves, is also abundant at St. Helens, perfectly at home in the loose sand. *Erythræa pulchella*, if it be a distinct species of centaury, I found sparingly; the corolla is smaller than in centaurium, in some cases 4-cleft instead of 5, and invariably deeper rose-colour. In long grass, almost before you reach the sandy spit, *Lathyrus nissolia* (crimson vetchling) lies hidden. It has grass-like leaves, single crimson flowers, and is the only vetchling minus tendrils. *Eryngium maritimum* (sea holly) is everywhere among the sand, having the prickly glaucous foliage and bluish flowers. *Sedum Anglicum* (white English stonecrop) and *S. acre* (wall pepper), with white and yellow starry flowers respectively, abound, the contrast being very striking. *Erodium maritimum*, with simple leaves and very small flowers, may occasionally be gathered, cicutarium, the common stork's-bill, being common.

Glaux maritima (sea milkwort) is another of the characteristic flowers, an upright little plant with dark green, alternate leaves and flesh-coloured axillary flowers. *Solanum nigrum*, garden nightshade, is a common weed, growing even in the cart-ruts on the sandy roadway across the Spit.

Euphorbia paralias (sea spurge) is thoroughly established at St. Helens; the leaves are glaucous, somewhat imbricated, the umbel 5-cleft, greenish with yellow glands. On muddy patches of ground, *Salicornia herbacea* (glasswort) and *S. radicans* grow; curious succulent green plants with little beauty to recommend them. *Arenaria marina* (sea sandwort), with fleshy leaves and purple star-shaped flowers, is abundant near the water's edge. *Silene maritima* is sure to be found among the shingle, almost creeping along the ground, with fleshy leaves that at once distinguish it from other species of campion or catchfly. *Armeria maritima* (sea thrift) is plentiful in every corner of our hunting-ground. Though *Statice limonium* must be sought for higher up in the dry bed of Brading Harbour, it is curious that this sea lavender should not extend to St. Helens' Spit. *Honckeneya peploides* (sea chickweed) grows on the sea-shore, very nearly down to tide mark; it has very large, greenish-yellow capsules which attract attention sooner than the white flower. *Cochlearia Anglica* (English scurvy grass) will be found along the embankment of Brading Harbour, and *C. Danica* is stated to grow at St. Helens, though I have not yet succeeded in finding a specimen. *Draba verna* (whitlow grass) is abundant early in the year. Most of these species may be found in June, as stated above, but the Spit is well worth a visit in August or September, to see several acres of ground literally covered with the delicate little *Scilla autumnalis* (autumn squill). The flower varies in colour from purplish-blue to nearly white; it blossoms before the leaves appear, thus differing from the bright blue spring squill. This rare little flower may be gathered by the hundred at St. Helens without any fear of extermination, so plentifully does it reappear every autumn.

MICROSCOPY.

FLUID CAVITIES IN METEORITES.—Last autumn we obtained a section from Edmund Wheeler. The bubbles in many of the cavities move distinctly. We have watched them under a "6th," but prefer the "12th." Last Friday evening we found in a tiny cavity an unusually active bubble; suddenly my husband exclaimed, "I have stopped it." True enough, there it was as quiet as possible at the top. The lamp alone had been touched; the lamp was moved, when off shot the bubble across the cavity and back; again the light was moved, and the bubble became as active as when first seen. We have Heinrich Hensoldt's very interesting paper upon "Fluid Cavities in Meteorites," and think our section is from that which fell near Braunfels. My husband is an old microscopist, and would much value a fragment as offered by Heinrich Hensoldt. The instrument and "powers" used were by the late Andrew Ross; the stand, his largest size. We have not detected any effect by light upon the other bubbles since examined.—*F. S.*

MR. BOLTON'S "PORTFOLIO OF DRAWINGS."—We have received a copy of No. 9 of this series. It is, as many of our readers are aware, a description of the living organisms (animal and vegetable) illustrative of fresh-water and marine life, which Mr. Bolton weekly sends out to his numerous *clientèle*. The illustrations are vigorous, and many of them quite artistic, whilst the descriptions accompanying them are pithy, but clear. When it is remembered that one of these drawings and descriptions accompanies each bottle of living organisms sent out for microscopical examination, the reader will begin to think there is a royal road to knowledge, after all! The present number gives descriptive illustrations of *Uvella virescens*, *Pyxicola affinis*, *Stichotricha remex*, Trochosphere of Alcyonidium, *Æcistes umbella*, *Floscularia regalis*, *Melicerta tyro*, Leptodora (young stages), Cephalosiphon, Annurea, Ammothea, Idya, &c. &c.

"STUDIES IN MICROSCOPICAL SCIENCE." Edited by A. C. Cole, F.R.M.S.—Some excellent things have been recently sent out in connection with these now well-known "Studies." Among the best preparations we may mention No. 39, "Tongue of the Dog;" No. 40, "Leaf of *Ficus elastica*" (transverse section); No. 42, a prepared section of the "White Syenite of Lairg;" and No. 48, another of the "Porphyritic Basalt" from Arthur's Seat, Edinburgh. These geological slides are of the greatest interest and beauty. Another containing a transverse section of the stem of *Ribes nigrum* (No. 44), stained with carmine, and that (No. 46) giving us a similar section of the "Leaf of the Scotch Fir," are exquisite specimens of mounting. The illustrations keep up their high artistic merit, and the "studies" or descriptive accounts of the objects are models of condensation, brevity, and withal of clearness.

HARECOURT LITERARY AND SCIENTIFIC SOCIETY.—This flourishing society held its first annual Microscopical Soirée on the 30th of March, in the Harecourt Hall, St. Paul's Road, N. It is pleasing to find all the chief metropolitan districts developing these scientific nuclei, around which it becomes easy for people of scientific tastes to collect and make each other's acquaintance.

JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY.—The last part of the journal contains a paper by Dr. Hudson, on "Five new Floscules; with a brief note on Professor Leidy's genera of Acytus and Dictyophora." The illustrations accompanying it are very beautifully executed. The address of the President (Professor Duncan) is also given in full, dealing with practical optics relating to the microscope. Mr. H. J. Waddington has a paper on "The Action of Tannin on the cilia of Infusoria," &c. There is, besides, the usual copious and excellently-condensed summary of current researches relating to botany and zoology, in so far as microscopy is connected with them.

LAND AND FRESHWATER MOLLUSCA NEAR LONDON.—Correspondents on this subject, if not already acquainted with it, would come upon some interesting records in Daniel Cooper's "Flora Metropolitana" (Appendix), 1836, where a very full list of shells and the localities in which they were found near London is given. Many of the places there named are now either built over or threatened, and local collectors would do well to work over the latter spots, that something may be saved before the flood of houses sweeps over these "happy hunting grounds" for the conchologist.—*B. B. Woodward.*

ZOOLOGY.

CLEANING BIRDS.—The new American publication "Science" says that, when obliged to wash birds, collectors will find it an advantage to use salt and water instead of plain water. The salt prevents the solution of the blood-globules, and consequent diffusion of the red hæmoglobin.

"EXTRACTING MINUTE SNAILS" (S.-G., No. 218, p. 43).—Permit me to say that the plan here recommended is not the proper one to adopt, inasmuch as, in boiling out the creature, you destroy the epidermis of the shell also; and as in many instances the character of the species depends upon keeping this intact, it is of the first importance to preserve it; e.g. *Helix aculeata*, *Planorbis albus*, *P. nautileus*. Again, it should be the object of the collector to preserve the shells in their natural condition, with all their distinctive peculiarities about them. Very minute shells (Vertigo, Pupa, &c.) cannot be emptied of their animal contents successfully. The best plan, supposing the collector is determined to try, is to put the living molluscs into tepid water, and allow them to protrude their foot to the fullest extent; then add suddenly boiling water, when with considerable care and labour part may be extracted—the muscular more opaque mass, foot, &c. My own experience teaches me that in the case of shells too small to be cleared of the animal by the ordinary method of scalding and picking out, there is no necessity to attempt the operation, as the creature will dry up sufficiently to leave the shell transparent enough to satisfy the student. I have *Clausilia rugosa*, var. *albida*, *C. laminata* and *albida*, *Planorbis lineatus*, and others, all semi-transparent forms, from which the creatures have not been extracted, quite clean enough to please the most fastidious collector. My advice is, carefully clean your shells of all extraneous dirt you can, by washing, before mounting them in your cabinet, leaving those too minute to clear of the mollusc to thoroughly dry (in a pill-box); but if you are desirous of retaining the natural beauty and character of the shell, do not use caustic potash. I am quite sure you will be satisfied with the appearance of the shells. If you are not convinced as to the correctness of my remarks, come and see my cabinets, and I think the shells will do what I have failed in.—*G. Sherriff Tye, Handsworth.*

ADMISSION OF LAND-SHELLS TO THE BRITISH LIST.—Mr. Sherriff Tye will, I trust, excuse me if I presume to express opinions opposed to the spirit of the remarks which he contributed to the December number of SCIENCE-GOSSIP (p. 278), on the desirability of admitting certain species of land-shells into the British list. I fully agree with him as to the definition of the term "indigenous," viz. not having been introduced by human agency; but when he states that, "in the absence of any information to the contrary, we have to consider *Helix villosa*, *H. personata*, *Clausilia parvula*, and *C. solida* as coming under that head, albeit there are at present very slight grounds for supposing them so," I must differ from him entirely. He says further, "Two specimens of *H. villosa*, I believe, have been taken near Cardiff, one dead shell of *H. personata* at Newcastle in Ireland, one specimen of *C. solida* near Bristol, and several shells of *C. parvula* at Kniver, Worcestershire." Now it seems to me that the grounds on which Mr. Sherriff Tye wishes us to admit these species as indigenous are so extremely slight that they point to a conclusion directly opposite to that which he has arrived at. I have not before me the original records of the discovery of these specimens, but I would point out that the three first were all met with in the immediate proximity of seaports; and as, taken altogether, only four specimens (one of them dead) have been found, I think the only rational conclusion which it is possible to come to is that they have been introduced—most likely with ballast. At Cardiff, where two specimens of *H. villosa* have been found, there is, if I have not been wrongly informed, an accumulation of ballast so immense that the owner of the adjoining land (the Marquis of Bute, I believe) has benefited largely by extending his house-property over it; and my friend Mr. Thomas Rogers, of Manchester, has found on the ballast-heaps there quite an extensive, non-indigenous flora, containing so many representatives of plants from far-distant parts of the world that I should be altogether afraid to state the number of species from memory. The Newcastle in Ireland where a single dead specimen of *H. personata* was found is, I presume, the seaport of that name in Dundrum Bay. It is especially unlikely that a species which has never been found in England should have occurred in Ireland; and I can only conclude that this solitary specimen, like that of *C. solida* which was found near Bristol, was introduced by shipping. It is true that conchologists are not a numerous body; but they are, I think, sufficiently abundant to have detected, before this time, other specimens of the foregoing species if they were indigenous to Britain, especially as attention has been called to them. The foregoing remarks, however, do not apply with equal force to *C. parvula*; and the fact of several specimens having been found so far inland as Worcestershire, suggests the question whether some collectors may not have mistaken this common continental species for *Clausilia rugosa*. An examination of a large series of specimens is desirable. It seems to me Mr. Sherriff Tye has arrived at a most illogical conclusion as to the distribution of these species. He says: "Reeve tells us the theory of migration points in a north-westerly direction; if therefore these species be really indigenous (their recorded habitats being continental), we should expect them to be found in south-east

England." It seems to me that if "the theory of migration points in a north-westerly direction," we should be most likely to find the species in question in the north-westerly parts of our country rather than in the south-easterly, unless we suppose that the migration has altogether ceased since the separation of England from the rest of the continent of Europe, which, as I take it, took place at a period sufficiently remote to have allowed the molluscs to have spread themselves, by now, in any direction over the country; so that I can see no reason for supposing that the species in question are more likely to be found inhabiting the south-east than any other part of England. At all events, none of the occurrences which Mr. Sherriff Tye gives have been in the south-east.—*Robt. Miller Christy, Saffron Walden.*

American Economic Entomology.—There are few of the numerous scientific publications issued by the United States Government which deserve more careful study than the Report of the Entomologist, Dr. Charles V. Riley. The volume for the past year is just out, containing chapters on American silk culture, the use of pyrethrum as an insecticide, the army worm, scale insects, insects affecting the rice plant, insects affecting corn or maize, the cotton worm, miscellaneous insects, methods of destroying insects, new insects, &c. The illustrations are numerous, and many of them are coloured plates, in a telling and even high style of art. We congratulate Dr. Riley on bringing out so admirable a report.

Hertfordshire Natural History Society.—The last number of the "Transactions" of the above society contains the following papers: "Hertfordshire Deer Parks," by J. E. Harting, F.L.S.; "Notes on a Microscopical Aquarium," by Isaac Robinson; "The Protozoa of Hertfordshire," by F. W. Phillips, F.L.S.; "The Upper Portion of the River Rib and its affluent the Quin," by Messrs. R. P. Grey, F.G.S., and R. B. Croft, F.L.S.; "The River Rib from Standen to its junction with the Lea," by A. G. Puller, F.L.S.; "Notes on the River Ash," by Hellier Gosselin; &c. &c.

The Cumberland Association.—As most of our readers are aware, the scientific societies in all the large Cumberland towns are affiliated to the above association, and the papers read at one society are interchanged with the other, with the happiest results. The "Transactions," therefore, form a decent volume. That for 1881–82 is just out, edited by Mr. J. G. Goodchild. Among the papers here published are the following:—The address of the President (Robert Ferguson, M.P.), on "The Future of the English Language;" "The Land and Fresh-water Shells of Cumberland," by Miss Donald; "The Glacial Deposits of West Cumberland," by J. D. Kendall; "The Fungi of the district round Carlisle," by Dr. Carlyle; "The Minerals of Cumberland and Westmoreland," by J. G. Goodchild; "List of Works on the Geology of Cumberland and Westmoreland," by W. Whitaker; "Local Entomology," by George Dawson; "Flora of Ullswater District," by William Hodgson; "Our Northern Mosses," by F. Harrison; "Flowering Plants of West Cumberland," by J. Glaister and Dr. Leitch; &c. &c.

The Study of the Ixodes.—Can none of your readers be prevailed on to take up the study of the *Ixodes* (ticks), of which there are several British species? I feel sure their life history, if fully worked out, would prove both interesting and instructive, and might throw some light on a mysterious and deadly disease amongst cattle and sheep, which prevails extensively in Scotland, and in some districts in England. It is a curious fact that Ixodes are almost invariably if not always found infesting sheep where this disease prevails, and it becomes an important question whether their presence is merely a coincidence from the rough coarse natural grasses forming a congenial habitat, or whether they are not the carriers or inoculators of vegetable or other poison. I should be very glad to give further information to any one disposed to take up the study.—*W. E. L.*

BOTANY.

Suffolk Local Names.—"Boar-thistle," *Carduus lanceolatus*; "Bull-fist," puff-ball, Lycoperdon or Bovista; "Bunks," wild chicory, *C. intybus*; "Canker-rose" and "head-ache," red field-poppy; "Clow," clove-pink; "Cow-mumble," *Heracleum sphondylium*; "Cuckoo-flower," *Orchis mascula*; "Dick-a-dilver," "periwinkle," *Vinca minor*; "Ebble," the aspen-tree, *P. tremula*; "Five-fingers," ox-lips, *P. elatior*, L.; "Fliggers," common flag, varieties of Iris; "Haw," ear of oats; "Hulver," holly; "Old man's love," "Lad's love," southern-wood, *A. abrotanum*; "Peagle," *Ranunculus arvensis*; "Pickerel-weed," *Potamogeton natans* (young pike are called "pickerels")—this is also "Tench-weed;" "Scallion," the edible onion; "Suckling," the white cultivated clover; "Quicks" or "twitch," *Triticum repens*. The red field-poppy is also called "Copper-rose:" is this at all connected with the French *couperosé*, and is "Ebble" for the aspen connected with "wobble"?—*P. S. Taylor.*

Dulwich College Science Society.—The fifth annual report of this society confirms our former opinion that this society is a model which all our public schools would do well to copy. The list of papers read covers a wide ground, chiefly of natural science. Important among them is one on the Botany of Dulwich, by the hon. sec., Mr. S. W. Carruthers. There are also abstracts of papers on the Geographical Distribution of Plants; the Natural History of Bournemouth; the Frog, a study on evolution, &c.; all indicating much mental activity and appreciation of the great thoughts which are moving the scientific world.

Peridermium Pini.—I regret that so many of those who have written to me for specimens of this fungus should have been disappointed in not receiving a specimen. The demand has this time proved greatly in excess of the supply. Should I be fortunate enough to procure fresh specimens this season, those to whom I have not sent specimens shall receive some, and those whose specimens were poor shall receive others.—*Charles F. W. T. Williams, Bath.*

The Home of the Potato.—Professor J. G. Lemmon believes he has discovered that the original home of the potato is Arizona. He discovered it in bloom last summer in the Huachuca mountains: by the 1st of September the plants had formed tubers as large as hens' eggs.

GEOLOGY.

Fossil Sponges from the Inferior Oolite.—A paper on this subject by Prof. W. J. Sollas, M.A., F.G.S., was recently read before the Geological Society. Some fossil Sponges have been described from the Inferior Oolite of the Continent, but hitherto none have appeared in the lists of fossils from this formation in British localities. The collection of Sponges described by Prof. Sollas was made by the Rev. G. F. Whidborne. The author described 11 species (6 of which he identified with those already described from continental localities), belonging to 9 genera, and concluded his paper with some general remarks. These Sponges are calcareous, but are considered by the author to have been originally siliceous, replacement of the one mineral by the other having taken place as already noticed by him. The beds in which these Sponges are found bear all the appearance of being comparatively shallow-water deposits.

The supposed Pre-Cambrian Rocks of St. David's.—The following important paper by Archibald Geikie, Esq., LL.D., F.R.S., was lately read before the Geological Society. The author began by briefly narrating the circumstances under which he had been led to study the geology of St. David's. He had visited the district twice, first in company with Mr. B. N. Peach, with whose co-operation nearly all the field-work was done, and again in conjunction with Mr. W. Topley. The paper was divided into two parts, the first being mainly controversial, and the second descriptive. Only the first part was read. According to Dr. Hicks, there are at St. David's three distinct Pre-Cambrian formations:—the "Dimetian," consisting of crystalline, gneissic, and granitoid rocks; the "Arvonian," formed of felsites, quartz-porphyries, hälleflintas, and other highly silicated rocks; and the "Pebidian," composed of tuffs, volcanic breccias, and basic lavas. He regards the "Arvonian" as later than and unconformable to the "Dimetian," and the Pebidian as younger than and unconformable to both; and he asserts that the basement conglomerate of the Cambrian system lies quite unconformably on all these rocks, and is in great part made up out of their waste. Taking up each of these groups in the order of sequence assigned to them, the author maintained that the "Dimetian group" is an eruptive granite, which has disrupted and altered the Cambrian strata, even above the horizon of the supposed basal conglomerate. He described a series of natural sections where this relation is exposed, particularly one on the coast at Ogof-Llesugn, where the conglomerate has been torn off and involved in the granite, and has been intensely indurated, so as to become a kind of pebbly quartzite. No other rock occurs within the granite mass except dykes of diabase, which rise through all the rocks of the district, but are especially abundant in the granite. The veins of finer granite, so general in granite areas, are conspicuous here. In short, whether studied in hand-specimens or on the ground, the rock is so unmistakably an eruptive mass, that the author could not understand how this view, which was that expressed on the Geological Survey maps, should ever have been called in question. The manner in which it has risen across the bedding of successive horizons in the Cambrian series proves that, instead of being a Pre-Cambrian gneiss, it must be much younger than all the Cambrian rocks of the district. The "Arvonian group" consists of quartziferous porphyries, or elvans, associated with the granite, and of the metamorphosed strata in their vicinity. Reference was made to natural sections where the actual intrusion of the elvans across the bedding of the rocks could be seen. The "Pebidian group" comprises a series of volcanic tuffs and breccias, with interstratified and intrusive lavas. The author maintained that this group forms an integral part of the Cambrian system as developed at St. David's. It has been broken through by the granite and porphyries, and is therefore of older date. Instead of being covered unconformably by the Cambrian conglomerate, as asserted by Dr. Hicks, the volcanic group is covered quite conformably by that rock; and seams of tuff are interstratified with the conglomerate and occur on various horizons above it. The conglomerate, instead of being mainly composed of fragments of the rocks beneath it, consists almost entirely of quartz and quartzite, only 4 per cent. of fragments having been found to have been derived from some of the projecting lava-islands underneath it. From the evidence now brought forward, the author contended that as the names "Dimetian," "Arvonian," and "Pebidian" had been founded on error of observation, they ought to be dropped out of geological literature.

Has "Helix aspersa" been found Fossil in Britain?—It certainly is an extraordinary fact that this well-known and common shell is conspicuous by its absence from all the lists of Pleistocene mollusca that I am acquainted with, though *H. nemoralis* (vel *hortensis*) and other large-sized Helices are common enough. The only alleged instance of its occurrence in the fossil state in England is that given by Ralph Tate in his "Plain and easy Account of the Land and Fresh-water Mollusks of Great Britain" (p. 146), where it is mentioned as being found "in the uppermost tertiaries at Newbury." Now, so far as I can make out, this refers to a specimen from the marly and peaty alluvial deposits of the Kennet Valley; but whether this example is still in existence or not, I have been unable to ascertain. This, however, I know, that pits have been sunk from time to time in these beds to obtain peat; that these excavations become filled with water in which aquatic plants of all sorts grow, fresh peat is formed, and in about twenty years the holes are completely filled up again. It must, I think, have been in the chance re-excavation of one of these that the *H. aspersa* was found, and not in the original Pleistocene deposit. Perhaps, however, some one of the readers of Science-Gossip would kindly help me in ascertaining the truth or fallacy of this supposition. As matters at present stand, I am nursing a kind of pet theory that *H. aspersa* was a Roman introduction (it has been found associated with Roman remains), like *H. pomatia* and for the same reason, but being a hardier mollusk has taken kindly—rather too kindly—to our climate and vegetation, and so has spread and multiplied more rapidly than its more conservative relative, the *H. pomatia*.—*B. B. Woodward.*

The Geology of Palestine.—The last number of the "Proceedings of the Geologists' Association" contains a lengthy illustrated paper on the above subject by the President, W. H. Hudleston, M.A., F.G.S. We have read it with the greatest pleasure, and strongly recommend its perusal to all our geological readers. It is an admirable summary of all that has been written on the geology and physical geography of this interesting country, and sets forth the chief geological features in the clearest manner.

The Interior of Greenland.—Professor Nordenskiold, the distinguished traveller and geographer, intends this summer to attempt crossing the interior of Greenland from the west to the east coasts. Many years ago Professor Nordenskiold got as far as thirty miles into the interior, and that is the furthest any one has yet gone. The Professor thinks the interior is not entirely covered with ice.

NOTES AND QUERIES.

Mind in the Lower Animals.—There are some things in the article on this subject in page 73 with which I cannot at all agree. For instance, talking about a dog eating, Dr. K. says, "There is no necessary connection, through memory, between different particles of food offered to him at different times." However this may be with a dog, it is not so with my cat. She knows and remembers well the difference between meat and any other food. She knows very well the difference between breakfast and dinner, and will, when she knows meat ought to be on the table, refuse what she will at other times take, because she knows that there is meat. Again, does a dog do more than a child when he remembers one pleasure and longs for a repetition, and expresses his joy in the prospect of it? An animal can show its hunger as well as a child, and in its way can ask for something to eat or drink. And did not the dog reason when he saw the woman in the water, as related a day or two ago, when he went and fetched his master to help him save the woman? And are there not many instances of dogs knowing a butcher's shop, and going and taking meat? And what must our dog have done but reason, when he as usual was quite friendly with a person who lived just on the other side of the road, and used to fetch her water from our pump, but one day as soon as she went to open the kitchen door laid hold of her clothes, knowing the servants were out? Was there no reason in a cat I knew who jumped up to the handle of the kitchen door, and supported herself there with one foot while with the other she opened the latch and so used to let herself in? Has really a cat or dog no self-consciousness? As I understand the term, they have a good deal of it. Have they no reflection, no memory? In short, animals are not human beings, and should not be compared with them, but I believe they have a certain degree—some more, some less—of reason; but they have no moral sense, no religious sense, no idea of a Supreme Being, other than that man is their god, whom they look up to and serve and fear.—*Edwd. Thos. Scott.*

Mind among the Lower Animals.—Being a warm friend of what are called the lower animals, and a believer in reasoning powers as possessed by them, I cannot let some of the sentiments expressed by Dr. P. Quin Keegan, in his paper under the above heading, be passed without comment. To take the first thing that catches my eye: the remarks about the dog and meat. I will not quote them here for want of room. I assert, contrary to the Doctor, that a dog does know meat as meat, by name, in our language, in contradistinction to other food. To instance my own little dog. If I say to her, "Do you want some meat?" she expresses her pleasure in many ways,—by jumping about, by her eyes, and by various little sounds, which are as much words and as expressive of ideas, to another dog, as our own language is to a fellow-countryman. And I, though I cannot pretend to translate a dog's talk word for word, can tell to a great degree what feelings are uppermost in its mind by the different sounds it utters. But "to return to our muttons." If I ask my dog if she wants meat, and then give her biscuit, although she may have been contentedly eating biscuit a moment before, she is not satisfied with it when the idea of something nicer is brought into her mind. Again, if the mere word "walk" or "street" is mentioned in her presence, she instantly becomes an attentive listener, and plainly associates the idea of going for a walk with the word "walk." And a dog can not only understand proper names, as is said farther on, but even adjectives. When my dog's dinner, of freshly cooked meat, is brought in; if I say to her, "It is too hot," she waits till it gets cooler. And even a tame thrush of mine, who is fond of warm boiled potato, is restrained from a too impatient assault on it by the words "Too hot." The learned Doctor says, "You might thunder the word 'fish' a thousand times into a cat's ear, but she would not understand." Now a cat of my acquaintance is instantly on the alert at the word "fish;" and if mice or rats are the subjects of conversation, she becomes extremely excited, as does my dog at the word "cats." Again, as to the remarks quoted from Bowen, as to dogs not knowing a pond as a pond, if they are not used to it; a large retriever which has frequently accompanied me in country walks will, on being told to go for a swim or go to a river, though in a new part of the country, run about looking for the means to take the said swim. Now as to the dog and well of water (p. 75): "If the dog had to explain by language that he wanted water, his powers would fail him." Why? He cannot speak our language, nor can we speak his. If we mention water, he will (I speak of ordinary pet dogs) show by his signs that that is what he wants. Are we much better? Should we not be in very much the same position if we wanted an "untutored savage" to give us water? And if he mentioned water in his tongue, should we know that he spoke of water? It may be argued, that the dog is not possessed of much intelligence because he fails to perfectly understand our language. To this I reply, "Might not the dog dub us unintelligent because we fail to perfectly understand his?" And that dogs have a language of their own, who will deny? or how is that, to bring up a well-known instance, a small dog who was maltreated by a big one, returned and arranged a plan by which a big dog of a friendly disposition accompanied the little dog to the residence of the savage dog, and punished him severely? For want of space I must leave the other points untouched; but, if it were permissible, I could fill the whole magazine with instances and arguments. I sincerely hope that the Editor will give me space for this paper, long as it is.—*H. C. Brooke.*

PLANT ON LUNDY ISLAND.—A letter appeared in the *Standard* of April 4th, on Lundy Island. It is there stated that a plant grows there in abundance early in the summer, with bright pink blossoms, said by the inhabitants to be the woad used by the ancient Britons. This description does not suit what we now call woad, or *Isatis tinctoria*. What is the plant spoken of? Will any one direct me to an account of Lundy Island, giving ample information about the natural history of the place, especially botany?—*H. E. Wilkinson.*

"COCOA" OR "COCO."—Is not the spelling of the word "cocoa" incorrect, and does not the error probably arise from confounding the coco palm with a totally different vegetable called the cacao?—*Ada P.*

SHELL COLLECTORS, TAKE NOTICE.—Just after the heavy snowstorm which visited us during March, and whilst the snow lay on the ground, I walked along the sea-banks at Redcar, where *H. nemoralis* abounds; but although dead shells were in plenty in sheltered hollows, no living animals came to hand. Strangely enough, however, I found three large stones whose heads peeped through the snow surrounded by broken shells of nemoralis and virgata, principally the first named. The shells lay on the snow, and had evidently been in many instances only opened that day. As I have not before observed this, I mention it as exhibiting, on the part of the birds, whose slaughter-blocks the stones evidently were, a considerable amount of dexterity and acuteness in discovering the hybernating mollusks. There were in all, I should say, some seventy or eighty shells round the three stones; and curiously enough the five-banded variety, which is most prevalent on these banks, was almost absent; the rarer varieties, with one, two, and four bands, being the chief victims among the nemoralis.—*B. Hudson, Middlesbro'.*

QUERY AS TO A FUNGUS.—Could you kindly inform me of the name of a fungus I found in January 1883? Several very small white fungi, scarcely larger than a mustard seed, on some small twigs on sandbanks near some firs. I put them under a microscope and saw they were white cups, like *Peziza communis*, only their edge was feathery. The cup did not spring directly from the twig, but was raised on a stalk. I found them near Salisbury, Wilts.—*C. L. Fort.*

VESPA NORVEGICA.—On the 23rd of January, 1883, a nest of *Vespa Norvegica* was found in the "super" of a straw hive which was inhabited by bees. The wasps were found in the adjoining hive in a torpid state, but unfortunately they were crushed by the gardener. I have this nest now with me. This took place at "The Grange," Hoddesdon, Herts.—*N. R. Wilkinson, St. Paul's Priory, St. Leonards-on-Sea.*

THE GUILLEMOT.—Your correspondent "P." (in the number for January last) is perhaps right in his objection that my notes on one of these birds might "lead anyone unacquainted with its habits to imagine it was unable to fly." I might have expressed myself with greater care. Guillemots certainly can fly "with great swiftness," notwithstanding their comparatively short wings. They can rise also from the surface of the water (they do so generally, I think, against the wind) because it gives under the strokes of their wings, but they cannot, I think, rise from a hard level surface. To get under wing from off a hard surface, I think, they have to drop from a considerable height; relying on this, I allowed the one spoken of perfect liberty. I have done the same with cormorants and gannets, but a gannet once did rise (against a stiff breeze) from a field where I was feeding it. It flew around me and settled again. In general, no doubt, the ledge of rock on which one of these birds settled is reached by flight, not by climbing. I have never seen one in its wild state attempt to climb; but from observation of the one in question, it would seem not to be a difficulty to them. My bird was not wounded when I got it; it was "unhurt," as your correspondent says it "must have been."—*P. M. C. Kermode.*

POND LIFE IN MIDWINTER.—It is Easter Sunday, and I have just read Mr. Lake's remarks on the above. I have seen *Melicerta ringens* that were captured in a December month. Mr. Lake wishes to correct an "erroneous" notion that I have given expression to, and that seemingly on the ground that he has captured caddis worms "in cases which have lost all their greenness;" but query had they any greenness when first built? This is omitted. I found, as hundreds I suppose have found before me, that caddis worms build their houses according to their surroundings. In a piece of the old New River in White Webbs, where the vegetation was plentiful, the cases were green; where the surroundings were dark, the cases were dark (decayed leaves, twigs, &c.); where shells, shells were used; and where sand, sand was made up into a little boat with a tube down the middle. I have kept caddis worms, but in no case did their cases turn from their greenness. Will Mr. Lake keep some caddis worms this season with green surroundings? and if he finds their cases lose their greenness, I shall be most happy to acknowledge that my expressions are "erroneous," which maybe they are. I find *Volvox globator* mostly in its active state in April, as I understand rain and sunshine are essential to it in this condition; but I believe it can be found in a quiescent state during any part of the year, and brought into an active state by the above means. I also understand that it is a great mistake to consider Volvox dead because it is not rolling through the water with extended cilia. I think Mr. Lake will be able to find during the winter months, as much as during the summer—certain larvæ &c. of course excepted, but by no means so plentiful.—*John Alex. Ollard, F.R.M.S., Enfield.*

Sea Birds near Cambridge.—It is probable that the gulls seen in summer by Mr. Waters were the black-headed gull, which breeds inland, and especially in dry seasons wanders long distances in search of food. The guillemots, shearwaters, and common (?) gulls were doubtless storm-driven. It would be very interesting if Mr. Waters could ascertain the species of the "shearwaters" which he records. There are four British species of Puffinus; either, I fancy, would be new to Cambridgeshire.—*Thomas Southwell, Norwich.*

Local Name of the Stoat.—In Norfolk the stoat is known amongst the country people as the "lobster" or lobstert, which is said to be derived from old Norse *lopi*, a lump or swelling, and *stertr* (Danish *stjært*), a tail. Probably Mr. Ingleby's "clubstei" is a corruption of the same. Bell gives the derivation of the word stoat from the Belgic *stout*, bold.—*T. Southwell, Norwich.*

Can Pigs swim?—In reply to W. H. F., I beg to give the following interesting fact. A gentleman residing at Caversham bought two pigs at Reading market, which were conveyed to his house in a sack, and turned into his yard, which lies on the banks of the river Thames. The next morning the pigs were missing; a hue and cry was immediately raised, and towards the afternoon a person gave information that two pigs had been seen swimming across the river at nearly its broadest part. They were afterwards observed trotting along the Pangbourne Road; the result was their safe return to the place from which they were originally conveyed to Reading, a distance of nine miles, and by cross roads. The farmer from whom they had been purchased brought them back to the owner, but they took the very first opportunity to escape, recrossed the water like two dogs (thus removing the stigma on their race which proverbially disqualifies them for swimming without cutting their own throats), and never stopped until they found themselves at their first home.—*W. H. G., Somerton.*

Podophyllum.—The podophyllum, as ordered to be used for preparing the resin for medicinal use, is *P. peltatum*. No other is recognised for medicinal properties in the Pharmacopœia.—*T. J. Wickes.*

Climbing of Mice.—I don't quite see what is the intent of "Petrarch's" question, whether he is merely inquiring about mice having their nests in trees, which I should fancy is very uncommon, or whether he doubts their power of climbing; but as to this I should not have thought he could have any hesitation. At any rate I saw a mouse running up the straight wall of my house, to get in at the bed-room window, into which one had got shortly before.—*Edwd. Thos. Scott.*

Climbing Powers of the Dormouse.—In answer to "Petrarch," I may say that there is no doubt the dormouse invaded the blackbird's nest. They and the long-tailed field-mice frequently alter a bird's nest for their own use. Dormice can leap and climb to an extent astonishing to anyone who has only seen them in small cages. One which I keep in a tolerably large cage jumps frequently from the floor to a perch nine inches higher, and thence runs along the wire top of the cage. Dormice, being closely allied to the squirrel, make their nests in bushes, and climb and jump about with great agility. Common house mice can run up a brick wall, as I have often seen them; and harvest mice climb with great ease along wheat-stalks. Long-tailed field-mice are also very good climbers; but the campagnol or meadow vole does not seem to be much of a climber, being more heavy and clumsy than the true mouse. In climbing, harvest mice aid themselves by twisting their tail-tips round any convenient stem.—*H. C. Brooke.*

Fish in Spirit.—I used frequently to have fish and reptiles and fat-bodied larvæ go bad, as W. Finch describes. I believe that they ought, except when very small, to be opened and disembowelled.—*H. C. Brooke.*

The Egyptian Gerbille.—Can anyone tell me anything of the habits and haunts of this animal? Having one alive, I wish to gain information about it, but I find it meets with but the barest notice in many zoological books.—*H. C. Brooke.*

Pied and Albino Birds, &c.—As I am gathering together as much information as possible on the above subject, I shall be greatly obliged to persons who may be able to send me any facts on any of the following points. I especially desire lists of birds abnormally pied (No. 3 below), with date and full details of occurrence. (1) Animals always white (lists of species, habitat, &c., required). Example: Polar bear, &c. (2) Animals always white in winter. (Has the degree of cold any effect on the amount of whiteness? How is the change from summer to winter colour, and *vice versâ*, accomplished? &c.) Ex.: Ptarmigan, &c. (3) Animals abnormally white (full particulars of locality, date, &c., desired). Ex.: Sparrow with white head, &c.—*Edw. J. Gibbins, The Graig, Neath, Glamorgan.*

White Varieties of Flowers.—As some interest is being taken now in the variation in the colour of flowers, I send you some memoranda of those which I remember to have seen in this part of Surrey. *Pedicularis sylvatica* and *Polygala vulgaris* are very frequently white, the last-named passing through various shades like the sweet violet. In 1869 I found a white variety of *Erythræa centaurium; Echium vulgaris*, 1870. In 1881 I found *Campanula rotundifolia*, nearly white, in open sandy ground. In March 1882 I found a white variety of *Lamium purpureum*, and, later in the season, of *Geranium Robertianum*. The late Mr. J. C. Loudon found that the flowers of this plant always became white under cultivation, in his garden at Bayswater. *Antirrhinum orontium* occurred white in 1865, and I remember finding a white *Centaurea nigra* many years ago. I have frequently seen pink flowers on this plant: *Achillea millefolium* sometimes occurs with us of a deep pink.

I also found *Glechoma hederacea* with lilac variegated flowers in 1869, and I once saw *Calluna vulgaris* white, and I think also *Scabiosa succisa*. In conclusion, it seems that blue and pink flowers are much more liable to white varieties than red or yellow species are.—*H. W. Kidd.*

USE OF THE TELESCOPE.—In these days when scientific trophies mostly consist in mummies and dried bones, it is not a little refreshing to discover that there remains for field purposes an instrument whose qualities for research have been for the most part overlooked. During these first few hours of real spring, I have drawn infinite delight from lounging on the grass, and watching the doings of my neighbour's starlings through a telescope at a distance of a thousand yards or so. The starling (*Sturnus vulgaris*) has naturally great urbanity; his whole time at present being spent in whetting his beak and pluming his glossy waistcoat. This delightful occupation proceeds until sun-down, when there is a reunion of starlings on the chimney-tops, and then they go it with such a rattling, squeaking, and whistling, as it were nigger minstrels or a party of fiends. The old crow is not nearly so consummate an actor; and probably when tall trees come to be cut down there will be an end of crows, rooks, and ravens hereabouts, unless they resort like the jackdaws to the church steeples. The starling contrariwise is emphatically a friend of man.—*A. H., Swinton.*

DRYING PLANTS.—I collected some plants and dried them as one would for a herbarium, last year. Now the colour of the flowers of some has remained—the buttercup, furze, saxifrage; while ragged robin has partially retained its colour, and restharrow and lousewort have lost their colour. Could any one of your readers tell me what method I should adopt so that I could preserve the plants, the colour of the flowers being retained?—*T. J. Wickes.*

LINYPHIA MONTANA?—In my remarks on Spiders in the April issue of SCIENCE-GOSSIP, *Linyphia montana* should read *Linyphia, ? montana*. I omitted the note of interrogation. The notes were made when I commenced collecting, and the accidental destruction of the specimen and other causes prevent my verifying memory, and I feel uncertain as to the species.—*J. E. A.*

ORCHIS MASCULA (p. 52).—Your correspondent E. H. Scott cannot have read Mr. Malan's paper on the common orchis, in which (I have just read it again most carefully) there is no such statement as "that the orchis bears no pollen." Mr. Malan has twice mentioned orchis pollen on p. 57: first he speaks of "the ripening of the pollen," and next of dews that "would spoil the pollen." In Hooker's "Student's Flora" will be found the following description of orchis pollen masses, of which each inflorescence produces but two only, "of many grains united by an elastic web."—*H. W. Lett, M.A.*

ARRIVAL OF SWALLOWS.—Dr. Abbott's interesting inquiry about North American swallows induces me to record my observation, that sand martins, barn swallows, house martins, and swifts have during the last eight years been observed in this neighbourhood exactly on the day after that on which, according to notices in the *Field*, each appeared on the south coast of England three hundred miles distant. Has any one else observed the same? I live on the south shore of Lough Neagh, where the Tipulæ are in millions all spring and summer, about the trees that verge on the water. I may just say that already the pioneers of 1883 are with us; several sand martins have been flitting about since 31st of March. Is not this early? I have not yet read of their first arrival this year in England.—*H. W. Lett, M.A.*

SPONTANEOUS GENERATION.—Should Mr. E. H. Scott not yet have made the acquaintance of the "Journal of the Postal Microscopical Society," I would advise him to procure part 5, which was noticed in SCIENCE-GOSSIP for last April, and to study the article on The Conduct of Scientific Inquiry, by E. J. E. Creese, F.R.M.S. In it he will find the arguments for and against the idea of spontaneous generation stated lucidly and forcibly. I have met nothing that so well gives the whole question as thorough a sifting as could be done in a short essay as this clever and thoughtful paper.—*H. W. Lett, M.A.*

WILL some reader kindly refer me to any papers on the botany of Snowdon and the Snowdon district that would be useful on the spot?—*J. B.*

THE PRE-CAMBRIAN ROCKS OF ENGLAND.—On reading the article on the Pre-Cambrian Rocks of England and Wales by Mr. W. W. Watts, which appears in the February number of SCIENCE-GOSSIP, I was struck with the remarkable character of the section shown in fig. 46. The angle (something like 130 degrees) through which the gneissose rocks (B) must have passed before the deposition upon them of the Holly-bush sandstone (A), is so great, that a suspicion is raised that some error must have been made, either in the representation of the section or in the interpretation of it. If there be no error, then the gneissose rocks must have been turned almost completely upside down; and although this is perhaps not impossible, yet it would be a movement of such magnitude that one may well pause and consider before accepting it as proved. Perhaps Mr. Watts may think it worth his while to refer to this matter, and he may thereby remove a difficulty from the minds of others besides myself.—*Henry Fleck.*

"THE STAR OF BETHLEHEM."—The American papers are discussing the expected reappearance of this star, which will be seen in the constellation Cassiopeia about August 1887. It is said to be the same star that appeared at the birth of Christ, and only appears once in 312 years; the last occasion being in the year 1572, when it was described by Tycho Brahe. I am not aware that he described it as having any connection with the one said to have been seen at the birth of Christ, but merely as a new star. On the night of the 11th of November, 1572, his attention was drawn to a brilliant and unknown star in the constellation Cassiopeia, which filled him with so much astonishment that he could scarcely believe his own eyes. To convince himself there was no illusion he put the question to other persons, if they saw the star that had so suddenly appeared. The star received the name of the Pilgrim, but it has also been called the Star of Bethlehem. It is said to have outshone all the stars in the sky, including Jupiter, which was then at its brightest. It continued to shine during the rest of the month with a lustre so great as to be visible to some persons in the day-time. It was at first of a bright white, afterwards a reddish-yellow, and lastly of a leaden white like Saturn. Its lustre began to diminish, and it grew fainter and fainter until it became invisible in March 1574. It is not to be supposed that the astrologers would allow so extraordinary a phenomenon to pass unnoticed; and therefore, according to these seers, it will appear in August 1887, accompanied by solar and lunar eclipses, together with the baleful influence that follows the position that Mars and Saturn will occupy—will cause a universal war, and portentous floods and fearful shipwrecks. North America will be involved in civil strife, and a reign of terror will prevail in the Atlantic States unless a Napoleon arises to quell it. There will be a war of classes—the rich will array themselves against the poor, and *vice versâ* everywhere. I am not aware there are any records to show that this star appeared in 312 or 627 or 942 or 1257, or any traditions to that effect; otherwise astronomers might account for its periodic flashes into brightness on the theory illustrated in the case of the star Mira, or that of T. coronæ, to which attention was called in 1866. Well, four years will soon pass over; and should it make its appearance at the end of that time, there will be some reason for believing that it is the star that suddenly flashed into such wonderful brilliancy at the birth of Christ.—*Dipton Burn.*

Disease of Larvæ.—Last season I reared about a dozen larvæ of the puss moth (*D. vinula*) from the egg. All went well until they were full fed and about to pupate, when they were attacked with a very curious disease: they became mottled with brown all over the body, refused food, and after violent purging died. Out of a dozen larvæ only one survived. I should very much like to know what this disease was, and if these larvæ are subject to it. It has never occurred before, with larvæ I have bred. Also, is there any remedy for it? Perhaps I should mention that they were reared in a cage in which larvæ of the gold tail (*L. auriflua*) had been bred, and it is well known that the hairs of these larvæ are very irritating to the human skin. The question here is, was this the cause of disease in the puss larvæ? It is just possible. I shall be very glad of any information on the subject. —*W. Finch, jun., Nottingham.*

Puss Larvæ, &c.—Although I have reared many of these interesting larvæ, I have never noticed as yet the peculiarity mentioned by T. A. Dymes, that the last pellet of excrement of these larvæ is partially red. I confess I have not made much note of the excrement of any larvæ I have reared (some hundreds), as I did not consider it a very interesting matter. But I shall be pleased to hear the experiences of other naturalists, as regards this subject. As to paper for lining drawers of cabinets, it may be obtained from any stationer; it is sold by weight at fivepence or sixpence per pound, there being on an average about thirty sheets to the pound.—*W. Finch, jun., Nottingham.*

Climbing Power in Mice.—In woodland rambles the common dormouse may be watched in its full activity, nimbly leaping through the intertangled brushwood, and climbing the hazel-bushes in search of its favourite food, the hazel-nut. It is very evident that the climbing power of these sprightly creatures is not absent, and it is very interesting to watch them—for they are generally in twos and threes—in their quick gliding movements along the hedgerows; now leaping with sportive activity over protruding roots, now sitting erect, and then, with a bound characteristic of its allies, it ascends the smooth stem of a hazel-bush. The hybernating habits of the dormouse are too well known to allow of any comment here; but perhaps it may not be out of place to remark that their frequency in the old nests of hedge-sparrows may add a point to prove the climbing powers of these animals. It is universally admitted that the common mouse (*Mus musculus*) is an expert climber, and has been known to obtain its food from the most unlikely places. A case which is worth recording came under my notice some years ago in one of the Northumbrian coal mines, which are infested with these pests. On occasions when the work has been suspended for a few days they turn out quite ravenous. This behoves the workmen to be careful how and where they lay the little bag containing the viands for the day, in order that it may escape mousie. One of the workmen had fixed his "bait" in a rent in the roof, where to all appearances it was quite safe. The passage was about seven feet wide and six feet high, with coal walls cut almost vertical. When the workman came to his food, he found it riddled and crumbled by the mice, which dropped to the floor and decamped. There was no timber about the place by which they could ascend, so it entailed the animals' scaling the coal walls. But what is more perplexing is the fact of their getting along the smooth roof to where the miner's food was concealed! Leaping was impossible.—*P. Dodds.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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. Brook.—We have no doubt your sketch is that of the Apollo butterfly.

A. Beales (Maidstone).—Your shells were quite smashed when they reached us. Delicate objects should never be enclosed in an envelope, but in a box, with a directed label attached. Send us some more, and we shall be glad to help you.

E. L. L.—Several excellent papers on collecting and preserving botanical objects, and on how to make herbaria, have already appeared in our pages.

Firefly.—The autograph and book you mention do not possess any special pecuniary value.

F. H. A.—The red objects clustered on the back of the oyster-shell you sent us are Ascidians, commonly called "currant squirters" (*Cynthia grossularia*).

T. J. Wells.—The 7*s.* 6*d.* microscope will be of little service to you. You had much better get a cheaper pocket-lens with several glasses. Cooke's "Manual of Botanical Terms" is published by W. H. Allen & Co. Davis's little book "On Mounting" is cheap, and published by the same firm.

H. R. Alexander.—You will be able to get the self-acting air-cans mentioned in Taylor's "Aquarium" of J. A. R. Sclater, Naturalist, Teignmouth, who is the inventor. Please address your queries to him as to price, capacity, &c. You will find "Half-hours at the Sea-side," and Gosse's "Year at the Shore," would help you. Gosse's "Marine Zoology" is very cheap, and covers all you require.

R. Henslow.—You will find all the commoner objects occurring during a walk figured and described in Taylor's "Half-hours in the Green Lanes."

E. E. Turner.—Berkeley's "Introduction to Cryptogamic Botany" was published by Baillière in 1857. Mr. Collins advertises a secondhand copy in his last catalogue at 15*s*.

E. Fewings.—You will find the theory of Geotropism fully discussed in Darwin's "Movements of Plants." Knight's paper on the subject was published in the "Philosophical Transactions" for 1806, pp. 99–108. See also Sachs' "Botany" for discussion of Geotropism, page 758. You will find a good account of Knight's experiments on this subject in Prantl's "Text-book of Botany," (London: W. Swan Sonnenschein and Allen).

R. Brayshaw.—We know nothing about Loisette's System of Memory, but our contemporary "Knowledge" appears to think highly of it, and recommends it.

A. W. OGILVIE.—"Asbestos" is the name given to the fibrous varieties both of hornblende and pyroxene, chiefly of the former. Pumice-stone has nothing to do with it, being a light felspathic cellular substance, ejected from volcanoes.

F. W. CRICK.—Your glass tube was quite smashed when it reached us, but we were able to secure as much of the specimen as caused us to believe it is one of the leech family, most probably *Clepsine hyalina*. Try and send us a live specimen.

EXCHANGES.

EGGS of sooty tern, spotted sandpiper, black-bill cuckoo, golden-wing woodpecker, Carolina crake, red-eyed flycatcher, &c., to exchange; also sets of laughing gull with full data, and many American eggs. Foreign or the rarer English eggs wanted in exchange.—W. R. Wharton, Germantown, Phila., Pa., America.

"BRITISH Bee Journal," August 1881 to December 1882, inclusive, and "Life of Rev. Philip Pugh," binding worn, for exchange. What offers in old SCIENCE-GOSSIPS, micro slides, or British shells.—G. F. Wheeldon, 15 Hanover Street, Birmingham.

WANTED, rare varieties of *Helix nemoralis, hortensis, hybrida, aspersa, virgata*, &c. Also several correspondents for coming season.—B. Hudson, Stevenson, Jaques, & Co., Middlesbro'.

SECTIONS of *Trichomanes radicans* (Killarney fern), *Hymenophyllum demissum*, and other ferns, double-stained, for other well-mounted slides; parasites preferred.—A. Norris.

"THE Alkali Trade" (Kinzett); will exchange for "The Principles of Geology" (Lyell), in good condition, or books of the International Scientific Series.—Edward Blythe, Green Lane, Wavertree, Liverpool.

OFFERS invited for Deschanel's "Natural Philosophy," translated by Professor Everett, 4 parts, 1877; Gray's (Asa) "Lessons in Botany," New York, 1879; Messer's "British Wild Flowers by Natural Analysis;" all in excellent condition. Botanical works preferred.—F. Tunbrell, 51 Queen's Road, Upton Park, E.

WANTED, living specimens of *Unio tumidus, Neritina fluviatilis, Hydrobia similis, Planorbis carinatus, Ancylus fluviatilis*, and *A. lacustris*. Exchange shells or slides.—G. T. Lightwood, Lytham.

DRIED plants, neatly mounted, for exotic ferns.—C. H. Goodman, Lesness Heath, Kent.

CEYLON shells, Cypræidæ, Conidæ, Volutidæ, &c., in exchange for other shells, British or foreign, not in collection; or fossils.—J. H. K., Wesleyan Schools, Didsbury.

"ENGLISH Mechanic," vols. xxx.–xxxvi., unbound, for "Midland Naturalist."—W. R. Wells, Greenbrook Terrace, Taunton.

WANTED, living specimens of the edible frog (*Rana esculenta*) in exchange for other natural history objects.—Edward J. Gibbins, The Graig, Neath, Glamorgan.

WANTED, living specimens of marine algæ (especially *Iridea edulis*) and sea-anemones, cucumbers, &c. (especially *Sagartia viduata, miniata*, &c.), in exchange for freshwater beetles (*Gyrinus natator, Notonecta glauca, Dyticus marginalis*), &c. State wants, and if possible they will be supplied.—R. A. R. Bennett, Walton Manor Lodge, Oxford.

CLIFTON corals in the rough, offered in exchange for tropical recent shells, land or marine.—F. M. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

WANTED, mounted micro-photographs; will give in exchange mounted histology specimens.—B. H., Guy's Hospital, S.E.

EXOTIC Lepidoptera, numerous duplicates to exchange for others, exotic only.—J. C. Hudson, Railway Terrace, Cross Lane, Manchester.

WANTED, in fruit, *Campylostelium taxicola, Eucalypta commutata, Glyphomitrium Daviesii, Dissodon splachnoides, Amblyodon dealbatus*, and *Mniums cuspidatum, riparium*, and *spinosum*; exchange in greenhouse fern roots. — Miss Ridley, Hollington, Newbury.

LARVÆ of scarlet tiger moth, in exchange for larvæ or pupæ of other species.—Sidney Smith, 3 Strand Terrace, Lower Walmer, Kent.

FLINT implements from Spiennes, Belgium, offered for good Palæolithic or Neolithic implements from other localities.—Thomas D. Russell, 48 Essex Street, Strand, W.C.

SEVERAL dozen interesting micro slides—vegetable, animal, polarising, &c.; also some micro material for other slides of interest. Send package of slides or list to—J. E. Read, 112 Pottergate Street, Norwich.

PHONOGRAPH, on stand, 16 in. × 9 in., in good working order; cost £5; will exchange for micro books or apparatus.—A. Pitman, Hazelwood, Bath.

WANTED, L. C., 7th ed., 6, 13, 69, 72, 73, 104, 172, 181, 222, 360, 366, 388, 413, 414, 415, 422, 427, 428a, 436, 438c.—Thomas A. Dymes, 8 Hardwick Road, Eastbourne.

SEND three well-mounted micro slides for a bottle of brown cement, a larger one for six slides.—S. H. Robinson, 20 Branston Road, Burton-on-Trent.

WANTED, in good condition and cheap, Tate's "British Molluscs."—State price to William Coates, 5 Chipchase Street, Linthorpe, near Middlesbro'.

OFFERED, a first-class lantern microscope, with rack and pinion, by Wrench, three powers, new, in exchange for one of Browning's rain band spectroscopes, in perfect condition, with pamphlet.—T. Bewlay, Vine Street, York.

WANTED, 2-in. objective; good exchange in books offered.—I. Shelton, Stafford Street, New Brompton, Kent.

SEVENTY-FOUR British birds' eggs, 29 species, seeds of *Auricaria imbricata*, and *Ianthina communis* shells, to exchange for marine algæ, foreign shells, or micro slides.—Rev. H. W. Lett, Lurgan.

PERFECT specimens of *Papilio penthesilaus, P. telesilaus, P. Americus, P. antiphus, E. Duponchellii* (fair), *Lycorea atergatis, Ithomia heraldica, P. cotytto, M. imitata. H. cossotis*, also many others.—H. H. Druce, 43 Circus Road, St. John's Wood, London, N.W.

DUPLICATES: *Sinapis, *Rhamni, *Hyale, *C. album*, Cardui, *Antiopa, Semele, *Comma, *Euphorbiæ, *Statices, Jacobææ, Carpini, Auriflua; also, **H. briseis*, **A. dia*, **P. damon*, **L. dorylis*, **Z. carniolica* (all marked * are continental specimens). Desiderata: healthy pupæ of Ocellatus, Tiliæ, Populi, Quercus, Quercifolia, Vinula, or other sphinges or bombyces.—J. Günther, Queen's Road, Oldham.

GLANDS from the capsules of *Rottlera tinctoria*, from India; also nitrico-oxide of mercury, pretty opaque objects, in exchange for other well-mounted slides.—John R. Marten, Cottage Hospital, Redhill, Surrey.

THIS season's specimens of No. 100; wanted, 3, 9, 11, 16, 38, 50, 54, 68, 93, 97, 136, 172, 181, 183, 338.—J. H. Bloom, Westbury House, Worthing.

WANTED, foraminiferous sand from March, Cambridgeshire; will return the same quantity of sand from Smyrna, containing minute shells, corals, spicules, &c.—G. Garrett, 17 Burlington Road, Ipswich.

FOR packet of Zoophytical corallines, send stamped and directed envelope. Also an exchange of named specimens; send list.—F. S., Rhianva, Rhyl.

COLLECTION of 80 minerals and fossils in glass-topped cabinet, 17 × 13 inches, offers in instruments; also, six dozen well-mounted micro slides in pine cabinet (horizontal drawers), offers in instruments. — N. C. Haring, 334 Upper Brook Street, Manchester.

ANDROMEDA, the three *Droseras, pilularia*, and many other rare flowering plants, characeæ, algæ, diatoms, desmids, micro-fungi, plants for freshwater aquaria, and well-mounted slides, in exchange for books on natural history, cabinets, slide boxes, or apparatus.—Thomas Birks, jun., Old Goole Mill, Goole.

MICRO slides: wanted, named diatomaceæ, desmidaceæ, and foraminiferæ, for dried plants and mosses or moss dissections.—J. Harbord Lewis, 145 Windsor Street, Liverpool.

BOOKS, ETC., RECEIVED.

"Evolution explained and compared with the Bible." By W. W. Smyth. London: Elliot Stock.
"Agenda du Chimiste, 1883." Paris: Hachette & Co.
"Studies in Microscopical Science," edited by A. C. Cole.
"Journal of Conchology."
"Land and Water."
"Midland Naturalist."
"Practical Naturalist."
"The Field Naturalist."
"The Young Naturalist."
"Natural History Notes."
"Science."
"American Naturalist."
"Canadian Naturalist."
"American Monthly Microscopical Journal."
"Boston Journal of Chemistry."
"Good Health."
"The Botanical Gazette."
"Revue de Botanique."
"La Feuille des Jeunes Naturalistes."
"Le Monde de la Science."
"Ciel et Terre."
"Cosmos: les Mondes."
&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 10TH ULT. FROM:—W. E. L.—L. B.—A. H. B.—W. D.—J. L.—F. K.—R. M. C.—A. D.—P. M. C. K.—S. S.—F. W. C.—W. Z. B.—A. H. S.—J. S. W.—J. C. H.—W. B. G.—Miss R.—F. T.—J. L.—H. C. B.—W. H. N.—W. B.—J. S.—M. C. W.—J. H. K.—R. A. R. B.—I. J. W.—G. S. T.—J. B.—R. W. W.—J. G.—W. H. G.—C. H. G.—F. J.—R. N.—F. L. S.—E. J. G.—B. H.—H. E.—W. R.—J. H. B.—J. R. M.—F. M. H.—E. M.—E. T. S.—G. R.—H. W. R.—W. B. G.—A. B.—L. S.—G. A.—H. H. D.—C. F. W. S. W.—S. D. R.—T. A. D.—L. H. R.—P. D.—J. S.—W. F.—D. W.—G. H. R.—W. C.—A. P.—J. E. R.—J. E. A.—Rev. H. W. L.—J. H. L.—J. S. C.—N. C. H.—S. B.—A. W. G.—J. G.—A. G. P.—C. L. F.—C. T. B.—I. J. W.—E. B.—G. F. N.—N. R. N.—A. N.—P. E. K.—P. P. A.—B. H.—W. E. L.—L. B.—A. H. B—W. D.—J. S.—F. K.—R. M. C.—A. D.—P. M. C. K.—J. A. O.—T. S., &c.

A PLEA FOR OUR CHARAS.

By JAMES SAUNDERS.

THAT this curious group of aquatic plants has received but little attention from British botanists, is generally admitted, but that period of indifference is apparently passing away. For several years past a few enthusiastic but comparatively isolated workers have investigated various parts of the country, with gratifying success. Much, however, remains to be done. For many counties and vice-counties there are either no records or but unreliable ones; and it is with the earnest desire that, by directing attention to these facts in the pages of SCIENCE-GOSSIP, some of its numerous botanical readers will be stimulated to work up those of their own localities, if not hitherto attempted. By such means the British census of these plants which is now in progress by the Messrs. Groves, will more speedily be sufficiently complete to warrant its publication.

As, however, many of the readers of SCIENCE-GOSSIP may not have observed any growing Charas, as was confessedly the case with the writer till late in the autumn of 1881, although he had searched unsuccessfully for two years, a few hints as to their habits may be acceptable. Now, the only wonder is, how they could have been overlooked so long. Where, then, should they be sought? In ponds, pools, and ditches chiefly, and also in running water, but in this they occur more rarely. There are however certain ponds in which it would be useless to seek them, as, for example, those that are frequented by domestic ducks, as these useful creatures devour the aquatic vegetation. It is equally useless to search for them in shaded pools, or on the shady side of them; for, so far as the limited experience of the writer has gone, they appear to grow only in such situations as are fully exposed to direct sunlight. In confirmation of this, it may be mentioned that a flexible species (*Tolypella intricata*) now growing in a glass jar, in a window facing south, invariably has its growing branches raised near to the surface of the water during sunny days, and they sink near to the bottom during dull days. This is suggestive that the action of direct sunlight is a great stimulus to their growth, and is probably essential to their existence.

As to the time for Chara hunting, it might be said, Look for them all through the year, both in season and out of season, although it will be easily understood that in the summer months they are in best condition, and their curious fruits are ripe. It was very late in the autumn of 1881 that the writer first observed any of them growing. The true flowering plants were all gone; the chill autumn winds rustled mournfully through the dry rushes and sedges along the margin of a rivulet; regrets that the work for another season was over reigned paramount, when the eye was arrested by a dark green patch, of an unfamiliar appearance. In some respects it resembled an aquatic Crow-foot; in others, it was dissimilar. A hooked stick was quickly brought into requisition: some of the plant was drawn up, and speedily recognised as being one of the long-sought Characeæ. It afterwards proved to be *Nitella opaca*, one of our most frequent species. Since that time, one has been enabled to detect them in many localities in South Beds, especially in quiet pools, remote from the haunts of men. In some instances they grow so vigorously as to exclude most other forms of vegetation, but this is not of frequent occurrence. As an encouragement to those who might be stimulated to take up the subject, it may be mentioned that two of our rarest British forms*

* They are *Nitella mucronata* and *Tolypella intricata*. For the former see "Journal of Botany" for Jan. 1883.

have been proved to grow in this county, one of which had been found only once before in Great Britain. And further, there are now, within the writer's view, sundry recent local gatherings in glass jars, which contain types of the only three genera that have been found on the mainland of Great Britain, all of which were gathered within three miles of Luton. The fourth genus of British Characeæ has been found only in the Isle of Wight. This is sufficient to suggest that there is much room for original work, in this section of botanical research.

Some readers may also ask for hints as to the *modus operandi*. The apparatus is simple enough: a stout stick with an iron hook at the end is usually sufficient. Sometimes one may cut a long hazel rod, and fasten a few short lengths of dog-rose stem on the end: the stout, recurved prickles of which will invariably bring up specimens of any plants with which they may come in contact. When secured and taken home, it is necessary with the more delicate forms to float them on the mounting paper under water: with a little practice this may be done in a few minutes, so that the paper and specimen may be withdrawn from the water without injury to the former. Most of the moisture should be then absorbed with drying paper, before putting in press. The stouter forms may be dried in the usual way. Although somewhat difficult of manipulation, yet it is the published opinion of the Messrs. Groves, that "no plants better repay a little care." (Journal of Botany, 1880.)

The correct naming of specimens will necessarily be difficult at first. For this purpose the next best thing to the assistance of an expert will be the study of "A Review of British Characeæ," by Messrs. H. and J. Groves, price about two shillings, in which every known British species is faithfully portrayed. In cases of real difficulty there is no doubt assistance would be willingly rendered, if courteously requested, by some of the gentlemen whose names are on the list of "assisting naturalists" in SCIENCE-GOSSIP for recent years.

To recognise them in the field will require but little practice. Most of them have a peculiar fetid odour, and are encrusted with lime. Others are more flexible, and usually less disagreeable to the sense of smell. The former have the branches in whorls; the latter mostly in twos, and the branchlets forked. Some of the encrusted ones show through the water as patches of a greyish-green hue, from the abundance of lime they contain. These and many other interesting points will speedily manifest themselves to the patient observer, who will, at least in the search, find healthy recreation, if not all the scientific success which a sanguine temperament may desire.

Luton.

PRACTICAL SCIENCE.—Can any reader kindly tell me the name of the latest and most reliable work bearing on the above?—*Boston.*

ON THE STRUCTURE OF SOME DIATOMS OCCURRING IN THE CEMENTSTEIN FROM FÜR IN JUTLAND.

By MM. PRINZ and VAN ERMENGEM.

DR. Van Ermengem read a valuable paper on the above-named subject at the January meeting of the Société Belge de Microscopie. A *résumé* of the same is given in No. IV. of the Bulletin des Séances, 1882–1883. The paper will appear in its entirety in the Annals of the Society.

In the hope that the subject of the *résumé* may be of interest to the diatom student, I have translated it, together with the remarks of several well-known Belgian diatomists.—F. K.

The diffraction phenomena produced by structural conditions of the valves of certain diatoms possessing very fine markings, such as the Pleurosigmas, prevent a very exact knowledge of their nature being obtained.

The existence of hemispherical elevations which according to many diatomists produce the designs is denied by others. Professor Abbe himself believes that they are not due to hemispherical elevations. It is very probable that all diatoms are not structurally alike; and O. Müller, A. Schmidt, and Flögel admit of four or five different types.

MM. Prinz and Van Ermengem have employed in their researches species that are less delicate in structure, such as *Coscinodiscus oculus iridis* (Eh.) and *Trinacria regina* (Heib.), both of which are very abundant in the diatomaceous rock of Für (Jutland). In studying their valves in media possessing various indices of refraction, they have obtained a succession of optical reactions indicating that the valves are perforated with minute openings.

The results of their observations are entirely in accordance with other methods of research, notably with those obtained by the study of thin sections of frustules made in various directions. The calcareous rock containing these forms admits of very thin slices being cut and polished; and these sections, both transverse and oblique, allow of the diatoms being studied either in the matrix or in various media after the destruction of the calcite. It is easy to avoid all violent manipulation that would be likely to alter their structure. Mounted in a highly refracted medium (1·68), such as saturated solution of biniodide of mercury in iodide of potassium (Stephenson), they give images of remarkable distinctness. We are able to observe in slightly oblique sections that the valves of Coscinodiscus are composed of two layers: the superior layer presents the hexagonal alveolæ; the inferior layer is formed of a membrane, very thin and perforated by minute circular openings. The openings are surrounded by a thick annular margin. This layer when detached by the abrasion of the rock from the underlying calcite leaves an impression easily recognisable, which does not correspond with the convexities or concavities of the inferior surface.

The thinned transverse sections, when the thickness is less than half that of an alveole, also clearly prove the existence of openings in the inferior layer; the membrane that closes the bottom of the alveolæ is manifestly broken (*interrompue*) at its centre, and this lacuna is included on each side between the turgid parts (*est comprise de chaque côté entre des parties renflées*), where the section is more or less crescent-like.

The sections of Trinacria also demonstrate the existence of pores traversing the entire thickness of the siliceous envelope.

The aspect which presents the junction of the double connection of Coscinodiscus in a longitudinal section (*coup normal*) indicates that their growth takes place at the free margins (Wallich), and not by intussusception or the addition of a third internal connective (Cox). The naissant valves are formed of a single layer of silex and perforated; they develop centrifugally (O. Müller). In some preparations the valves of Trinacria are covered with a membrane, opaque and black in colour, and which shows similar perforations. This is probably the last layer of the cellular envelope, feebly silicified or entirely organic, reduced to a state of carbon by the slow combustion of its cellulose. The existence of this layer is admitted by many authors (Dippel); and chemical analysis also proves that this black matter is carbon. In the interior of the frustules is seen the spheroids, sometimes completely filled. In a normal section of Coscinodiscus it has been ascertained that the perforated tips of the dots on the inferior siliceous layer of the valve penetrate and force their way into the hexagonal cavities of the alveolar layer.

Among the mineralised diatoms found in the London Clay, and in which the silica has been replaced molecule for molecule by iron pyrites, these perforations are also present (Kitton). Certain Coscinodisci approaching very nearly to those found in the rock from Für, frequently show by cleavage the inferior layer and its perforations on the place in which it had been imbedded. The sections of this clay which the authors of this memoir have prepared demonstrate this very clearly.

A discussion, in which many of the members took part, followed the reading of the paper.

M. Delogne said that the principal conclusions of the writers of this memoir were not opposed to some ideas he had formed of the structure of certain species. He, however, did not wholly believe that, in consequence of the existence of the perforations in the siliceous carapace, the plasma came in direct contact with the water in which the diatom lived. An internal membrane which closes the pores may probably exist. The presence of these perforations was not opposed to the vegetable nature of the diatom cell, and he did not think that they should be allied to the Polycystina, as some had done.

M. Barre informed the meeting that in some researches on the Guano diatoms he had noticed certain facts which absolutely confirmed the presence of the perforations, as stated by MM. Prinz and Van Ermengem in the test of Coscinodiscus.

In reply to M. Delogne, M. Van Ermengem said that there could be no doubt that the Diatomaceæ belonged to the vegetable kingdom. He must nevertheless observe that Borscow and Pfitzer had not been able to obtain the reaction characteristic of cellulose n the membrane of the envelope, and that their morphological type was far apart from that of Œdogonium, Desmidiæ, and Schizochlamys, to which some had compared them; but it was even more difficult to find analogies between them and the Polycystina, animals to which they most nearly approached. Owing to these considerations, they had been ranged by Häckel in his kingdom Protista, where they formed a separate class.

F. KITTON, *Hon. F.R.M.S.*,
Cor. memb. d. l. Soc. Belge d. Mic.

NOTES ON THE SCHIZOMYCETES.

[*Continued from page* 86.]

APPENDIX.

WITH the Schizomycetes we may range several other genera which are partly united with them by others without remark, but which present so great peculiarities, that it will be better provisionally to separate them.

XIV. SPHÆROTILUS, Kützing. Cells roundish-angular or oblong, rounded at the corners, united in great numbers in a colourless gelatinous sheath to form long threads, which are densely tufted and entangled in floating flakes. Multiplication by means of vegetative cells, which isolate themselves and then form new threads by continued subdivision. Reproduction by spores, which are produced endogenously within the vegetative cells.

68. *S. natans*, Kütz.

Flakes in the vegetative stage yellow-brown in the older parts, colourless in the younger, many times branched, very slimy. During spore formation, partly milk-white, partly red-coloured. Cells 4–9 μ long, 3 μ thick.

In stagnant and flowing water.

The flakes consist of an enormous mass of long, variously-combined threads, which are formed of rows of cells, surrounded by a slimy, evanescent sheath. These threads often assume a shrubby branched form, and are attached to water-plants, or float in a thin layer on the water. In the formation of spores, the protoplasm of the cells breaks up into numerous, minute, strongly refringent portions, which become round spores, red at maturity, afterwards of a brown colour. These are set free by the dissolution of the mother cell. They germinate very quickly, and grow into threads which are either isolated, or united with the parent threads or with other threads as well. These daughter threads proceeding from the germinating spore, are at first undivided; not till after a time do they break up into the typical rows of cells. Sometimes the growth of the spores into threads takes place while they are still within the mother cell.

Sphærotilus ochraceus, de Brébiss. in litt., Kützing, "Species Algarum," p. 147, does not belong to this genus.

XV. CRENOTHRIX, Cohn. Threads cylindrical, somewhat clavately thickened upwards, articulated, provided with a sheath. Multiplication by means of the joints, which escape from the sheath and grow into threads. Reproduction by spores, which are formed in the sheath by further subdivision of the joint-cells. The spores either grow directly into threads, or form by continued subdivision gelatinous colonies of roundish cells, which afterwards produce threads.

69. *C. Kühniana* (Rabenh.), Zopf.
Leptothrix Kühniana, Rabenh.
Hypheothrix Kühniana, Rabenh.
Crenothrix polyspora, Cohn.
? *Palmellina flocculosa*, Radlkofer.

Threads in whitish or brownish tufts, $1\frac{1}{2}$–5 μ thick, increasing to 6–9 μ towards the end; joints of very varied lengths. Spores 1–6 μ in diameter.

In wells and drainpipes, etc.

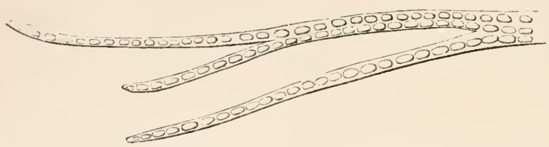

Fig. 77.—*Sphærotilus natans* (after Kützing).

A fungus which is often very troublesome, because it defiles the water and stops up the narrower pipes.—The cylindrical threads, somewhat clavate above, are visibly articulated; the joints afterwards separate from one another, but are then surrounded by a sheath, which, originally colourless, becomes of a yellow or yellowish-brown colour by impregnation with iron. The sheath, at first closed, is burst at last by the continually dividing joints, which then escape. Each joint can develop a new thread. In other cases, however, the thread remains enclosed in the sheath; its joints are divided by closely contiguous transverse partitions into flat discs, which then break up by vertical partitions into smaller roundish cells: the latter may be designated the spores of the fungus. They often develop, even while still within the sheath, into new threads, which grow through the gelatinous swollen sheath; or else they leave the sheath, and undergo further development outside it. They either grow into threads, or form by repeated bipartition larger or smaller colonies of roundish cells, held together by their membranes, which assume a gelatinous consistence. These colonies are designated the Palmella form (probably the *Palmellina flocculosa* of Radlkofer); each of their cells can again form a thread.

This completes the number of the Schizomycetes, according to Dr. Winter's account of them, in the last edition of Rabenhorst's "Kryptogamen-Flora." In concluding the translation of this portion of that work, I wish to make a few remarks, first concerning the translation, secondly concerning the Schizomycetes themselves. When I commenced my task, as will be seen from the few prefatory words on page 148 in the last volume, it was my intention to add nothing to the translation; but, as I proceeded, it became obvious that its value would be much increased if figures were given of more species than the few illustrated in the "Flora." I have therefore collected figures of a great many species, from various sources, in addition to one or two drawn from nature, which will, I hope, render the identification of the forms more easy. It must be observed, however, that the "Kryptogamen-Flora" is that of Germany, Austria, and Switzerland, and hence may possibly contain some species which do not occur in our country. But to mutilate it, as is the practice in too many cases, by omitting those of which it is supposed no record has hitherto been made in Britain, would be to deprive it of half its usefulness. No one can say yet that any one of the sixty-nine species included in the foregoing list does not occur in these islands; in

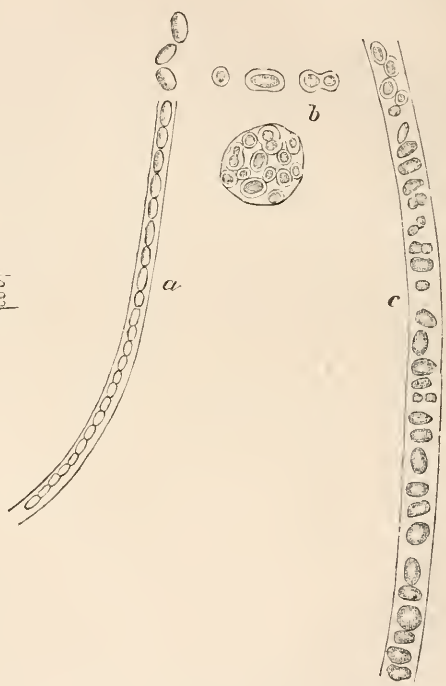

Fig. 78.—*Crenothrix Kuhniana* (after Zopf.).—*a*, vegetative threads; *b*, Palmella-form; *c*, spore-forming threads.

fact, considering the close similarity in climate and other circumstances between this country and Central Europe, as well as the nature of the fungi, we may conjecture that nearly every one will ultimately be found here. To facilitate this result is my object; and if the British observers of this group will communicate to me lists of those species which they have found, addressed to the Mason College, Birmingham, they shall be gratefully acknowledged and used to prepare, for the readers of SCIENCE-GOSSIP, as complete a catalogue as can be formed of the Schizomycetous flora of the British Islands.

In the second place, a few words must be said concerning the principle on which the foregoing list is compiled. Students of Algæ will see that many species formerly included in that class are included here, while a few have even been claimed from the animal kingdom. As regards the boundary between the Schizomycetes and the Algæ, the discriminating test is merely the want of chlorophyll. The order of Algæ most nearly allied to these fungi is the Phycochromaceæ, which live in pure water or in damp localities; like other Algæ, they do not require the presence of organic matter in the moisture in which they flourish; they produce no striking decomposition therein; and they soon perish in a putrefying fluid. The Schizomycetes, on the contrary, live solely on the decay of organic matter; they produce very marked decompositions in the fluid which they inhabit; they revel in putrefying substances, and cannot exist in pure water.

In regard to the distinction of the Schizomycetes from the Infusoria to which they make the nearest approach, the Monadina, it cannot be said that there is yet known any absolute test. Some of the mouthless monads so closely resemble Bacteria that the possibility is that before long they will be classed in

Fig. 79.—*Bacillus tuberculosus*, from human sputum. *a* × 1200; *b* × 1500.

the same group. It is just here that part of the shadowy boundary between the animal and vegetable kingdoms runs, and that boundary may never be more definitely fixed.

There is still another question which deserves mention, and that is, are the forms described above true species? A great deal of useless talk has been wasted upon this subject: many persons argue from a preconceived idea as to the limits of species; others from some fanciful notion as to the number of species which ought to exist; others again reason that forms frequently found in company with one another, or agreeing in some one point, such as colour, must be phases of the same species. Upon the first two "arguments" nothing need be said; concerning the last it may be observed that, however useful co-occurrence or similarity may be in suggesting the possibility of genetic connection, it yet falls far short of the probability which science requires. To prove that one form of life is merely a phase in the development of another, one thing, and one thing only, is sufficient; the one must be traced into the other. Professor Ray Lankester has classed a great many bacterial and monadic forms together as one species, *Bacterium rubescens* (for references see *Cohnia roseo-persicina*, vol. xviii. p. 200), merely because he found them all together in the same habitat, and they present certain points of similarity, especially in colour. But this is unsafe, nay unphilosophical. If it can be shown that one cell of Cohnia, sown in a suitable fluid, produces all these various forms without the intervention of any other germ, then and not till then can his contention be admitted.

The warning of previous cases of the same character is too plain to be neglected. Professor de Bary described (Beiträge zur Morph. und Phys. der Pilze, 2nd series, pp. 13–24) various mucorine forms as phases in the life-history of *Mucor Mucedo;* and succeeding botanists, deferring to so high an authority, repeated the error. But Professor de Bary's experiments were made in the ordinary way, and every one who has examined the Mucorini knows the vast abundance of their spores and the impossibility of excluding them from an ordinary culture. Mons. van Tieghem, however, sowed one single spore of each form, such as Thamnidium or Chætocladium, in a drop of water or other liquid: in every case where the absence of any extraneous spore was satisfactorily ascertained, the sown spore reproduced its parent form and no other, and this process was continued for many generations.* Professor de Bary himself now admits that his previous conclusions were unfounded (Beiträge, 4th series, p. 1). In the same way, as soon as experiments were devised by which the progeny of one bacterial cell could be ascertained, it was found that there was no longer that intermixture of various forms which had previously confused and misled observers. Micrococcus produced nothing but Micrococcus, Bacterium nothing but Bacterium. (*Vide* Koch's experiments.) To my mind it certainly seems most rational to assume that every form which has not been shown to be capable of being produced by another form is a distinct species, until the contrary is proved. Certain writers, however, are captivated by the opposite view, and seem to regard themselves as adopting a higher scientific position when they advocate the union of distinct forms, upon no better ground than that when one is sown others will appear. But this is to ignore the minuteness and omnipresence of the reproductive germs of all these lowly forms of life. The very diversity of the species which are found at different times in the ordinary culture of any one throws suspicion on the hypothesis of their genetic connection. We arrive then at the conclusion that, for the present and until the contrary is proved, all the species enumerated

* "Recherches sur les Mucorinées," par Ph. van Tieghem et G. Lemonnier, pp. 18, 48, etc. Brefeld in "Botanische Untersuchungen über Schimmelpilze" arrives at the same result.

above must be considered true and independent. This view is in best accordance with the facts and with a true philosophy.

W. B. GROVE, B.A.

NOTE.—Although *Bacillus tuberculosus*, the newly discovered germ of consumption, is not included in the foregoing list of the Schizomycetes, I have added a figure drawn with the camera, showing the rods when filled with spores, as occurring in human sputum, from a specimen kindly lent me by Mr. F. H. Collins, F.L.S. There is also a *Bacillus lepræ*.

A DAY'S MOUNTAIN RAMBLING IN NORTH WALES.

By WILLOUGHBY GARDNER.

[*Continued from page* 99.]

BUT to return to my journey; eventually there was some little break in what seemed to me then in that dreary east wind the stupendous monotony of the place; for I began to get upon rougher ground, pieces of rock protruded here and there through the greensward, in many places to an extent sufficient to form what might be called small cliffs and precipices. As soon as this change in the nature of the ground became apparent, the vegetation began to be more diversified, and many plants came under my notice sufficiently interesting-looking to warrant their claim to attention, as no doubt rare and interesting species; but being no general botanist, I am unable to mention any by name, though I saw several I had not observed before. In some of the hollows beneath these rocks, however, I met with something more in my line, viz. a great profusion of ferns. Among literally beds in some places of the common species, such as *L. dilatata* and *A. Filix-fœmina*, I think—though I am not sure that it was not something else after all—I was pleased to meet with the Beech Fern (*Polypodium Phegopteris*) in fair quantity, and the Mountain Buckler Fern (*Lastrea Oreopteris*), easily recognisable by its peculiar fragrance when handled, in great abundance. The Hard Fern (*Blechnum Spicant*) also grew here and there among the rocks; and under a large overhanging stone I found a single root of a very interesting variety of *Lastrea*, which I have not yet been able to identify.

Here, too, the character of the rocks became quite different, nearly the whole of the route from Aber had lain over those of the Lower Silurian age; but I now entered a large patch of igneous formation, which appears to extend over some three square miles behind the Aber cascade, and includes Llyn and Afon, which it surrounds on all sides; the patch contains igneous rocks of various kinds, the hills on the western side of the Llyn being composed of greenstone.

But I anticipate, not having yet reached the Llyn, though after rounding still a few more corners, and surmounting yet another ridge or two, there it lay before me, a dark blue-black sheet of water, lying in a hollow, surrounded on all sides by high mountains, and with a small stream running into it from the south, where the steep precipices of Y Foel Fras, with their tops hid in cloud and mist, formed an imposing background. A few steps more brought me to the margin, and a more lone and desolate piece of water I certainly never saw; the solitude, more especially perhaps on this particular day, black and drear as it was, seemed almost awe-inspiring. The rushing of the stream running out of the lake was just audible where I stood, and with the exception of the lapping of the little waves of the lake on the stones at my feet, the only other sound was the harsh croak of two great black birds which were wheeling about in the air round a rock high up on the right. At first my enthusiasm led me to imagine that they might be ravens, birds I have never had the pleasure of seeing in their wild state; but they were most probably only a pair of carrion crows, though at the height it was difficult to distinguish size, and their note was certainly hoarse and loud enough for anything, and seemed more so in the silence which reigned around. Having now since starting traversed a distance of some seven miles of rather rough, and in many places steep country, I thought it well to improve the occasion by making a meal of some of the provisions I had brought with me, and accordingly did so, quenching my thirst between whiles with the crystal water of the lake. While I was thus engaged, the mist I had noticed on my arrival hanging over the cliffs of Y Foel Fras, descended on all sides to within about 40 feet of the level of the lake, making all chance of further progress impossible for the time being; I therefore just had to make myself comfortable, sitting still on a large stone for an hour. I employed the time in studying my ordnance map to determine the next point to be aimed at, and also in taking a sketch of the lake, as well as it was possible to do so in the mist which overhung the scene. I had intended having a cast or two on the lake with my fly, had the day been more favourable; but the east wind made fishing quite out of the question. At length the clouds lifted again, and after mature consideration, I made up my mind to set off to find the top of "Drum," a mountain 2527 feet high, almost direct east from the lake, and then again to call a halt before deciding whether to continue east down the valley towards the Conway vale, or to strike off south again in search of Llyn Dulyn, a wonderful little lake high up in the mountains, within a couple of miles from the top of Carnedd Llewellyn—the state of the weather to determine which it was to be. Leaving the lake, I crossed the little stream I had seen in the valley below me on my way up, which here has its source, and for the first part of its progress now runs underground. So far as I could make out, its original course from the lake had become choked up with large stones and boulders, and its progress having thus been stopped, the water had gradually wormed its way into the soft ground underneath them, resulting in its at present running in a subterraneous passage.

After a very steep ascent from the lake, I reached a fairly flat piece of ground, gently rising towards the top of "Drum," and here I entered the first tract of heather, mixed with whin and other plants, I had so far met with during the day. I wished the weather had been more favourable, for the ground looked very promising for insect hunting, and at a height of over 2000 feet there was no knowing what interesting things one might have come across. As it was, I had not gone far, carefully scrutinising the herbage within "ken" on either side, before I espied a Geometer, settled with closed wings on a tuft of heather, which on inspection proved to be a remarkably richly-marked and dark-banded specimen of *Cidaria populata*. I was particularly pleased with the marking of my capture, which was just what I had expected, or rather hoped to meet with, in any species I should be lucky enough to take at such an altitude; for these Alpine forms differ from their lowland representatives, seeming, as I imagine, several generations (or scores or hundreds of generations) behind them in development, and therefore exhibiting more traces of the original type; as in this instance, the dark-banded variety I had just picked up pointed much more distinctly to the earliest form of a Lepidopterous insect, generally considered as one with several dark bands traversing the wings from costal margin backwards, than its ordinary type taken in lowland regions, which is certainly evolved many generations further. In confirmation of this, it is an interesting fact to note that this specimen was taken quite fresh out on September 5th, whereas the usual time of appearance of the species in the lowlands is July, so that I much doubt whether reproduction in this case could be effected in the twelve months; and supposing a year was missed every now and then, it would, in the course of ages, add up to a considerable sum, and its lowland compeer would meanwhile leave it far behind in gradual evolution. As a proof that the reproduction of a species frequently takes two years in high altitudes, where it only takes one elsewhere, I may mention that a little further on I picked up several larvæ of *B. Rubi*, the Fox Moth, which were almost full grown, and so must have come from ova deposited the previous year, and they would certainly never arrive at their perfect state this autumn, now so far advanced.

After the capture of this, to me, most interesting specimen, I set to work to search for more, and was rewarded by finding two others marked in a similar manner, and in equally fine condition. These were the only insects I met with; but, doubtless, the fact of the fog coming on rather thick again, prevented my making any further "finds."

The gathering mists now began to become rather more than pleasant, and made it very difficult to be quite sure of the direction in which one was going. I at once brought out my compass, and steered up the hill, as I thought straight for the summit of "Drum," 2527 feet, which, according to the ordnance map, was marked with a heap of stones; but I was quite unable to find it, though I got upon what seemed to be the highest ground about. However, after wandering up and down for some little time, I gave it up, and also abandoned Llyn Dulyn as well, and I pressed on by compass (for there was no seeing anything) towards the east, which course I knew must take me over the top of the watershed which divides the sea from the Conway valley. Before long I began, as I expected, to descend; I had not gone far, however, when the clouds commenced to lift, so I halted, for the chance of their still clearing sufficiently for me to visit Llyn Dulyn. After a short time the aspect of affairs improved so much, that I made up my mind to try my luck, and accordingly set off direct south along the ridge I was then on, to traverse a distance of about three miles, as far as I could make out by the map, to the Llyn.

The ground here was very boggy. It seems strange that so much water should lie at the very top of a mountain like this, where one would think all the moisture should drain off its sloping sides; however, it certainly does not, and for about a mile I found progress exceedingly precarious, for the ground was very "shaky" indeed, and all around were deep peaty holes, full of exceedingly black-looking water. Many of them were far deeper than I could reach, or their bottoms were covered with a kind of impalpable peaty mud, in which one could poke a stick down, down, down, as if the whole of the mountain was soft pulp inside, and the turf one walked upon only a thin "pie crust" on the top. Every now and then I passed hollow places, where the said pie crust seemed to have fallen in; but holes of this nature, though large and deep, were generally dry, and even stony at the bottom, showing that the bog did not extend very far down after all.

About this time the mists to the south-west suddenly divided for a few moments, and a ray of sunlight burst upon the distant scene, revealing such a chaos of rolling clouds and mountain peaks as to baffle description; but it was only for a moment, and before I had time really to take in the view, and try to identify on my map any of the hills I saw, they closed again, and all was gloom and darkness as before.

On reaching firmer ground I crossed another ridge, bringing me to the edge of a fine valley. Consulting my map again, I found that far up at its southern end

Llyns Dulyn and Melynllyn lay embosomed among the steep rocks there visible. In order to make as straight a course as possible, I descended the valley, crossed successively several brooks and tracts of "squashy" ground, till I came to a fair-sized stream, which I conjectured came from the wished-for Llyn. The weather was now much improved, and distant prospects were much more discernible. From the point I had now reached I saw a great dark hollow in the side of the mountain to my right, one of the spurs of Carnedd Llewellyn, which I felt sure must contain the lake. I pressed on up the stream, expecting ere long to see the gleam of the water; but no, up, up I went, and not till within ten yards or so of the edge did I see the lake,—then it suddenly burst into view, a large dark sheet of water, shut in, on all sides but this one, by high precipitous rocks, in some places coming almost sheer down a height of about 500 feet into the water. I was indeed glad that I had persevered and managed to reach the spot, for certainly it is well worth a visit. Dulyn (black water) is without doubt an appropriate name, for I never saw such a very dark and altogether weird-looking lake before. Its surroundings, high rocks, reaching as they did on this occasion into the clouds, are most impressive, the whole effect being one of stupendous wildness and gloom. The place was not inaptly described by Charles Kingsley, in a familiar letter to a friend, as the "original mouth of the pit itself."

Close by the Llyn I found a temporary wooden shed, and several workmen laying piping in the ground; on questioning them, I found that they were engaged completing the arrangements by which, I should imagine, the purest water conceivable is now carried a distance of sixteen miles to Llandudno, the fashionable watering-place on the sea-coast. There were eight or ten men living in this shed, and they told me they had been working there during the summer for four years. In the winter the place is quite ungetatable, and even in the spring the climate is severe. Last spring they were there rather early, and had once or twice to dig a way out of the house through the snow in the morning! I gleaned several interesting facts from these men about the Llyn. They said it was cram-full of fish; but, like all lake trout in these parts, they were difficult to catch, and in fact could only be hooked after a good flood, when it was impossible for any one to get up to the place from the valley below, and unless you were living on the spot, you had no chance. The men had a long line rigged up, which stretched right across the lake, and had drop-flies suspended at intervals of a few yards. The wind bobbed these up and down in an enticing manner, and on favourable days a large quantity of fine fish were captured. They also had a raft for fishing from; and the foreman told me that he had measured the depth of the lake in one place as 216 feet. From the shape of the basin in which the Llyn lies, and from the fact of its great depth, it would almost appear to be an old crater; and most of the rocks around are of igneous origin.

I reached Llyn Dulyn at 3 P.M., and was quite ready for another rest, so I put on my mackintosh to keep myself warm, as the air was chill, and sat down by the margin of the water to finish the provisions I had brought with me, and afterwards employed my time by taking a sketch of this remarkable lake. This occupied me till a quarter to five o'clock, when, not wishing to be overtaken by darkness in such an out-of-the-way spot, I reluctantly had to "make tracks" towards home, much as I wished that it had been earlier, to have enabled me to see Melynllyn, a lake about half a mile higher up, or even to gain the summit of Carnedd Llewellyn, only about two miles further—though two very stiff ones, and across a bad bog into the bargain.

The wind had now changed a little, and seeing a fish or two rise in the small stream, whose course I had to follow for a distance of some seven miles to the Conway valley, I determined to have a cast or two with my fly. I soon landed three small trout; but the twilight coming on warned me that I must put up my rod and press on in real earnest, if I wanted to get home that night. As I followed the stream, vegetation became more abundant the lower I descended, and presently I entered a tract of luxuriant heather mixed with other plants. Here many moths were on the wing; but I had not much time to devote to their capture, which was rather difficult, as the ground was very rough, with large boulders strewn all over the place. The only thing I netted worth mention was *Chareas Graminis*, the Antler Moth, here in great profusion. It is particularly worthy of notice, as it seems to have completely overrun the country this year, becoming in some places, as at Clitheroe in Lancashire, almost a plague, and doing much damage. As far as my observation goes, it is usually rather a scarce insect, only met with in certain localities; but this year I have seen it at every place I have visited. Its sudden appearance over the whole country in such profusion is another of those mysterious workings of Nature which finite man at present is utterly unable to fathom.

Continuing my course along the stream, I at length, at a distance of about three and a half miles from Llyn Dulyn, came upon the confines of habitation, a small mountain farm, surrounded by a few acres of cultivated ground, from which the meanest apology for a crop of hay was just being collected. As usual, the faithful guardian of each of these primitive Welsh homesteads, a great shaggy sheep-dog, rushed out with much noise and show of fierceness, which sometimes, however, develops into further than a mere show, and is liable to become a serious nuisance, or even impediment in one's progress. The next thing I met with in the way of impediment was a herd of long-horned black Welsh cattle. These animals are often disposed to act strongly on the offensive, and are unpleasant customers to cope with; in the present instance, shouts in the Welsh language from a man and some boys working at some distance off, caused me to hurry rather quickly out of a field in which a number were grazing, as soon as the said shouters, changing their tongue for my own, warned me that a very savage bull was among them.

Darkness now finally setting in, I was glad to find myself at last on a mountain road, which I learned from my map came from Llyn Eigiau above, and led to the village of Tal-y-bont below. After a very steep descent upon it down zig-zags for about two miles, I came upon the high road within the village above named, a place sacred to artists. Inquiring for the village inn, I speedily made myself comfortable within side, and called for a plentiful supply of tea, eggs, and bacon, it being then half-past seven o'clock, a few sandwiches having been my only food for the last twelve hours. After partaking of a very good meal, I set off along the road for Tal-y-cafn Ferry, a distance of three miles, where I purposed crossing the river Conway, and catching the last train for Llandudno Junction. It was a lovely moonlight night, without a breath of wind stirring, and I soon got over the ground to the Ferry, passing en route Caerhun, nestled in the trees to the right. In the park belonging to this house the various Roman remains that have been identified with the military station of Conovium have been found, including a villa, baths, sundry pottery, vases, &c., and a very fine circular shield. Arriving at the Ferry, which is the old Roman one, whence starts the road running across the mountains to Aber, which I have described above, I summoned old Mr. Roberts from the little inn, a most picturesque and ancient building, the front of which is covered with ivy, looking centuries old. He speedily rowed me over "old Conway's foaming flood," which looked grand by moonlight, and I was just in time for the last train from Tal-y-cafn to Llandudno Junction. From the latter place I walked over the suspension-bridge, and beneath the shadow of the grand old castle, into Conway, reaching home about ten o'clock, after having much enjoyed my ramble, in which, in the space of fourteen hours, I had seen so much of interest, while walking about twenty-four miles, mostly over rough mountainous country, from the level of the sea up to an altitude of 2500 feet. I naturally slept well that night, feeling my rest well-earned, and looking back with much pleasure to a day's exploration, of what I consider to be one of the most interesting tracts of country in North Wales.

PODOPHYLLUM.—In answer to Mr. Sang's query as to the source of the podophyllin of medicinal use, I beg to say that it is obtained from the dried rhizome of *Podophyllum peltatum*.—*A. W. Griffin, Bath.*

NOTES ON NEW BOOKS.

PHYSICAL *History of the British Isles*, by Edward Hull, M.A., LL.D., &c. (London: Edward Stanford.) This is an invaluable volume to students of British geology. It sets forth in a plain but attractive style, how the geological frame-work of the British Islands has been put together, and how our country has gradually assumed all its well-known scenic and physical features. This method of dealing with physical geology is graphically enforced by twenty-seven coloured maps, which show the areas submerged during each geological period, the distribution of the exposed strata, and their probably concealed extension underground. The design is quite original, and admirably carried out. Professor Hull does not accept Geikie's doctrine that the continental areas and deep sea basins have more or less relatively held their present sites from the beginning of geological time. On the contrary, he contends that the area of the present North Atlantic Ocean must have been occupied by a continent certainly up to the close of the Silurian period, and that the sediments forming the older formations were derived from its atmospherical wear and tear. The North Atlantic was not commenced as an ocean until towards the end of the Silurian period, and Professor Hull gives abundant reason for believing that it was largely in the condition of a land surface up to the Oolitic period. All our geological readers are acquainted with Professor Hull's arguments respecting the thickening of the Carboniferous, Triassic, and other strata in certain directions. He argues that the thickening of strata must necessarily be in the direction whence the sediments were obtained, and he shows that this points to a North Atlantic land surface. The volume is handsomely got up, and its matter cannot fail to add to Professor Hull's well-earned reputation.

Sketches of Bird Life, by James Edmond Harting. (London: W. H. Allen & Co.) This attractive volume is written by a well-known and enthusiastic ornithologist, and every page is redolent of open-air life and observation. The commoner and characteristic birds of Great Britain are treated to separate chapters, and Mr. Harting gossips about them delightfully, and relates numberless personal anecdotes and experiences, tells us the newest proved facts about them (as for instance the proof of the woodcock carrying its helpless young with its feet or clutches in its thighs). The author is intimately acquainted with the rich literature of British ornithology, and he lays his abundant stores of knowledge under liberal contribution, in order to render his topic interesting and instructive. This volume ought to be largely read, as we have no doubt it will be. There is not a dull page in it, and, moreover, it is enriched with exquisite vignettes by Wolf, E. Whymper, Kenlemans, and Thorburn.

Walks in the Regions of Science and Faith, by

Harvey Goodwin, D.D., Lord Bishop of Carlisle. (London: John Murray.) The Bishop of Carlisle has always been an ardent supporter of scientific investigation, and as loyally accepted its logical results, even when public opinion has been against them. In the present volume, for instance, he only demurs to the illegitimate applications of the doctrine of evolution; he otherwise accepts it as a grand statement and formulation of the works of the Creator. All the essays forming this volume have appeared in a serial form, and some of them occupied much attention at the time, such as "The Philosophy of Crayfishes," which appeared in the "Nineteenth Century." Dr. Goodwin's grand summary is that "the results of scientific investigation and observation of nature, and the pushing of hypotheses to their legitimate conclusions by all means which the reasoning powers of man supply, will find their complement, not their contradiction, in the knowledge conveyed by the mission of Him," &c.

The volume closes with the funeral sermon on Darwin which the bishop preached in Westminster Abbey, on the Sunday after his death. The ten essays make up a most readable and thoughtful volume, which all reverent naturalists will peruse with pleasure and profit.

Evolution Explained and Compared with the Bible, by W. W. Smyth. (London: Elliot Stock.) Evolution is now rapidly passing through the "Harmony" stage. All scientific and philosophical truths ultimately pass through this stage after being bitterly opposed, and, before being so generally accepted that the wonder is people did not accept them at first as a matter of fact. We do not discourage "harmonies" like this of Mr. Smyth (although we do not encourage them), if they are only fairly and intelligently written as this is. It will do much to overcome the foolish and ignorant prejudice against evolution which many tender consciences still maintain.

Bee-keeping, by Alfred Rusbridge. (London: E. W. Allen.) The author is a well-known apiarian, and this cheap little book is well timed. It is devoted to plain and practical bee-keeping, and, most important of all, seeing that a good deal of the bee-keeping of our time is merely a "fad"—how to make it pay! We cordially recommend Mr. Rusbridge's book.

Agenda du Chimiste, 1883. (Paris: Hachette & Co.) This little work is in French. It is a collection of useful extracts, abstracts, tables, formulas, for the use of engineers, chemists, medical men and apothecaries, agriculturists, photographers, distillers, &c. There is an enormous amount of work condensed into a small space, which renders it a very useful pocket-companion and hand-book to all who have to do with the details of practical, working chemistry.

QUERY AS TO FUNGUS.—The small white fungus curtly described by C. L. Fort last month would be *Peziza virginea*, Batsch.—*W. West, Bradford.*

NOTES ON *RANUNCULUS FICARIA.*

THE very excellent and thoughtful paper by Mr. Malan, on the peculiarities of the common orchis, have induced me to call attention to another plant, which, though belonging to a different order, possesses much in common with the orchis.

I refer to the common celandine (*Ranunculus ficaria*).

The particular point to which I want to draw attention, is the method of annual production. On this, botanical guides are either silent or misleading. Thus, Hooker's "Student's Flora" says "the root-fibres stout, cylindric;" but on taking up a celandine, I should not recognise the root from that description. On examination, I should find the root-fibres as fine as hair, neither stout nor cylindric, but I should also find these roots springing from the apex of a bottle-shaped tuber. Now this tuber is not a root in the common acceptation of the term, any more than a potato tuber and a hyacinth are roots; the celandine tuber, in fact, grows very much like a potato. All the nourishment that the growing plant gets from the earth is by means of the fibrous roots; the tubers supply it with no food.

It will be well to trace the plant from its babyhood, in order better to understand this.

For about eight months in the year it exists in a passive state, in the shape of a tuber without roots, or signs of growth; the colour is a dirty drab, and it often lies on the top of the soil, looking like a small pebble; thus it remains until the month of January, or earlier, according to the temperature; then its active life commences, the first signs are a protuberance at the apex of a tiny growth. This gradually developes until the plant appears above ground. When deeply buried, it pushes upwards a long white succulent stem, and then, as the plant requires food, the real roots are put forth from the apex of the tuber. This now begins to diminish and shrivel up, as the plant is elaborated above ground, and the deterioration continues, until there is nothing left but an empty skin; and this brings me to a matter I wish to point out, that I have no doubt the undeveloped tuber contains within itself the whole material of the future plant, the office of the real roots being to supply the plant with its food, when made or developed from the tuber.

Meantime something else is going on; the plant is forming itself for another year. This it does in the shape of new tubers. These are formed directly from the base of the plant where it is attached to the soil, and here is a distinction from the orchid; as they are not formed by the side of the old tuber, except by accident. At first these appear as mere thickened rootlets, but quite distinct, for they have no fibres, and probably represent Hooker's description of the plant, when he says, "roots stout, cylindrical." When in this state, they are thickly covered with stout hairs. Now, whether these hairs assist in producing the tubers I am not prepared to say, but I have little doubt they act as absorbents of nutriment from the soil. I hope to determine this by microscopic examination. As the plant grows older, the thickened string which attaches the new tuber to the parent gets more and more slender, and at length dies away, and the tuber is then in the state of the first diagram, and the office of the plant, in providing for its continuance, being complete, it also dies. Although the plant has numberless blossoms, it seldom seeds. I cannot say why, as the organs appear remarkably well adapted for that purpose, and bees visit the flowers, blossoming as it does so early in the year. It may be, that frosts destroy the pollen, but to make up for want of seed, the plant reproduces itself, by forming, in addition to the underground tubers, numberless little ones in the axils of the leaves, which may be seen on the top of the ground by hundreds when the plant has disappeared. I must here again express my surprise that Hooker should denominate these tubers as roots; roots are not usually thrown off as independent plants from the axils of leaves. Botanically speaking, these tubers are underground stems; in fact in growth the interior part of the upper stem is continued to the end of the tuber, by five nerves. At the same time, I do not think it at all a happy way of expressing it; really it is a bud, exactly as a rose forms a bud at the base of the leaf; only in the case of the celandine, the plant being herbaceous, it is thrown off.

In a very old book, I have just found this extract: "These stems (underground) were mistaken by old botanists for roots, and this error is still frequently committed." Hooker seems to perpetuate the error. Withering is rather better, but still he says, "root of oblong tubers, accompanied by fibres;" he also says "the bases of the leaves contain one or two knobs similar to those of the root." How can they then be roots?

J. R. NEVE.

Campden, Gloucestershire.

DREDGING IN THE MENAI STRAITS.—I did not see SCIENCE-GOSSIP in time to reply earlier, but I wish to say in reply to W. J. R.'s question that I think he would find Beaumaris a very suitable place to make his head-quarters at, and that I am sure Mr. Ambrose, who resides in Church Street and is the proprietor of a library, will give him every assistance in his power with respect to works on the Natural History of North Wales, as well as valuable local information on the subject. Mr. Ambrose, who is a very clever man, has written several notices of the place; and as I resided in the neighbourhood for three years, I know that W. J. R. will find it a fine field for his researches in marine zoology.—*Helen E. Watney.*

THE PRE-CAMBRIAN ROCKS OF ENGLAND AND WALES.

By W. W. WATTS, B.A., F.G.S.,

[*Continued from page* 82.]

5. SHROPSHIRE.—In 1877 Mr. Allport was working in some rocks which had been mapped as intrusive greenstones in Shropshire, when he discovered that they were bedded acidic lavas stratified with beds of volcanic breccia and ashes. Dr. Callaway was working in the area at the same time, and independently came to the same conclusion. He worked from the Cambrians down to the earlier rocks, just as Hicks had done in S. Wales. Two well-marked groups of rocks are to be found in this district, at Lilleshall, Wrekin, Wrockwardine and Church Stretton, and similar rocks have even lately been found west of the Longwynds and in Radnorshire. In the Wrekin the two groups are fairly well developed, and so the hill may be described in some detail.

It is a N.E. and S.W. range, with four principal elevations,—the Ercal, Lawrence Hill, Wrekin proper, and Primrose Hill. The oldest rocks are found at the north and south ends; newer rocks being let down by faults in the middle. The range is faulted on to the Trias on the west side, while on the east successive members of the Cambrian are faulted on to it and on to one another, the lowest being the Hollybush sandstone, like that of Malvern. At the north end, in the Ercal Hill, there is a fine granitoidite, with a great boss of felstone, of the same character as that of the centre of the chain, intruded into it. At the south end, in Primrose Hill, faulted in to the Pebidian series, there is a series of gneisses, hälleflintas, granitoids, and schists, remarkably like the Malvern rocks. These belong to the Dimetian system.

Lawrence Hill and the Wrekin proper, in the middle of the chain, are composed of bedded felsite lavas, agglomerates, and ash-beds, sometimes with immense fragments of Pebidian age. The whole is flanked by a quartzite which appears to be faulted on to the other rocks, and is certainly posterior in age, for it contains undoubted fragments of the Wrekin felsites.

Figs. 80 and 81 indicate the relative positions of these rocks.

Many other exposures of these rocks occur in the vicinity, and the history of those at Wrockwardine has been so well worked out by Mr. Allport that an account of his chief results may not be out of place. The rocks are purple felsites, and contain many curious structures. They have porphyritic crystals of felspar; they often show lines of viscous flow or fluxion structure, such as is seen in modern slags and lavas: then they contain curious little spheroidal cracks (like the spheroidal structure of basalt on a small scale), called perlites; and in some parts one sees little rounded concretions formed of radiating crystals, and called spherulites. Now the combination of all these characters leads in a remarkable manner to the unravelling of the rock's history.

When we come to examine thin sections of these felsites under the microscope, the origin and relative importance of these several structures can be made out. The porphyritic crystals of felspar are set in a matrix of crypto-crystalline material; that is, a matrix which gives on the whole the reactions of a crystalline body, but in which the distinct crystals are not well defined. The flow-lines are resolved into irregular lines of microliths, tiny embryo crystals, whose long axes maintain a general direction along the lines of flow.

The cracks of the perlites are beautifully shown, consolidation appears to have been the same. These structures therefore tell us that the old Pebidian felsites were once glassy pitchstones or trachytes, and that they cooled and acquired the same structures as modern glassy lavas, but that the lapse of time has devitrified the matrix, or induced the crypto-crystalline structure and altered the general appearance of the rocks. Figs. 82, 83, 84, 85, and 86 are sections of tertiary pitchstones from Meissen and Kremnitz, and of Pebidian felsites, or devitrified pitchstones from Wrockwardine, to show how nearly the porphyritic, microlithic, perlitic, and spherulitic structures correspond in rocks of such widely different ages.

The age of these Wrekin rocks is well shown, first, by their unconformable junction with the Hollybush sandstone; and second, by the occurrence of pebbles

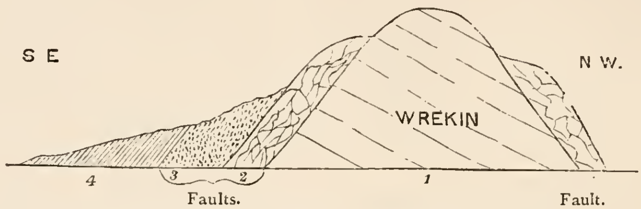

Fig. 80.—Section across the Wrekin Chain (Callaway). 1, Bedded Pre-Cambrian tuff, dip N. 2, Quartzite. 3, Hollybush Sandstone. 4, Sheveton Shales (Tremadoc).

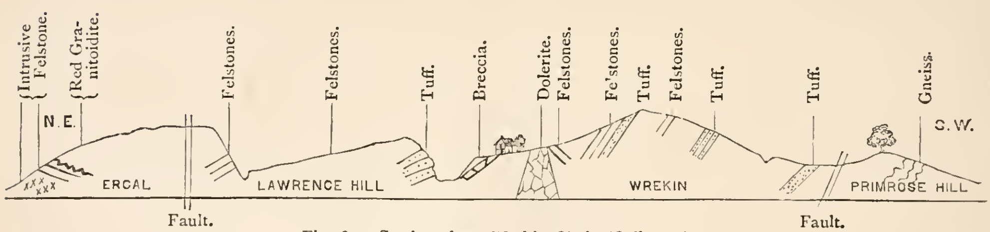

Fig. 81.—Section along Wrekin Chain (Callaway).

and indicate that they are caused by the strain of the rock in contracting during solidification. The radial structure of the spherulites is well seen. Now the streams of microliths are seen to avoid the porphyritic crystals and flow round them (fig. 85), but to run in a straight course through the spherulites (figs. 85 and 86) and through the perlites, indicating clearly enough the order of events during the consolidation of the rock; viz. that the porphyritic crystals must have been formed first, then that the microlithic fluxion structure was caused by the rock flowing in a viscous state, and lastly the rock during contraction and cooling formed perlites and spherulites. These felsites in general appearance are not at all like any modern volcanic rocks, but these microscopic structures are found exactly reproduced in tertiary volcanic rocks, such as pitchstones and trachytes, and only in them; while in every case which has been examined the order of events during of the Wrekin felstone in the Cambrian conglomerate of Haughmond Hill.

The intrusion of felsite of the Pebidian character into the granitoidite of the Ercal Hill furnishes additional proof of the relative ages of the granitoid series and the volcanic series. The gneiss and granitoid series is correlated with the Dimetian or Malvernian system, the volcanic series with the Pebidian.

6. *Charnwood Forest.*—While the discovery and elaboration of the pre-Cambrians of Wales was rapidly progressing, Professor Bonney and Mr. Hill of Cambridge were patiently and laboriously working out the details of the anomalous rocks of Charnwood. They have at last made out the succession in this complicated district, and by the lithological and microscopical characters of the rocks they have correlated them with the Pebidian of other areas. The principal rocks are slaty and gritty beds, thick masses of agglomerate of a rhyolitic (felsitic) type,

and some aqueous deposits. The great difficulty in this district lies in the fact that the rocks are isolated and are not near any Cambrian rocks, but are in contact with Triassic or Carboniferous rocks on all sides.

7. *Cornwall.*—The new Eddystone lighthouse is built on a gneiss of a type which can only be matched among pre-Cambrian rocks. There seem to be in South Cornwall curious hornblende schists and other rocks which may hereafter be referred to this period.

These two or three great systems of pre-Cambrian rocks contain a great thickness of strata, and so must represent a long lapse of time; yet, when we ask for the life history of the period, they are all silent, with the doubtful exception of the Wrekin quartzite, possibly pre-Cambrian in age, which has yielded to Dr. Callaway an obscure trace of a worm burrow.

A word on the various opinions which have been expressed as to the origin of these old rocks may not be out of place.

The earliest school of geological thought referred all the crystalline schists to the time when the earth was intensely heated, and when the seething of the primordial ocean might have given rise to the crumpling and contortion visible in these rocks.'

The strictly uniformitarian school believed these rocks were laid down as ordinary sediments, and were subsequently metamorphosed by heat, water, and pressure,—agencies now in action.

Some geologists are, however, now going back to the old ideas, and Dr. Sterry Hunt has gone so far as to state that "all gneisses, hornblende and micaceous schists, &c., are of Neptunean origin, and are not primarily due to metamorphosis of ordinary sediments." "The chemical and mechanical conditions under which these rocks were deposited and crystallised . . . have not been reproduced to any great extent since Palæozoic times."

We have yet however so very much to learn about the mere succession, position, and character of these rocks, that it is, perhaps, mere waste of time to speculate as to their mode of formation, or to draw conclusions from them as to the state of the earth in those very ancient times.

Fig. 82.—Typical perlites in Meissen pitchstone. Showing passage of microliths through perlites.

Fig. 84.—Perlites of Meissen, showing their dependence on joints (Allport), × 6.

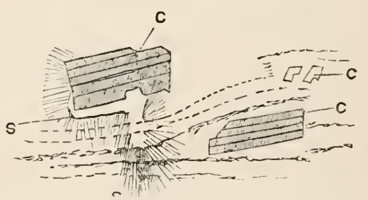

Fig. 85.—Kremnitz perlite, with crystals (c), and spherulites (s). The microliths pass through the latter, but not the former (Allport), × 20.

Fig. 83.—Pebidian felsite (Wrockwardine), showing perlites (Allport), × 10.

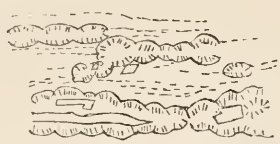

Fig. 86.—Pre-Cambrian felsite (Wrockwardine), with bands of spherulites, sometimes round crystals, and traversed by microlithic streams (Allport), × 2.

THE GREAT INTERNATIONAL FISHERIES EXHIBITION.

ALL lovers of the angle, and those who are interested in any of the numerous ways in which pisciculture affects us, should visit the above Exhibition, which doubtless will remain open during the summer months. English people are interested in everything relating to the sea. This is proved by the fact that on Whit-Monday no fewer than 44,000 people passed through the Exhibition. The number of objects brought together from every civilised country in the world is truly marvellous, and although the greater part of them very naturally relate to the economic side of Ichthyology, &c., there still remain large numbers to interest the pure naturalist. The official catalogue extends to nearly 600 pages and is admirably drawn up. It contains short, practical essays by well-known writers on matters relating to fish and fishing. As might be expected, the United States and Canada are very strongly represented in the exhibits; next to them come Norway, Sweden, and Holland. The objects gathered together in these courts alone would make a magnificent exhibition. Fish-hatching is shown by several contrivances; oyster breeding, lobster breeding, &c., are also illustrated on an extensive scale. There is a superb collection of stuffed fish sent by various angling societies and celebrated anglers, representing, as might be expected, the largest specimens of each kind of freshwater fish. Perhaps there is a trifle too much pike about! Some of the coloured casts of fishes are exceedingly well done. The models sent by Mr. Searle of diseased salmon are of great interest; Mr. Rae, of Coventry, shows the microscopic parasites which affect fish; Mr. T. Bolton, of Birmingham, has a stand where various living microscopic and other organisms are exhibited; Mr. Edward Lovett exhibits exquisitely mounted slides, illustrating the embryology of Crustacea; Mr. Brotherston, of Kelso, shows mounted specimens of freshwater plants; Mr. Bryce Wright has a splendid series of corals, sponges, mollusca, &c.; Dr. Dohrn sends specimens of Entozoa and Epizoa affecting fishes; and Dr. Spencer Cobbold has a collection of no fewer than 80 species of fish parasites. Other objects of high interest to the naturalist are Professor Sars' illustrations showing the embryological development of the codfish; Professor Traquair's exquisite illustrations in pencil of British fossil fishes; Mr. Cholmondely Pennell's pictures of fishes; and Professor Mackintosh's series of original coloured drawings of annelids.

We would also draw attention to Mr. J. Eede's collection of insects injurious to fish and those on which fish prey; and especially to Mr. J. T. Carrington's preserved specimens of Crustacea. There is a large series of British aquatic birds, and of birds whose natural history in any way brings them into relationship with fishes. As the natural history department of the exhibition is of a competitive character, there is necessarily a great deal of repetition in the objects. This, however, need not be a drawback, and we would direct attention to such incidents as the markings and mottlings on the common pike. These usually range from bars to spots, and may be related to the character and depth of the water they inhabit, &c. The natural history student who is weary of the crowds of objects which meet his eyes in the courts and galleries may either amuse himself by observing the living objects in the large and extensive aquarium, or, still better, by strolling into the pleasant grounds and watching the live flamingoes, pelicans, and other aquatic birds in the artificial waters.

THE CONTROVERSY ON THE ARCHEAN ROCKS.

PROFESSOR GEIKIE'S challenge as to the genuineness of the so-called Pre-Cambrian or Archean rocks, contained in his paper read before the Geological Society (an abstract of which was published in the last number of SCIENCE-GOSSIP), has caused quite a keen controversy. The second part of the paper was read on April 11th, when a sharp discussion followed. In the second part of his paper, Professor Geikie gave the results of the survey which he had made of the district with Messrs. Peach and Topley, and of his study of a series of more than 100 thin slices of the rocks collected at St. David's. He found that he could corroborate generally the descriptions of previous writers on the microscopic structure of the rocks, and that investigation with the microscope amply confirmed the deductions he had drawn from observations in the field.

1. *Order of Succession of the Rocks.*—The following rock-groups in the Lower Cambrian series are recognisable at St. David's, and are given in descending order:—

4. Purple and greenish grits, sandstones, and shales.
3. Green and red shales and sandstones, with true tuffs (*Lingulella primæva*).
2. Quartz conglomerate.
1. Volcanic group (tuffs, schists, lavas).

The volcanic group forms the oldest part of the Cambrian series at this locality. The bottom is not reached; but about 1800 feet are visible. It consists mainly of purplish-red, green, grey, and pale tuffs, with occasional breccias and bands of olivine-diabase. Analyses of some of these rocks had been made by M. Renard, of Brussels. The tuffs are partly basic, derived from the disruption of diabase lavas (48 per cent. of silica), partly acid, from the destruction of fine felsites (72–80 per cent. of silica). The microscopic structure of the tuffs was described, and slides and drawings were exhibited. The lavas are varieties of olivine-diabase. Their augite is remarkably abundant and fresh, and they contain scattered larger, well-formed, as well as imperfect crystals of olivine, generally in the form of hæmatitic pseudomorphs. No instance was observed of a siliceous lava having been erupted at the surface. The felsitic fragments in the tuffs must have been derived from the explosion of lavas that do not seem to have flowed out above ground. It was pointed out that this fact is exactly paralleled in the case of the volcanic group of the Lower Old Red Sandstone in the Pentland Hills. In relation to the quartz-conglomerate, allusion was made to the constant recurrence of such conglomerates in the series of geological formations, and to the fact that they do not necessarily mark unconformability or the natural base of groups of sedimentary rocks.

2. *Geological Structure of the District.*—It was shown that the rocks have been folded into an isocline or inverted anticline, so that in one-half of the plication the dip of the strata is reversed. The groups above mentioned are found in their proper order on both sides of the axis which runs through the volcanic group. The granite has risen irregularly through the eastern limb of the isocline. Small faults may occur here and there along the edge of the granite, but they do not in any way affect the general structure.

3. *The Foliation of the District.*—There has been extensively developed at St. David's a fine foliation of particular kinds of rock, more especially of certain fine tuffs and shales, which have passed into the condition of fine silky unctuous hydro-mica-schists or sericite-schists. A series of microscopic slices was described which showed that the original clastic structure of the beds remains quite distinct, though an abundant development of fine flakes of a hydrous mica has taken place. This structure more particularly characterises the fine parts of the volcanic group, but it occurs also on various horizons in the groups above the conglomerate, thus linking the whole as one great continuous series of deposits. The author connected it with the plication of the district, and pointed out the great interest attaching to these fine schistose bands, as revealing some of the incipient stages of the same process that had changed wide regions of sedimentary strata into crystalline schists.

4. *The Granite, Quartz-Porphyries, and accompanying Metamorphism.*—The petrographical characters of these eruptive rocks were described, and their perfect analogy to the familiar granites and elvans of other districts was pointed out. Specimens were shown, illustrating the gradation from a true granite into spherulitic quartz-porphyry. The quartz-porphyries of St. David's (described by Mr. Davies, Dr. Hicks, and others) exhibit spherulitic structure in an exceptionally perfect manner. Between the felso-spherulites the base is thoroughly micro-crystalline, and not felsitic. The rocks belong to a group intermediate between granites and felsites. They occur in bosses, elvans, or dykes round the granite, cutting through all horizons of the volcanic group, and approaching, if they do not actually intersect, the quartz-conglomerate. The metamorphism associated with the granites and porphyries is best seen near the latter. It consists chiefly in the intense induration of certain bands of rock which have been converted into flinty aggregates (adinole). The alteration takes place usually along the bedding, which is nearly vertical; but veins of the same siliceous material ramify across the stratification of the shales. Examined microscopically, the adinole is found to have acquired a micro-crystalline structure, nests of quartz and orthoclase and porphyritic crystals and plagioclase having been developed, together with fine veins and filaments of crystalline quartz. These veins are here and there crowded with approximately parallel partitions of liquid inclusions, showing freely moving bubbles. An analysis of a portion of the adinole, made for the author by M. Renard, shows the percentage of silica to be 78·62 with 5·80 of soda, indicating possibly the formation of albite. The author deferred generalising on the question of the metamorphism he described, but pointed out that a further study of the St. David's rocks could hardly fail to throw important light on the theory of metamorphism.

5. *The Diabase Dykes and Sheets.*—These are the latest rocks at St. David's, as they traverse all the others. Both their macroscopic and microscopic characters were described, and allusion was made to the perfect fluxion-structure found in many of the dykes.

The paper closed with a summary of the geological history of St. David's. The earliest records are those of the Volcanic group, which show the existence of volcanic vents in that region in an early part of the Lower Cambrian period. The volcanic accumulations were covered conformably by the Conglomerate and succeeding Cambrian groups; but the same kind of tuffs continued to be ejected after the deposition of the Conglomerate. At a later time this thick conformable succession of beds was plicated, and underwent a partial metamorphism, whereby some of the fine tuffs and shales were converted into sericite-schists. Subsequently a mass of granite rose through one side of the fold, accompanied by elvans of spherulitic quartz-porphyry, whereby a second, different, and feebler kind of metamorphism was induced. The last episode was that of the diabase dykes, which, crowded together in the granite, suggest that the granite boss stands on an old line of weakness and of escape for eruptive material from the interior.

In the Discussion which followed, Dr. Hicks stated that since the last meeting he had revisited the district with Professor Hughes and ten excellent trained observers from Cambridge. This examination confirmed, to the fullest extent, the views expressed by Professor Hughes and himself at the last meeting, and it proved also that the supposed facts, relied upon by the author to support his views, were clearly mistakes made by Professor Geikie from an imperfect acquaintance with the district and the rocks. By the admission of the author, the appearances are abnormal in the St. David's area. With respect to the intrusive character of the so-called granite, he asked what had become of the materials displaced by the intrusion. He regarded the so-called tuffs alternating with the Cambrian conglomerates as derivative rocks, full of quartz-grains, &c. The junction of the sedimentary rocks with the granitoid rock was a faulted and not an intrusive junction. The fault was marked by slicken-sides, but not by any contact metamorphism. He demurred to the author's views as to the double series of foliations. He showed that while a dyke of greenstone 50 yards wide had produced enormous alteration in the surrounding rocks, the great granitoid mass had produced no alteration. At Ogof-llesugn, a place specially [referred to by the author, it was possible to get between the Dimetian and the quite unaltered Cambrian conglomerate. Another mass of conglomerate was jammed in through the action of a fault. The amount of faulting and crushing in this area was enormous, a fact which did not seem to have been recognised at all by Professor Geikie. The supposed porphyries in the Pebidian were really, for the most part, indurated ash. The author now admitted that unconformity existed between the Pebidian and the Cambrians. Examined with more care than appeared to have been given to it by the author, the conglomerate was found to consist in very large part of the Pebidian rocks, and of derivative materials from the still older Arvonian and Dimetian series. This fact was remarkably confirmed in Ramsey Island. He maintained the existence of a great unconformity between the Pebidian and the Cambrian conglomerates, the materials of the former having been metamorphosed before the deposition of the latter. He pointed out the existence of great masses of agglomerate in the midst of the supposed intrusive masses.

Mr. Peach, from the sections of Dr. Hicks, argued that the Cambrian conglomerate rests always on the same member of the underlying beds, and there could be no unconformity. He regarded the so-called Pebidian pebbles as segregations, and not pebbles.

Mr. Hudleston said that no one could suppose the Pebidians to be of sufficient importance to constitute a system by themselves; and the great question was whether they should be grouped with the Cambrian or the Archean. He had difficulty in recognising the supposed unconformity between the Cambrian and the Pebidian, and he thought that the volcanic series was the natural base of the Cambrian system.

Mr. Topley stated that the faults invoked by Dr. Hicks would account for the non-passage of a dyke from the granite into the Cambrians. Dr. Hicks had not distinguished between local and regional metamorphism. The species from the conglomerate exhibited by Dr. Hicks were certainly exceptional; but the great mass of the conglomerates are of quartzose character. Local and small unconformities between the Cambrian conglomerates and the main volcanic group (Pebidian) had been admitted both at this and at the last meeting; but he differed from Dr. Hicks as to the great significance to be attached to them.

Dr. Callaway objected to Professor Geikie's views as to bleaching and induration being proofs of local metamorphism; he regarded them on the contrary as evidence of faulted junction, the result of pressure and the infiltration of water. He remarked that the key found by Dr. Hicks at St. David's had supplied us with an explanation of most of the similar Archean series in England and Wales, which was a great confirmation of the truth of the theory.

Mr. Rutley said that some of the felsites of the district resembled certain spherulitic rhyolites. He thought that they represented a transition between granitic rocks and ordinary rhyolitic lavas. Most of the Welsh lavas of the same kind with which he was acquainted were of Lower Silurian age.

Mr. T. Davies did not agree with Professor Geikie in regarding the so-called Dimetian as a granite. It contained no mica, nor had it contained any; for he could not regard the green mineral as the result of the alteration of mica *in situ*, but rather as derived from the interbedded basic rocks. Among 500 specimens of granite from about 400 localities he could find nothing resembling the St. David's rock, and he could not regard the latter as a granite at all. A rock in the very heart of this supposed intrusive mass was found to be a breccia with fragments, some of them water-worn, of the stratified rock of the district.

Professor Renard said that he had had a collection of specimens and of microscopic slides from the rocks of St. David's submitted to him by the author, and had examined them in concert with Professor Zirkel, of Leipzig, and Professor Wichmann, of Utrecht. The conclusions arrived at regarding them were as follows:—1. The so-called "Dimetian" rock of St. David's is unquestionably a true granite. 2. The quartz-porphyries are just such rocks as might be expected to occur as apophyses of the granite, and the specimens from Bryn-y-Garn, Rock House, and St. David's left no doubt on our minds that such is really their origin. They cannot be confounded with rhyolitic lavas. 3. The conglomerate from the granite-contact shows secondary quartz between its pebbles. 4. The bands of fine tuff found intercalated with, and on various horizons above, the conglomerate, consist of true tuff, and cannot have been derived from the mere superficial waste of older volcanic rocks. 5. Fine foliation is well developed among the strata above the conglomerate as well as in the volcanic group below.

Professor Bonney thought that on the whole the conglomerate made a good base for the Cambrian; and he felt certain that whatever the so-called Dimetian might be, it was older than the Cambrian conglomerate.

Professor Geikie said that Dr. Hicks's views as to the remanié character of the tuffs alternating with the conglomerate were contradicted by the careful study of Drs. Zirkel and Wichmann, and M. Renard. Dr. Hicks had been recently to St. David's, but he was quite unable to produce a pebble of Dimetian from the Conglomerate. He controverted Dr. Hicks's views as to the section at Ogof-llesugn. He stated that the diabase dykes cut through both the granite and the Cambrian conglomerate of the district, though they are most abundant in the former. In reply to Professor Bonney, he stated that microcline was regarded by continental workers as characteristic of granite rather than of gneiss. He asserted that none of the conclusions of his paper had been shaken by the discussion.

MICROSCOPY.

Germination of Fungus Spores under the Microscope.—In reply to Mr. G. H. Wasse, inquiring for information on this subject, I think that the use of a damp chamber deserves at least a trial. It would no doubt serve to keep the pabulum moist and would maintain the damp atmosphere, which seems to forward the growth of all Cryptogams. The damp chamber devised by the Rev. Mr. Dallinger, and used by him and Dr. Drysdale in their well-known researches on the development of Monads, is the most effective and the simplest of its kind. The following description is taken partly from Mr. Dallinger's article in the March number (1874) of the "Monthly Microscopical Journal" and partly from Mr. Saville Kent's version in his "Manual of the Infusoria" (vol. i. p. 116). Its foundation consists of a plain glass stage, $\frac{1}{10}$ of an inch thick, so fitted as to slide on in place of the ordinary sliding stage of a Powell and Lealand or Ross stand. It is thus susceptible of the mechanical motion common to those stages. The thickness is too great to work through with achromatic condenser and high powers, and therefore a circular aperture is cut through in the centre and a good piece of thin glass fixed over it with Canada balsam. At the end of an arm projecting from the left-hand anterior corner of the stage there is a socket into which a glass vessel, $1\frac{3}{4}$–2 inches deep, drops. A piece of good new bibulous paper is laid on the stage, coinciding with it in form, but slightly smaller and with a tongue-like projection that lies along the arm, and dips into the glass reservoir at the end. A circular aperture of greater diameter than the cover-glass intended to be used, must be made in the centre of the paper, and then the glass vessel filled with water and the paper moistened. The fluid to be examined is then placed on the centre of the thin glass and covered, if necessary. The bounding walls of the chamber are represented by a piece of glass tubing $1\frac{1}{2}$ in. in diameter and $\frac{3}{4}$ in. in length, over one end of which a piece of thin caoutchouc is firmly stretched and a small hole made in its centre. The bottom edge of the tube must be carefully ground. This is placed on the stage with the caoutchouc upwards, and the hole in it over the centre of the cover-glass. The objective is now racked down through the small hole and adjusted to focus. The caoutchouc should be thin enough to afford no impediment to the action of the fine adjustment, when it will be seen that it clasps the object-glass firmly round its central perforation, and the pressure from the under edge of the chamber on the blotting-paper so that little or no air is admitted, while if the under edge of the chamber be carefully ground it will suffer the stage, paper and all, to move under it when the milled heads for working the mechanical stage are in action. As I have neither mechanical stage, achromatic condenser, nor very high powers, I have an ordinary glass slide $3 \times 2\frac{1}{2}$ in. such as would be used for mounting large sections on, and I have cemented to one corner a strip of glass which projects beyond the stage of the microscope, and is then bent down at right angles so as to dip into a small jar of water. A centrally perforated piece of blotting paper with a strip from one corner hanging over into the water is placed on the slide, and upon that a deep glass cell $1\frac{2}{10}$ in. in diameter, which can be procured with both edges ready ground, a piece of thin caoutchouc is easily tied over one end. Working with medium powers I have been able to keep some specimens of pond-life under observation, unfortunately not continuous, for some length of time.—*E. J. Bles.*

Embryological Specimens for the Microscope.—The new and fertile field of research opened up by the development of the science of Embryology has attracted numerous enthusiastic workers. All such will be glad to hear that Messrs. Sinel & Co., of Jersey, have commenced to issue slides illustrating the embryology of marine life. Their situation gives them splendid command of the most fertile marine gathering grounds in the British Islands. We have carefully examined the slides sent out, and are happy to be the means of strongly recommending them to our readers. The specimens are carefully named, and mounted in a new preservative which admirably retains the beauty of form and structure of the most delicate of organisms. We understand that the happy thought of introducing these specimen in this state is due to Mr. Edward Lovett, of Croydon, whose exhaustive papers on the Natural History of Jersey appeared in SCIENCE-GOSSIP for 1882.

STUDIES IN MICROSCOPICAL SCIENCE, edited by A. C. Cole.—The first volume of this successful series is now completed. Nos. 49 and 51 treated on the large and small intestines of the dog. Nos. 50 and 52 on the Serpentine of the Lizard Rock, and the Serpentine of Portsoy (by Professor Heddle). Mr. Cole offers a very tempting and attractive prospectus for his second volume, which will commence shortly.

OTTAWA MICROSCOPICAL SOCIETY.—Last October a society was formed in this distant Canadian city, called as above, for the purpose of encouraging the use of the microscope, as a means of recreation to some, and to others as an indispensable accessory in working out the northern fauna and flora. During the winter, monthly meetings were held at which papers were read and many temporary and permanent preparations exhibited, and thus a good basis was laid for the work which is about to commence for the spring and summer. The hon. secretary, Mr. J. B. Tyrrell, writes to say that if any of our readers would like to obtain microscopic material from this part of the earth, for which they would give good exchange, the Society would be very glad to hear from them. The address of the secretary is—*J. B. Tyrrell, F.G.S., Geol. Survey of Canada, Ottawa, Canada.*

ZOOLOGY.

GOLDEN PLOVER, &c.—On Good Friday, on Nazing common, I saw a large number of pewits, and with them many golden plovers, as I believe. Is it usual for green and golden plovers to fly in company?—*Frederic Johnson.*

HARLESTON LITERARY SOCIETY.—A very successful course of six lectures on "Flowers, &c.," delivered by Dr. J. E. Taylor, F.L.S. &c., Editor of SCIENCE-GOSSIP, before the above society, has just been concluded.

VANDALISM.—A dealer in natural history objects here informs me that a "gentleman," a *private* (not a professional) collector of birds' eggs in the Midland counties, lately offered him for sale the following:—400 eggs of hedge accentor, 200 eggs of yellow hammer, 400 eggs of chaffinch, 250 eggs of white-throat, 110 eggs of greenfinch, 270 eggs of willow wren, 20 eggs of common wren, 30 eggs of robin, 80 eggs of sedge warbler, 70 eggs of linnet, 50 eggs of sand-martin, and others; total, 1880. Comment on this is not necessary: suffice to say that the dealer was too indignant to make an offer.—*Adolph Leipner, Hon. Sec. of the Bristol Naturalists' Society.*

THE FRESH-WATER MEDUSÆ.—Mr. W. Sowerby writes to "Nature" to say that these interesting little creatures have once more made their appearance in the *Victoria regia* tank at Regent's Park.

OTTAWA FIELD NATURALISTS' CLUB.—We have received a copy of the Transactions of this flourishing Society for 1881–2, which contains, besides the President's Inaugural Address, the Reports of the Geological, Botanical, Entomological, Ornithological, and Oological branches of the Society, and papers on the Geology of the Ottawa Palæozoic Basin, by Dr. A. R. C. Selwyn, F.R.S.; Filterings from the Water-supply of the City of Ottawa, by the Rev. Dr. Kemp; On some Canadian Ectoparasitic Sarcoptidæ, by J. B. Tyrrell, B.A.; On Ottawa Unionidæ, by Mr. F. R. Latchford; Pine-life, by Dr. B. Small; on the Utica Slate, by Mr. H. M. Arni. The Address of the President, Mr. Jas. Fletcher, gives a capital review of the year's proceedings and doings, and amongst other things refers to his recent visit to England in the following terms, which will give our readers an idea of how our colonial brethren regard our English green lanes: "They are a characteristic feature, and I believe not to be found of the same description in any other country. Few things are more beautiful; their steep banks of refreshing green, surmounted by well-trimmed hedges, and clothed from top to bottom with feathery grasses and lovely flowers, breathing forth delicious odours, have an effect little less than enchanting on visitors from other climes. Their beauty is ever-varying; plant after plant throughout the whole summer, succeeding in its turn, claims the reward of its effort by forcing up its head into the sunlight to bear its corolla or crown of glory; the gay butterfly with bejewelled wings adds its charm to the scene; and the hum of the bee as it hurries by is no unimportant factor of the whole. Truly this scene of beauty should be sufficient to demand from all—the most unobservant—some small share of attention." During the past year, prizes have been given of the following books for the best collections: Dr. Asa Gray's "Manual of Botany," "Flowers, their Origin, Shapes, Perfumes, and Colours," by Dr. J. E. Taylor, and the "American Naturalist" for 1882. The President for 1883–4 is Dr. H. B. Small, and the Hon. Secretary, Mr. W. H. Harrington.

THE METALLIC PLUMAGE OF BIRDS.—Dr. Jadow, in a paper on plumage of birds, states that feathers having metallic tints owe them to certain prisms found in the cells.

ISLE OF MAN NATURAL HISTORY SOCIETY.—At the last meeting of this very active society the Rev. S. N. Harrison was elected president, and Mr. P. M. C. Kermode, hon. secretary. The Society, in view of the meeting of the British Association at Southport in September next, has determined to get up a dredging excursion round the shores of the island, and has made arrangements and voted a sum of money for the purpose. We hope the Southport Local Committee will join in the matter, for there is no better dredging ground (and we speak from delightful experience) in the British Islands.

MIMICRY OF HUMMING BIRDS BY MOTHS.—Dr. Krause thinks that the striking resemblance in size, form and movements of the South American moth (*Macroglossa titan*) to humming-birds is a case of protective mimicry, and that the moths benefit by the resemblance to the birds, which have few winged enemies. He thinks that the closeness of the resemblance also protects the moths from the humming birds, which always give chase when they recognise them.

THE ACADIAN NATURALIST.—We have received the first copy of the above scientific serial, published in the interest of the Acadian Science Club. It opens with a capital article by Dr. Dawson, F.R.S., on "The Present Rights and Duties of Science."

BOTANY.

"OLD-FASHIONED FLOWERS."—A very handy, compact, and interesting little handbook has been issued by Mr. L. Gill, price 6*d.*, on the above subject. All of the plants described are hardy perennials, and of the kind now known as old-fashioned garden flowers. We are glad to see the outburst of feeling which has rehabilitated the flowers our grandmothers loved and cultivated, and has once more given them a place in English gardens.

SECOND FLOWERING OF CORNEL.—I have observed for many years the *Cornus sanguinea* almost invariably has, or makes an attempt at having, an autumnal flowering. This takes place in September or October, and, more rarely, as early as August, which was the case in 1868. Of course no berries are produced from these autumnal flowers. Now, although *C. sanguinea* ranges as far north as Denmark and Norway, it is also a native of southern climates, as Spain, Italy, and Turkey, and it would be interesting to learn whether in any of its southern haunts it really perfects two crops of berries in the year; and if so, does it not still continue the attempt with us, although it has migrated farther north? The same facts hold good with the strawberry-tree, *Arbutus Unedo.* A specimen near my window invariably commences a second flowering about October, and continues in blossom up to about Christmas, so that flowers and ripe berries are prettily mingled together, the former forming a winter repast for the honey-bee and sundry Diptera. Nevertheless I think we dare not conclude that the sole reason for the second blowing is to furnish food for insects.—*H. W. Kidd.*

LEONTODON TARAXACUM.—On the 5th of May, the air being still a little searching but the sun warm, I bethought me to take a stroll over the downs. It was not long before I came upon the home of the greater and lesser dandelions. The lesser sort were gaily starring the short turf, the big ones were arranged along the hedge-row; so that there could be no mistake as to habitat. The diagnosis was briefly this: Var. *major*, leaflets runcinate, glabrous, toothed, veined. Var. *minor*, leaflets sagittate, glabrous, smooth, distinctly brown at the edge, and exhibiting a tendency to change into prickles; outer ray of flower-head deep purple beneath; averages one-third the dimensions of var. *major.* Perhaps to complete the illustrious task of redescribing the genus Leontodon I should add: var. *palustris*, outer scales of the involucre erect, appressed; leaves sinuato-dentate, nearly glabrous. Thus does our common dandelion produce its races, under the shady hedge, on the dry down, and wet bog.—*A. H. Swinton.*

THE FLOWERING OF THE DUCKWEEDS.—The flowers of duckweeds appear to be seldom observed and are repeatedly said to be rare. Some time ago I was surprised to hear a field botanist of some repute say that the flower of *Lemna trisulca* was unknown in Britain; and the author of "Ponds and Ditches," writing of the four species, says, "the flowers are small and rare." On referring to my notes, I find that since 1878 the flowers of *Lemna trisulca* and *L. minor* have been seen in this locality each following year. *Lemna trisulca* in flower was first found by Dr. H. Franklin Parsons and myself in a pond at "Sandholes," Swinefleet Common, on the 2nd of June, 1878, and has since been regularly observed in that and in other habitats. *Lemna minor* has been noted in flower as follows: Goole, 1878–82; Telby, 1880 (W. N. Cheesman); Snaith, 1882; and *Lemna gibba*, in a ditch at Goole Fields in 1882. Their extreme smallness may be a reason why the flowers of the duckweeds are not more often seen, but perhaps some of your readers will say if they have been commonly observed by them?—*Thomas Birks, jun., Goole.*

PARIS QUADRIFOLIA.—It would perhaps prove interesting to botanists to learn that *Paris quadrifolia* may be found in a wood about half a mile beyond Pinner station, and about a hundred yards from the line. I found yesterday about a dozen specimens in flower, and there will be at least a dozen more out by next Sunday.—*M. Gunning.*

SIGNS OF SPRING.—The first migrants have arrived here. I saw the first chiffchaff on the 2nd of April, and since then I have heard three each day in the same glen. I remarked butterflies on the 4th of March, and a missel-thrush building on the 7th.—*G. A. K., West Cornwall.*

GEOLOGY.

Gelatinous Silica.—Dr. H. Leffmann states in the "American Naturalist," he has found that at the bottom of bottles containing certain siliceous geyser waters from the Yellowstone National Park, there is deposited a quantity of gelatinous matter looking like the white of egg, which, on analysis, proved to be nearly pure silica. It was entirely structureless, and by heat dried to a white opaque mass. After having been enclosed for several weeks in a closed vessel with strong sulphuric acid, it shrank to about one-tenth its volume.

Another Factor in the Evolution of Species.—The new American weekly journal, "Science" (whose great success is well deserved), has a short paper by Professor Verrill, in which he calls attention to the lack of maternal care as one of the probable causes of the extinction of many of the large and powerful reptiles of the Mesozoic periods. The more intelligent forms, by the development of parental instinct for the active protection of their young against their enemies, would survive longest, and therefore would transmit this instinct, with other cerebral developments, to their descendants. Professor Verrill thinks this mode of natural selection must always have been an active one.

The Fossil Men of Nevada.*

The wondrous story that I now relate
Of what was found in great Nevada's State
Will dash all human aspirations high,
But make the saddest of collectors spry.
Within the precincts of the prison wall
Of Carson city, the State Capitol,
Alternate layers of sandstone and of clay,
When dug, disclosed impressions—so they say—
Of human footsteps of gigantic size
Which made no less impression on the wise.
Great beetle-crushers, twenty inches long,
In thirteen prints a separate track prolong;
Though these big men, 'twould seem, had little go—
Scarce forty inches 'twixt the toe and toe.
A mincing gait was this for giant race—
Three feet and odd the step, six feet the pace.

So men before us made their lives sublime,
And left great footprints on the sands of time.
We follow, sailing o'er life's solemn main,
And seeing, tremble, losing heart again.
For being taught in Darwin's unique plan,
We thought perfection grew from man to man.
Such dreams, we see, are idle—time misspent—
When "understandings" narrow with descent.

A. Conifer.

* See the Duke of Argyll's letter to "Nature," April 19th.

NOTES AND QUERIES.

The Rose.—The rose is a plant which has been famous from all ages, and its history is largely interwoven with legends. Concerning the origin of the red rose, the three following versions are the most beautiful which I have come across:—"It was holiday in Olympia, and the gods and goddesses were drinking ambrosial nectar. Venus, for this occasion, had decked herself in garlands of white roses. Her son Cupid, while sporting with the nymphs, struck with the tip of one of his wings the goblet which his mother held, thus spilling a few drops of the celestial liquid, which, falling on the roses, suddenly changed them into a lovely scarlet." Another is: "Venus, during the heat of the day, was reposing in her bower, the floor of which was strewn with white roses. On learning the death of her beloved Adonis, who had been killed by a wild boar, she left her couch, crying bitterly; and while her eyes filled with tears which ever and anon fell to the ground, the blood shot forth from her foot, which had struck against a thorn: thus the roses became red and from her tears sprang the anemones." The last and, to my mind, the most beautiful: "A rose-tree, growing by a river-bank and seeing her lovely white corolla reflected in the stream, blushed with pride on seeing how beautiful she was."—*W. H. Newberry, Ghent, Belgium.*

Appearance of the Swallow.—It will perhaps interest your readers to know that on Tuesday last (the 3rd of April) I noticed here (Leeds) a common swallow (*H. rustica*) on the wing. There was no doubt about the bird, its peculiar head, tail, breast, &c., being distinctly observed. Tuesday was a beautiful day, and I have no doubt this had induced the bird to come out of its winter-quarters; for as there were no others present and I have not seen it since, I concluded that it had hybernated. This is another proof that the swallow does not always leave us, and corroborates Dr. Abbott's statement.—"*Plutarch.*"

Wood-pigeons and Owl.—On the 7th of April my brother disturbed a pair of wood-pigeons (*Columba palumbus*) and a white owl, out of a tree covered with ivy. Upon climbing up he found the wood-pigeons' nest with an almost fully-fledged young pigeon in it, and separated from this by only a small partition of ivy was the roosting-place of the owl, which had evidently been long in use, judging from the amount of excrement which lay there. It seems almost incredible that the owl should not have frightened away the pigeons whilst building, or devoured the young one when it was hatched.—*F. Hayward Parrott, Walton House, Aylesbury.*

Curious Phenomenon seen at Burnham, Somerset.—My attention and that of many others directed to it, April 6th, before and after sunset. All at once there shot up from the sun a column of fire towards the zenith. There were not other rays of light. It was like a huge pine trunk slightly knobbed at the top. This rose and fell, waxed and waned like an Aurora streamer; sometimes looking 300 feet high, and anon 3000. A gentleman who has lived here over forty years never saw anything like it before, and I, having watched the skies for over forty years, cannot remember such an appearance. It lasted about three-quarters of an hour.—*A. H. B.*

Lundy Island.—I have great pleasure in referring Mr. Wilkinson to a little book by Mr. J. R. Chanter of Barnstaple, in which he will find particulars of the natural history, geology, and botany of Lundy; together with a great deal of other information about this "right little, tight little island," which, if not useful to him, will at any rate prove interesting. The book, which is published by Messrs. Cassell, Petter, and Galpin, is entitled "Lundy Island: a Monograph, descriptive and historical."—*G. M. Doe, Great Torrington, N. Devon.*

LUNDY ISLAND.—Your correspondent, W. E. Wilkinson, asks for information on Lundy Island. Having been there, I can inform her, I did not find any plant at all resembling the one named in the "Standard," which much puzzled me. I believe, however, the plant must be the pink centaury, which is frequent—particularly the variety *pseudo-latifolia.* I showed this to the late Mr. H. C. Watson, as I imagined it was real "latifolia," but he decided otherwise. It is possible this may have been used as a dye, for many other members of the same order possess dyeing properties, *Chlora perfoliata*, for instance. I do not think there is very much worth going there for; your correspondent must be careful to avoid going when the island is covered with fog, as it is most dangerous. This, unfortunately, is its normal state. The geological formation is granite. Sea birds exist in the greatest number I have ever seen, particularly a small puffin; "Lundy Island parrots" sailors call them. A better botanising locality is Clovelly, but accommodation in the village is scarce and dear.—*J. R. Neve, Campden, Gloucestershire.*

SLOW-WORM.—Can any reader give me any hints as to the management of a slow-worm, and what to provide it with in place of its natural food, which is difficult to procure? Any hints respecting the management of a snake will also oblige—*Clara Kingsford, Canterbury.*

EPPING FOREST.—The readers of SCIENCE-GOSSIP will doubtless rejoice to know that the London Naturalists, especially those living in the Northern and Eastern districts of the Metropolis, were by no means lax in opposing the projected railway across Epping Forest. To the Essex Field Club belongs the credit of having taken the initiative in this matter. The famous broadsheets, circulated by this Club, were of a most argumentative character, and doubtless roused public opinion to a full sense of the evils which would accrue if the obnoxious railway Bill were allowed to become law. The action thus commenced was ably seconded by the East London, Hackney, Highbury, and Walthamstow Natural History Societies, while the East London, Haggerston, and West London Entomological Societies did their share. All these passed resolutions strongly denouncing the scheme as a direct violation of the "Epping Forest Act," which directs, *inter alia*, that "the Forest is to be preserved in its natural aspect." Copies of these resolutions were sent to Members of Parliament, Local Boards, and the Press. Moreover, many petitions were presented by Parliament. The defeat of this contemplated act of vandalism by the House of Commons on 12th of March has now become a matter of history. The second reading of the Bill (High Beech Extension) was rejected by a majority of 148. In the words of the contemporary: "The vote of the House of Commons has smashed, pulverised, and utterly destroyed the wanton attempt of the Great Eastern Railway, supported, we are sorry to think, from not too disinterested motives, by the Corporation of London, the appointed Conservators of Epping Forest, to ruin the seclusion of the most picturesque part of the forest by driving a line from Chingford to High Beech. The despised entomologists will now be able to pursue their butterflies in peace, and the lovers of sylvan scenery which never palls, will be able to enjoy the solitude of the forest undisturbed." —*F. Coles, F.L.S.*

MIND IN THE LOWER ANIMALS.—I beg to thank Mr. H. C. Brooke for his valuable criticism on my article in the April number. But let those who enter the lists as warm friends of the lower animals beware lest their feelings bias their judgment. It is incontestable that an experienced dog-fancier "can tell to a great degree what feelings are uppermost in the dog's mind by the different sounds it utters." But are not feelings very different from notions or conceptions? The grand question at issue is, are brutes competent to form the abstract and general notions implied in the intelligent use of speech? Mr. Brooke exhibits a catalogue of facts which tend to prove the affirmative side of the case. Thus, for instance, when his dog hears the word "meat" or "walk" or "street" or "cats," she thereupon listens attentively and becomes excited, frisking about, &c. But does it follow that the dog bears in her mind, during this paroxysm of excitement, any intellectual notion or conception corresponding to what men express when they use these words? Are her actions at this time guided or directed by any such abstract or general notion? Does she make towards the kitchen or the dining-room, or towards the hall-door, or towards the resort of the cats? At the word "meat" does the dog beg, or lick her lips, or does her mouth water? No doubt it may be possible that the word "fish" may be so often repeated in a cat's ear when she was actually eating fish, that on this sound being uttered on another occasion she may actually remember her last meal, and thus will manifest a certain amount of pleasure; but we entertain grave doubts as to whether the feline memory is so highly endowed. Then, again, is not the dog a very excitable and effervescent creature, and only too prone to catch the infection of his master's animation; so that when the latter sings out "cats" or "rabbits," at the same time throwing his arms about and looking particularly vivacious, is it not more than probable that the dog is sympathetically affected by this demonstration, rather than that he is pondering upon some ideal notion of these creatures? So also when the tame thrush is restrained from too hastily gobbling a boiled potato by the words "too hot," does the bird actually and truly understand that this adjective specially expresses that particular burning sensation? Surely not. Mr. Brooke goes so far as to say that "the various little sounds made by a dog are as much words and as expressive of ideas to another dog as our own language is to a fellow-countryman." Now, to seriously combat this view would be wholly superfluous. No doubt there are some stories in circulation about dogs which apparently lend colour to this assertion, but it is sufficient to observe that they are either wholly imaginary or fictitious, or they have been concocted by some person unused to reflection. "If we mention water," says Mr. Brooke, "a pet dog will show by his signs that that is what he wants." Did Mr. Brooke ever perform the crucial experiment of mentioning to the animal some other name, and accompanying it by the same or equally expressive gestures?—*P. Q. Keegan, LL.D.*

NOTES ON GNATS, ASH, &c.—While walking on Friday, April 20th, on the Crumbles, immediately east of this town, I observed swarms of insects which looked rather like large gnats flying about the bushes, especially the bushes where bramble and roses were common : in such swarms were they that it was quite impossible to walk in some places without getting these insects either in one's mouth, or ears, or nose, or eyes. During the eight years that I have been in Eastbourne (although I have not observed this sort of things except during the last four or five) I have never seen such large numbers of gnats (or whatever they were, for I do not think that they were the common gnats) either so early in the year or at a later period. I thought that perhaps this note might be interesting. The proper thing would have been to have boxed a few for examination, but I did not think of it. I should also like to notice that the ash (*Fraxinus excelsior*) is now out in many parts of Sussex in bud or leaf, and has been in bloom for nearly a month; the oak is only just beginning to bud, and is still quite brown. Surely this is unusual, or else how can we justify Tennyson, who says, "as lingereth the tender ash to clothe herself when all the woods are green"?—*T. A. Dymes*, *Eastbourne*.

"THE STAR OF BETHLEHEM."—Mr. Dipton Burn, under the heading "The Star of Bethlehem," in your last number, refers to a conjecture, recently brought forward again, that the star seen by the Magi at our Lord's nativity was identical with a new star observed by Tycho Brahe in 1572, that it appears regularly in periods somewhat exceeding three hundred years, and that it will be seen once more in two or three years from the present time. I have shown in "The Observatory," a scientific journal which circulates amongst astronomers, that there is no real ground for supposing that Tycho Brahe's star of 1572 has any such period. It has indeed been stated that new stars were seen in A.D. 945 and 1264; but Tycho himself has shown, in his elaborate work on the star of 1572, that there is no sufficient evidence of these supposed earlier appearances, and that the allusions were in all probability to comets which were observed in those years. (The splendid comet of 1264, the year of the battle of Lewes in England, is mentioned by all the historians of that period.) And with regard to the star of the Nativity, nothing can be more evident, as was pointed out by St. Chrysostom, than that it was a miraculous appearance in the form of a star (perhaps visible, as many divines think, to the Magi only), sent expressly to indicate the Saviour's birth. Let me quote part of a sentence from the learned Tycho:—"Stella illa, quæ in Oriente Magis apparuit, . . . illa, inquam, stella non erat de cœlestium astrorum genere." And these are wise words, as all the circumstances of that appearance, recorded in the sacred narrative, show.—*W. T. Lynn*, *B.A.*, *F.R.A.S.*, *Blackheath*.

NATURAL HISTORY OF NORTH WALES.—Do any of your readers know of any books treating on the natural history of North Wales? If so, will they kindly answer through your correspondence column?—*W. J. R.*

VINULA.—As regards the disease Mr. Finch notices in his larvæ of Vinula, I think it must be attributed to giving them damp food. This should never be done with these larvæ. I always dry the food well; and if Mr. Finch will do the same, I hope his larvæ will be free from this disease. I have reared many of these insects from the egg, and when I first began I found the same thing happen, but since I have given them well-dried food I have never had any die in this way. Of course this rule is not universal, as Potatoria and Caja, if kept without any moisture, will dry up. About the excrement of Vinula, of which I wrote in April, perhaps I should have called the colour pink instead of red. The last pellet very often gets spun into the cocoon, and this is perhaps the reason for Mr. Finch not noticing this very obvious fact.—*T. A. Dymes*, *Eastbourne*.

OVID'S HYACINTH.—The flower fabled to have sprung first from the blood of Hyacinthus, then from that of Ajax, is described by Ovid, a correct observer of nature, somewhat fully (Met. x. 210–216, and xiii. 394–398), yet the modern synonym of the flower is still an open question. According to his descriptions the plant must be (1) of the liliaceous type; (2) the blossom purple, reddish, violet or brownish (the word *purpureus* as used by Latin poets may be translated by any of the above*); (3) the perianth segments must be marked with the letters A I. It may be added that Dioscorides describes the hyacinth as a bulbous plant, with long narrow leaves. Other characteristics of the plant may be inferred from the facts of the story. Thus, it must be a native of Greece and Italy; must blossom in the early part of the year: for in Southern Europe grass is parched early in the summer, while Hyacinth is said to have sprung from the green turf; besides, Hyacinthus was killed by Phœbus and Boreas, an apt description of the precarious life of an early spring flower, liable on the one hand to be withered by scorching sun, and on the other nipped by blasting winds. Finally, the plant must have an appearance suggestive of sorrow (it was an emblem of death among the Greeks). The species of the genus Fritillaria growing in Greece and Southern Italy—viz. *F. Messanensis*, *Pontica*, *Græca*, *conica*, and *tristis*—fulfil in a remarkable degree these requirements, especially the last two. It must be noted that they form so natural a group, in other words are both so variable and nearly allied, that Floras differ in the naming of them. Loudon selects the character of chequered flowers as a distinctive mark of Fritillarias among European Liliaceæ. They have a peculiar tesselation which readily lends itself to the forming of letters in several of the species. In *F. Meleagris* small square letters can be easily traced, while in Sibthorp's "Flora Græca" there is another species figured, in which the purple veins of the flower look like cursive characters, among which the combination A I more than once occurs. The drawing is not likely to be exaggerated in this direction, for Sibthorp looked upon *Gladiolus Byzantinus* as the Greek hyacinth; moreover, Bauer, who drew the figures, is remarkable for the accuracy of his botanical drawings. The general appearance of Fritillarias is strongly in their favour, being plants of a forlorn and gloomy appearance. The species above named may be thus roughly described:—The stem is unbranched, bulbous below, bearing narrow leaves, and a solitary, drooping flower; the flower is an inch or more long, tulip-shaped; in systematic descriptions the colours are given as wine-purple or livid; the chequering is darker than the ground colour; finally, it is an early flowering genus, some species beginning to blossom in March, none later than June. Ovid's commentators are unanimous in rejecting the claim of the modern hyacinth, *H. orientalis*, to a heritage of tradition; but give their allegiance to one or other of the following plants: *Gladiolus Byzantinus*, *Lilium Martagon*, *Iris Germanica*, and *Delphinium Ajacis*. These all fail in three of the qualifications named above: they flower in summer and autumn, the colours of the flowers are bright, and the plants of robust

* Lewis and Short's Latin Dictionary.

appearance. But, besides, each plant has special disqualifications:—*Gladiolus Byzantinus* has indeed a V-shaped streak down the middle of three of the perianth segments, but there is no other mark to serve for an I. The leaves are sword-shaped, and Ovid would hardly have overlooked this opportunity of alluding to Ajax's famous sword: this last remark applies also to *Iris Germanica*. Iris also has a rhizome, not a bulb. *Lilium Martagon* is a formidable rival in that it is a true lily, but it completely falls short as regards the crucial test, viz. the marks: there are spots on the flower, but they are round and isolated. The last claimant to be dealt with, *Delphinium Ajacis*, has no shadow of resemblance to a lily, and no distinct marks on the petals.—*C. Garlick.*

Disease of Larvæ.—The case mentioned by Mr. Finch, I am inclined to think is a kind of dysentery common to insects. The cure is to wash them in clean cold water and put them on fresh food. The prevention would be never to give them food having any external moisture on it. If the food is obtained in damp weather it should be kept till dry.—*G. Robson, Leicester.*

Sidmouth for Shore Collecting.—Can you or any of your readers say if this locality is a good one for procuring anemones, zoophytes, &c., for the microscope? Are there reefs, rock-pools, and other suitable habitats? and are the specimens clean, i.e. free from the fine encrusting mud so common where the rocks are soft, which is so difficult to get rid of? If the rocks are there, are they fairly close to the town? Any hints from those who are acquainted with this locality would be very acceptable to the writer, who is fairly acquainted with the Devon coast from Exmouth to Dartmouth. June or July would be chosen, and of course spring-tides, for a visit.—*M. C. W.*

Bumble Bees and Clover.—In the April number of Science-Gossip, p. 77, Mr. Malan says: "Clover cannot thrive without bumble-bees, nor bumble-bees without cats." I can understand the first part of the sentence, but should like an explanation of the latter.—*E. L. R.*

Name for a Stoat in the North of England.—Mr. J. H. Ingleby writes in your April number that in his neighbourhood (that of Northallerton, Yorkshire) a stoat is called by the name of Clubstei, and he wishes to know whether that word is local and what is its origin. I must premise that there is evidently an error (probably a misprint) in the word, which should be Clubster. In Halliwell's "Dictionary of Archaic and Provincial Words," it is stated that Clubster or Clubtail is a north-country dialectic word for a stoat or summer ermine (*hermine d'été*, as the French call the animal). The last syllable, "ster," is evidently the old word "start" (in Anglo-Saxon *steort*), which still exists as part of the compound word red-start, but has in "clubster" been denuded, by a not uncommon process, of its final letter.—*W. T. Lynn, B.A., Blackheath.*

Sending Lepidoptera by Post.—I think it would interest a good many readers of Science-Gossip if entomologists would give their experience with regard to sending boxes of insects by post. I have nearly always found, especially lately, that the boxes get smashed and the insects damaged. Is there any contrivance whereby this can be avoided?—*A. E. Gibbs, St. Albans.*

Male of Epeira umbratica.—I should be glad if some one can inform me if the male *Epeira umbratica* is scarce, and from what cause. Last year, at various periods and in different situations, I found about a dozen females, but not one male.—*J. E. A.*

Eye in Cyclops.—I should be glad if any reader could inform me whether, in regard to the freshwater animalcule cyclops, the red spot in the centre of the head is in reality an eye or merely a highly sensitive organ. In examining one the other day under a ⅛in. obj. the red spot was of somewhat an angular form, and I did not observe any feature about it that would lead me to suppose it to be an organ of sight.—*J. S. C., Newcastle.*

The Slavonian Grebe (*Podiceps cornutus*).—A female specimen of this rare bird was shot near Gloucester on the 29th of January, 1883, and is now in my possession.—*R. Newstead, jun., Ince, near Chester.*

Curious site for Rook's Nest.—On the Forest Road, Nottingham, a pair of rooks have selected a curious site for their nest. It is placed, contrary to all rules of rook architecture, in the corona to iron finial of the turret of the Nonconformist College on the Forest Road. There is a small rookery about 200 yards from it. This is the first instance that has come under my notice of a rook building anywhere except in a tree. Has any similar occurrence come under the notice of your readers?—*W. J. Rawson, Nottingham.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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.

James Barclay.—In answer to your note, we are sorry to say that we have not received any tube containing larva.

H. M. Evans.—We know of no book on British birds' eggs to equal Hewitson's.

J. W. (Mile End Road, E.)—No. 1. *Hypnum velutinum*, 2. *Polytrichum commune*, 3. *H. splendens.*

W. L. B. (Warksworth).—The mosses are, No. 1. *Hypnum Kneiffii*; 2. *H. abietinum*, 3. *H. cupressiforme*, 4. *Mnium hornum*, 5 and 7. *Jung. albicans*, 8. *Mnium punctatum*, 6. *Hypnum.*

A. J. S. (Kentish Town.)—*Jung. albicans*, in early stage.

G. B. (Watford.)—Your specimens are, No. 1. *Hypnum cupressiforme*, 2. *H. serpens*, 3. *Hypnum*, not in fruit, 4. *H. serpens*, 5. no fruit, 6. *H. splendens*, 7. *Mnium*, parcel No. 1. contained three species.

B. B. Scott.—Accept our thanks for the specimens of the beautiful *Trichinium Manglesii* from Western Australia.

D. Williams.—Grove's Battery was invented by the present Mr. Justice Grove, when Professor at the Royal Institution. See "Philosophical Transactions," for 1843.

C. H. G.—It is not at all uncommon to find white varieties of hyacinth.

Mr. T. S. Morten, 42 Haverstock Hill, who has kindly acted as one of our "Assistant Naturalists" in answering queries and naming specimens of micro-fungi, &c., writes to say he will be unable to act in the future on account of business.

G. R. (Boothstown.)—Your specimens are too imperfect to be critically determined; kindly send others in fruit, and we shall be most happy to aid you.

A. Bealey.—The best book on British and foreign freshwater shells, is that by R. Rimmer, price 10s. 6d. It gives a photograph of every species of shell.

H. W. L.—The "Wampum Clam" (*Venus mercenaria*) is not a plant, but an edible bivalve mollusc, well known in the United States. It has just been laid down in British waters on the Cheshire coast, where we hope it will breed.

W. Hambrough.—The specimen of a cowslip sent us is an interesting example of "fasciation," whereby is meant the growing or fusing together of two or more flower stems.

F. Emsby.—"The Midland Naturalist" is published by David Bogue, 3 St. Martin's Place; "The Field Naturalist" by Heywood, Manchester; "The Young Naturalist" by John Kempster & Co., Bolt Court, Fleet Street. You will get Doubleday's List from Van Voorst.

EXCHANGES.

Unset Lepidoptera.—I have a quantity of last year's insects, which require relaxing and resetting; they include Sibylla, Paphia, Adippe, Ægon meliloti, &c. Will give them to any one on receipt of box and return postage.—A. E. Gibbs, The Hollies, St. Albans.

Wanted for special research. Living specimens of *Gordius aquaticus*, the hair worm. — Thomas Bolton, 57 Newhall Street, Birmingham.

Wanted, *Aulacodiscus Kittoni*, with 2-10 or more processes, for which three slides of diatoms are offered for each, *Pleuro-hippocampus*, *P. angulatum*, or others.—W. Hanwell, 46 Charlotte Street, Hull.

Eggs of osprey, killdeer, plover, mealy redpoll, gull-billed tern, and others equally rare for exchange.—T. Dealy, Grey Street, Derby.

Brilliant object, crystals of plumbic iodide (mounted opaque) in exchange for other equally interesting slide. John R. Marten, Cottage Hospital, Redhill, Surrey.

Wanted, L. C. Ed. 7—436, 438c, 460, 463, 474, 481, 485, 493, 509, 510, 518, 521, 561, 564, 567, 574, 579, 580, 593, 594, 595, 600, 605, 611, 613, 620, 623, 638.—T. A. Dymes, Eastbourne.

Wanted, micro-photographs of statuary or animals, will give in exchange insect preparations. Communicate with list first. —J. Boggust, jun., Alton, Hants.

Wanted, Bate & Westwood's "Sessile-eyed Crustacea," Shuckard's "Bees," Rye's "Beetles," Moggeridge's "Harvesting Ants and Trapdoor Spiders," and other Natural History Works, for Stark's "Mosses," Moore's "Ferns," Landsborough's "Sea weeds," &c.—C. A. Grimes, Dover.

Having some dried specimens of the fritillary (*Fritillaria Meleagris*), a few of which are white, I shall be glad to send a specimen to any botanist applying for one and enclosing a stamp. —F. Hayward Parrott, Walton House, Aylesbury.

A telescope, and a few books, amongst others, "Public School Atlas of Ancient Geography," edited by Rev. George Butler, and "Manual of Natural History for Travellers," in exchange for a good pocket lens, lepidoptera, bird's eggs or fossils. —F. B. Mason, St. Gregory's, Stratford-on-Avon.

Slides of *Bacillus tuberculosus* in sputum, and *Bacillus Anthracis* in lung, to exchange for well-mounted slides of selected or named diatoms, or insects, either whole or dissections. —Dr. Wallis, East Grinstead, Sussex.

Bankivia varius, *Stomatella imbricata*, *Nassa pellucida*, *Unio margaritifer*, *Conovulus myosotis*, and about 150 other duplicate foreign and British shells to exchange.—J. W. Cundall, Carrville, Alexandra Park, Redland, Bristol.

For specimens of *Trichinium Manglesii*, a beautiful flower from W. Australia, and a beautiful object for the micro, send any other object or slide to—B. B. Scott, 18 Chiswell Street, Needham Road, Liverpool.

Wanted correspondents in foreign countries to send the seaweeds, zoophytes or dried specimens of flowering plants in exchange for British mosses, plants, ferns, sea-weeds, &c.—B. B. Scott, 18 Chiswell Street, Needham Road, Liverpool.

L. glutinosa and British marine shells for British or foreign land and freshwater shells.—T. D. A. Cockerell, 62 Wimpole Street, London, W.

Wanted, either a cabinet or box with trays to hold micro objects; for exchange, Cassell's "History of the War between France and Germany," 2 vols. cloth, gilt, illustrated, and vol. 1 Cassell's "Household Guide," illustrated.—J. Burton, 78 Theobalds Road, London, W.C.

Swiss Plants.—Spendidly-mounted and well-preserved Swiss plants, all correctly named, price 6d. each.—Address, Dr. B., care of Editor of Science-Gossip.

Wanted, good specimens of *Botrychium lunaria* and *Ophioglossum vulgatum*. Rare British plants given in exchange. Also specimens of American plants offered for Continental species, especially Carices.—H. Lomax, 56 Vauxhall Road, Liverpool.

Science-Gossip for 1865, 66, 67, and other natural history works; also a quantity of micro material; offers, plants acceptable.—A. Allettsee, 49 Colby Road, Upper Norwood, S.E.

Lantern Slides full size, wanted in exchange for first-class microscopic slides.—B., 36 Windsor Terrace, Glasgow.

Wanted, interesting microscopical slides. Send list to—Mr. T. F. Uttley, 5 Clarence Street, Albert Square, Manchester.

Brula cæca—parasite of hive bee—well mounted in fluid without pressure, for good anatomical or mineralogical slides.—Edward Horsnaill, 11 Snargate Street, Dover.

A few herons' eggs for exchange. Wanted, gulls', sandpipers', grouse, and other rare English eggs.—W. J. Hart, London Road, King's Lynn.

A small collection of Lepidoptera, including some rare species in pine store boxes; *Nummulites lævigatus* and *variolarius;* also twelve species of marine zoophytes, named, for mounting.—G. W. Colenutt, 48 Union Street, Ryde, I. of W.

Wanted, Tate's "British Molluscs," Carpenter's "Microscope," &c., Thome's or Prantl-Vine's "Botany," in exchange for well-mounted micro slides, algæ, diatoms, desmids, micro fungi and other material, and rare flowering plants.—Thomas Birks, jun., Old Goole Mill, Goole.

Wanted, good specimens of Barbadoes chalk containing polycistina or sponge spicules, quantity preferred; will give good exchange in well-mounted objects or material.—J. M., 51 Great Prescott Street, Goodman's Fields, London, E.

Valuable collections of British fossils, minerals, recent shells, and rock specimens for disposal. Wanted, first-class microscope or Geological Society's journals.—E. Wilson, 18 Low Pavement, Nottingham.

Two small six-drawer cabinets for exchange, corked, glazed, and papered; offers invited.—H. H. Druce, The Beeches, 43 Circus Road, St. John's Wood, London, N.W.

Three hundred microscopic slides to exchange for polariser objectives, books on natural history, or other good slides; send lists, &c.—Wm. Tylar, 35 Burbury Street, Hockley, Birmingham.

To exchange or otherwise—Cypræa, Conus, Oliva, and other genera.—J. M. W., The Hawthorns, Bootle, Liverpool.

Wanted, copy of Wood's "Insects at Home." Exchange first-class slides or cash.—W. S. Harris, 44 Partridge Road, Cardiff.

A large number of duplicate interesting micro slides for exchange; send list or offers. Also, bull's-eye condensor, universal motion, for micro apparatus, slide cabinet, or offers.—J. E. Read, 112 Pottergate Street, Norwich.

Wanted, eggs of the following, in clutches: ring ousel, woodlark, merlin, golden plover, sandpiper, snipe, rock-pipet, pied flycatcher, and others; will give rare British lepidoptera and other eggs in exchange.—Thomas H. Hedworth, Dunston, Gateshead.

Beautiful fossil sand from Sancat's tertiary deposits, containing well-preserved foraminifera, shells, coral spicules (any quantity), in exchange for good mounted slides.—E. Rodier, 61 Rue Mazarin, Bordeaux, France.

Wanted, zoophytes and marine shells for British mosses or micro slides.—Lichen, 15 Horton Lane, Bradford.

Ceterach officinarum, *A. adiantum-nigrum*, *A. trichomanes*, *A. ruta-muraria*, for other ferns. Please send list.—Edward Howell, Gasworks, Yeovil.

BOOKS, ETC., RECEIVED.

"The New Principles of Natural Philosophy." By W. L. Jordan. London: David Bogue.
"Land and Water."
"Midland Naturalist."
"Natural History Notes."
"Studies in Microscopical Science," edited by A. C. Cole.
"Ben Brierley's Journal."
"American Naturalist."
"American Monthly Microscopical Journal."
"Science."
"Boston Journal of Chemistry."
"The Botanical Gazette."
"Cosmos: les Mondes."
"Le Monde de la Science."
"Ciel et Terre."
"Bulletin des Sciences de la Société Belge de Microscopie."
&c. &c. &c.

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

HOLIDAY RAMBLES.

IN TEESDALE.

By G. CLARIDGE DRUCE, F.L.S.

AFTER revelling in the sylvan recesses of the New Forest (where the crimson spikes of gladiolus glistened among the fern fronds, or the handsome flowers of Melittis grew under the Sibylla-haunted brambles), and gathering the fragrant Dianthus on the steep cliffs of Cheddar, I started northwards for the rich classical ground of Clova; but Teesdale and its singular geological formation, the beauties of High Force, and the varieties of Cronkley and Widdy bank tempted me to break the journey at Penrith, in order to gather the special plants of Teesdale. From Penrith a short journey by the Castle Eden line brought me to Barnard Castle, and thence to Middleton in Teesdale. From Middleton it is about six miles to the comfortable hostelry of the High Force, and the walk is very agreeable, the hedges being full of the splendid *Campanula latifolia*, while the dark-coloured roses, *mollis*, *tomentosa*, *cærulea*, &c., and the pretty willow, *S. Phylicifolia*, var. *Weigeliana* and *nitens*, with an abundance of *Trifolium medium* and *Crepis paludosa*, makes the distance to Winch Bridge seem short. Here, on the steep banks overhanging the Tees, grow *Pyrus rupicola*, *Thlaspi sylvestre*, *Crepis succisæfolia*, *Viola lutea*, *Equisetum variegatum*; about the wood of the High Force, *Poa Parnellii*, *Myosotis sylvatica*, *Sesleria cærulea*, and other plants were gathered, and then coming in sight of the High Force some time was spent in viewing this fine waterfall, seen under favourable circumstances, the previous heavy rain having well filled up the river which now tumbled in grand confusion its dark peat-coloured water over the rough basaltic rocks, great masses of foam being carried down a long distance from the fall, the water in the pool below being perceptibly warmer than the river above the fall. Then the surroundings are fine, the Durham side covered with larch, while the opposite is bleak moor, studded with juniper bushes, breaking suddenly off into the cliff overhanging the river, with here and there a bush of the local *Potentilla fruticosa* in fine flower.

Keeping by the river side above the fall, *Viola lutea*, both yellow and blue, were plentiful, and then came *Alsine verna*, *Primula farinosa*, and the sweet-scented *Gymnadenia conopsea*, while the *Potentilla fruticosa* was very plentiful. Reaching the base of some rocky cliffs, *Hieracium iricum*, *Rosa Doniana*, *Lastrea Borreri* were gathered; following the river to its junction with the Langdon beck, and wading over that, the boggy pastures opposite Cronkley Scar were soon reached. Here *Botrychium* occurred, and then on a sloping bank by the river side came a great gathering of varieties, *Tofieldia*, *Primula farinosa*, *Gentiana verna*, *Equisetum variegatum*, *Carex capillaris*, *Bartsia alpina* very abundant, and *Kobresia caricina*; *Polygonum viviparum* and *Saxifraga aizoides* being, as elsewhere in Teesdale, common. From here a short walk brings one to Widdy bank house, and then it is only a mile or so to the top of Widdy bank itself, 1660 feet; here, on this peculiar sugar limestone, occurred *Juncus triglumis*, *Thalictrum alpinum*, *Kobresia*, *Arenaria verna*, *Scirpus pauciflorus*, &c.

We were much troubled by the persistent attacks of a green-eyed fly, Chrysops, which rendered the search for *Alsine stricta* and *Viola arenaria* somewhat less pleasant than it might have been, but lengthy though the search was, it was at last succesful, the violet however being over flower; a rather boggy descent brought us to the Caldron Snout, another fall of about a hundred feet over ledges of basalt, and it is the continuance of this basaltic rock which forms the celebrated Falcon Clints, irregular craggy cliffs on the Durham side of Tees, which afford a home in their broken and scattered debris for *Saxifraga hypnoides*, *Sedum Fabaria*, *Galium boreale*, *Allosorus crispus*, and magnificent plants of *A. viride*; here, too, occurred not yet exterminated *Aspidium Lonchitis*, as well as *Lastrea abbreviata* and *Polypodium calcareum*. Retracing our way towards High Force, *Peucedanum Ostruthium* and *Rumex pratensis* were found near Langdon. Another day spent in exploring was Cronkley Fell on the Yorkshire side of the river. *Sedum villosum* was found in several places in abundant flower, and a long search was made for *Polygala uliginosa*, but although a plant gathered had the same narrow sepals with slightly anastomosing veins, and equal arils, yet the branched habit and large flowers rendered it very different in appearance from the typical plant. On the summit of Cronkley, like Widdy bank, composed of disintegrated limestone, occurred *Helianthemum vineale*, *Dryas octopetala*, *Juncus triglumis*, *Alsine verna*, and *Gentiana verna*, and then a descent brought one to the Tees, nearly opposite the Caldron Snout. Keeping by the side of the Maize beck, we crossed the stream by fording it into Westmoreland, and struggled over the boggy slopes of Dufton Fell, in a heavy shower, for some distance, then again forded the stream, and keeping on the north side of Murton Fell, gradually ascended High Cap Nick, one of the most singular views in Britain, like some huge graving dock, the sides of which were more than a mile long; then ascended Blackstone edge, 2620 feet, whence could be seen a fine view extending to the Lake district mountains. While here a thunder cloud was hanging over Murton Fell; thunder echoing grandly from the rocks around. A walk, about ten miles through pleasant country scenery, brought us to Kirkby Thore, in direct communication by rail with Penrith and the north.

"ADMISSION OF LAND SHELLS TO THE BRITISH LIST."

By G. Sherriff Tye.

It is satisfactory to note that the question asked by Mr. Loydell, Science-Gossip, September 1882, p. 214, has awakened the interest of some conchologists, and elicited various replies from which, let us hope, some knowledge may be gained by students.

In my own notes, December 1882, p. 278, respecting the admission of certain shells to the British list, I thought my proviso, "in the absence of any information to the contrary," would meet the requirements of the question; but Mr. R. M. Christy, May 1883, p. 112, takes exception to my remarks, because he thinks there is a probability of certain of them having been introduced by human agency. I quite agree with him as to the probability, but we have no reliable "information."

Touching the sea-port theory (quite a fair one, I freely admit), I may mention that all the localities given for *Succinea oblonga* in Britain, save one, are near sea-ports, no one has advanced "introduction" in this case, and we need not jump to a hasty conclusion with regard to *Helix villosa*.

When I sent my notes, I omitted to notice Mr. J. T. Marshall's remarks, November 1882, p. 261, which is unfortunate, as he disposes of *Clausilia solida*, much to my satisfaction. The gentleman who found it, found also a variety of *Unio tumidus*, which he insisted (to me) was a new species.

Clausilia parvula was found at Kinver, by Mr. Grant Allen, then, I believe, a member of the Birmingham Natural Historical and Microscopical Society, now a well-known writer on evolution, &c., and was submitted by him to Dr. Gwyn-Jeffreys, who named it, and who probably has the shells now; therefore there should be no doubt about the matter, so far as this species is concerned.

Helix personata.—"It is especially unlikely that a species which has never occurred in England, should be found in Ireland," says Mr. Christy. Does he remember that *Limnæa involuta* and *Geomalacus maculosus* are peculiar to Ireland, and as yet have not been found elsewhere? Really, in nature, many things actually are matters of fact which are, *prima facie*, "especially unlikely;" we must therefore be cautious.

Dr. Gwyn-Jeffreys says, in speaking of this finding of *Helix personata* by Mr. S. A. Stewart, "I have every reason to believe that *H. personata* is a native of Ireland, and that his specimen was not accidentally introduced." Doubtless the learned doctor has good grounds for his belief.

To conclude that any of the species about which we are speaking would have been found by collectors, if they occurred in places other than those mentioned, is "begging the question." It would be as fair to say that every locality was known for any given species, yet no collector will assert this.

Let us look at some recent examples. My correspondent, Mr. T. Rogers, added *Zonites glaber* to our list in 1870, and my friends Messrs. H. & J. Groves added *Vertigo Moulinsiana* in 1877; these species had escaped collectors until then.

The theory of migration! Why have I arrived at a most "illogical conclusion"? England has mollusca of its own, *i.e.* the species inhabiting our island are derivative; it has no species peculiar to it; they are continental, and came from thence before England was separated from the mainland.

The migration or spreading of mollusks has been a slow process, some have reached farther than others. Various causes operate to retard or increase the area of their distribution : inability to bear cold, slower production, &c., retards, e.g. *Helix obvoluta*, *H. Cartusiana*, *H. pisana*, *Clausilia biplicata ;* while a hardy constitution, and greater plenty tend to increase. Doubtless, human agency has had much to do with the distribution of some species, inhabiting, as they do, localities which man has continual access to, for business purposes ; as examples, take *Helix aspersa*, *H. nemoralis*, *H. hispida*, *Zonites cellarius*, and the slugs. Much may be written on this subject, but I have only an opportunity of touching one or two salient points.

As the species are derivable from the continent, I should "expect to find them in S.E. England," as I stated in my notes ; or, in other words, that is where, if I searched for continental forms, I should look first.

Doubtless migrations have taken place which do not come within the general theory of Reeve ; for example, *Helix lamellata* may have crossed England from North Germany, and reached Scotland from Sweden, and so progressed to Ireland, and this points to a remote period of introduction into Britain. It has not been found in England south of Scarborough, so far as I know, and Anglesea in Wales ; it has not been noticed in France, hence I should not look for it in the south of England.

As bearing upon this migration, may I call Mr. Christy's attention to some notes on *Helix Cantiana* in the "Midland Naturalist," p. 323, vol. i.? From its then known distribution through the counties, I named a number of others in which I should expect it to be found. I have since received intimation of its occurrence in four of them.

If in these few words I have made the subject clearer, I shall be glad.

MICRO-FUNGI BATHONIENSES.

[*Continued from page* 83.]

No. II.

I CONTINUED my rambles after the Micro-Fungi, after an interval of some months from the time at which most of the specimens named in my last paper were found.

It may seem to some that the list of specimens I am about to give does not represent any number of specimens such as one might with diligence have expected to find ; but when it is noted that I was not for some months at a time on the spot, this idea will cease to exist.

In order to really furnish a full and as far as observation goes complete list, the observer should be in the locality from the beginning of the year till the end.

Labouring as I did under a disadvantage in this respect, I must be pardoned if my list seem sparing and very incomplete. I can, however, but do my little, and leave it to abler observers who have more leisure and who are resident all the year through, to add to that which I have begun.

I can only add one Æcidium to my last list, viz. *Æ. Epilobii* on *Epilobium montanum*, to be found at the top of Bathwick Hill, on the wall by the side of the road leading to Bradford, and also in many other places. It may be worth while noting here how the number of Æcidiums fall off about June.

Before naming other finds I should like to say a few words on two specimens that we are told are common —I mean *Æ. Tragopogonis* and *Æ. Urticæ*. I have never yet found either of these specimens.

In the case of *Æ. Urticæ*, I have searched nettle-beds in all parts of Bath and its locality, and have never yet met with it. I have also searched in other places and counties, but without a find, and the same remarks apply equally to *Æ. Tragopogonis*.

I am therefore inclined to the belief that, at any rate of late years, they cannot be so common as we should infer from our text-book.*

As regards *Æ. Urticæ*, Mr. Brittain, in his valuable and most useful little work, "Micro-Fungi : when and where to find them," seems to agree somewhat with me in my opinion.†

I should be very glad if any one who has found either *Æ. Tragopogonis* or *Æ. Urticæ* in the Bath district would let me know.

Passing on to Puccinia, I have found *P. compositarum* on *Crepis virens*, Widcome Hill, abundant.

P. variabilis on *Leontodon Taraxacum*, Widcome Hill, not plentiful. *P. Malvacearum* on *Malva sylvestris*, Claverton Down, plentiful.

Coleosporium Sonchi-arvensis on *Sonchus oleraceus*, Widcome Hill, and common in many places.

Coleosporium Tussilaginis common where leaves of *Tussilago farfara* are to be found.

Lecythea Valerianæ on *Valeriana officinalis*, common at Conquell. *Ustilago segetum* very common in the summer of 1881 in corn-fields.

Urocystis pompholygodes on *Ranunculus repens*, common in lane leading to Hampton Down.

These specimens I have named bring us up to the end of August in the year's course, and in my next paper I shall name a few others, and also give a full list of all I have myself found hitherto. Every specimen named by me has been gathered by myself and in the locality named, and I have not in any single case depended on specimens brought me by others and said to have been found in certain spots.

I should like to call attention to the new edition of Dr. Cooke's valuable work on "Microscopic Fungi," though it bears date 1878 ; still some may be yet working with the edition of 1872, and they would do well to procure the last edition, which is carefully revised and enlarged.

CHARLES F. W. T. WILLIAMS.

Bath. (*To be continued.*)

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* Cooke's "Micro-Fungi," 4th ed., pp. 14, 195, 197.
† Brittain's "Micro-Fungi," p. 27.

NOTES FOR SCIENCE CLASSES.

No. VI.

Hepaticæ.

SPECIMEN for use of students: Common Liverwort. (*Marchantia polymorpha*, L.)

Every year it is becoming more important that the student should be practically acquainted with the life history, in connection with classification; to do so, he must not only know the chief types, but have also a practical knowledge of their life history by microscopic examination. Many students fail in the examination, who have confined themselves simply to text-books. We commence with the Liverwort, because it is in an excellent state for study in the early summer months.

There are two divisions of the Hepaticæ, known as the Thallose and Foliose group. In the latter we have a familiar example in the Jungermanniæ, which have a stem bearing scale-like leaves, without midrib, standing in two rows, running in right or left-handed spirals. Neither group are possessed

Fig. 87.—Thallus of Marchantia.

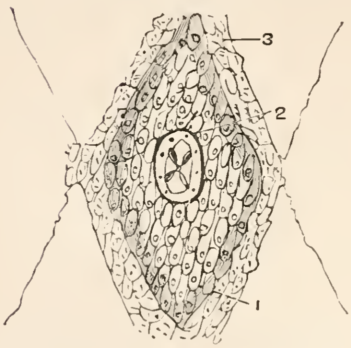

Fig. 88.—Long. section of Epidermis of Marchantia.

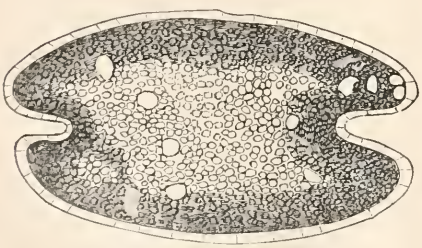

Fig. 89.—Gemma, magnified.

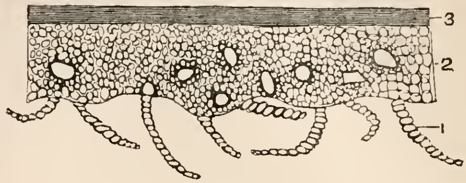

Fig. 90.—Amphigastria of Marchantia.

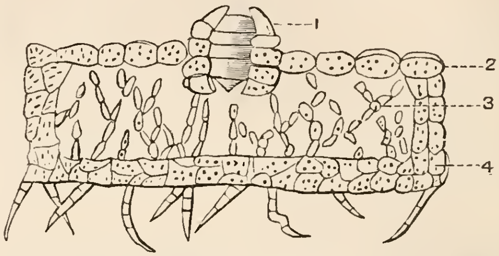

Fig. 91.—Trans. section of Thallus of Marchantia, to show Stomata.

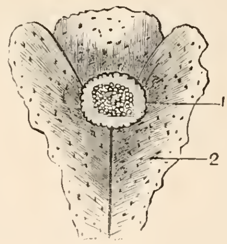

Fig. 92.—Cup, with gemmæ.

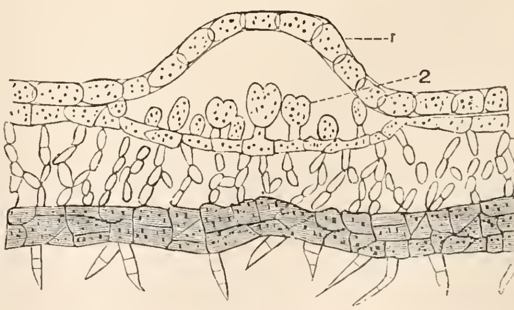

Fig. 93.—Trans. section of Thallus, through the Conceptacle.

of true roots; the structure of the stem is very simple. In the foliose section, it consists of an elongated parenchyma, thickening externally, thus forming a cortical layer passing gradually into the central ground tissue.

No Cryptogam possesses greater interest for the microscopist than the Liverwort, which is found on almost every damp rock, or wall, and even on the borders of well-kept gravel paths.

First, a part of the frond, or thallus, should be washed to free it from particles of soil, or grit; then having selected a portion of the outer edge, make a sketch of it as (fig. 87), so as to understand its dichotomous branching. The midrib is very conspicuous, and continually divides in a forking or dichotomous manner. Then take the clean thallus, the upper portion, and cut several sections, betwixt a carrot, passing them from the razor blade, with a fine camel-hair pencil, into a watch glass containing water, then mount several so as to have them at hand beneath a cover slip. Now search for the amphigastria. With a little care, they will soon be seen. No. 1 (fig. 90) is the amphigastria; 2, cellular tissue of the thallus, and 3, epidermis, the latter formed by a single layer. The amphigastria are distinct from the root hairs, and consist of a series of cells, arranged like a necklace. In some of the other trans. sect. will be noticed the root-hairs (fig. 93) or rhizoids. Stain the section with magenta and observe their structure, the darker parts in the figure represent thickenings, which project inwards of the cell-wall and arranged in a spiral series; the young rhizoids display the arrangement well.

Select a bit of an older thallus, and make a long. sect. to trace the peculiar and interesting lozenge-shaped divisions, as fig. 88. The epidermis may be stripped off for the purpose, but I find it better to cut a thin section; No. 1 is the lozenge-shaped division; 2, stomata in the centre, and 3, a lighter band separating the division. Again cut several trans. sect. of the thallus, as before (fig. 91). To observe the peculiar stoma, note it well; it takes a little trouble to secure a nice specimen. No. 1 is the stoma, forming an opening, composed of five parts, like the bricks in a chimney. The lower cells contract or expand, according to the state of the atmosphere, to regulate the moisture, &c.; 2,

Fig. 94.—Thallus, with Antheridia.

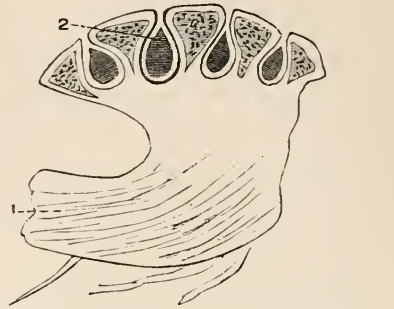

Fig. 95.—Section through young Antheridia.

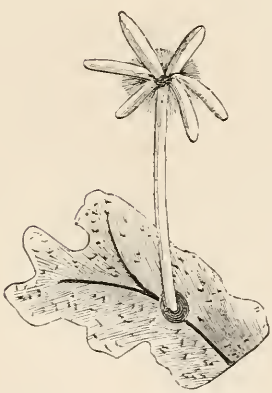

Fig. 96.—Stalk bearing Archegonia.

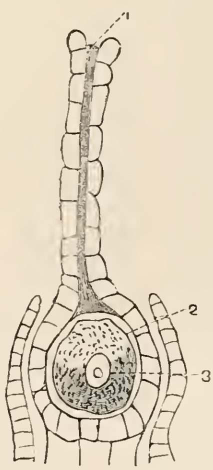

Fig. 97.—*Archegonium Marchantia*, magnified.

epidermis ; 3, a series of conferva-like arrangement of cells, making a free ventilation into the whole of the lozenge-shaped divisions for air, whilst 4 is a solid layer of cells, rising into a wall on each side. The loose tissue, 3, in the centre, only contains chlorophyll.

Glancing over the thallus, a quantity of cup-like bodies are easily visible (fig. 92) called conceptacles, these contain gemmæ, or buds. When viewed with a low power, the edge is seen to be fringed, in fact they are objects of singular beauty. Detach a few of the gemmæ, and slightly magnify (fig. 89), they are composed of two or more layers of cells, and are round or oblong in outline ; eventually they are washed out by rain to some damp spot, and grow rapidly into mature plants ; thus the thallus of the Marchantia is often, when it appears to be luxuriant, merely a thickening of young plants, produced from the gemmæ. Examine the upper surface of the thallus, under a Coddington lens, to detect the slight elevation of the epidermis which is the first growth of the conceptacle ; then cut sections of these, to observe the formation of the gemmæ. Fig. 93 is a sect. through the conceptacle ; they first appear as minute globular cells supported on other cells, as a kind of footstalk ; 1 is the single layer of epidermal cells, 2 is the gemmæ, in various stages of growth. These single cells next undergo rapid change, until they become perfect buds, when they lie detached from the footstalk in the conceptacle. We find another mode of reproduction by fertilised oospores in the Liverworts. The antheridia and archegonia are developed on special erect branches, more rarely on the same stalk. Search the mature thallus for the little umbrella-like stalks, which occur abundantly in summer. (Fig. 94.) Prepare a section of one, in the early stage, as observed in fig. 95. No. 1 is the thick frond, or thallus ; 2, openings, beneath which occur the antheridium. The archegonium, or female organ, is found on a distinct receptacle, or star-like stalked bodies. (Fig. 96.) A section cut through the receptacle will result in making an acquaintance with the ripe archegonia. (Fig. 97.) No. 1 is the neck connecting No. 2, a central cell, in which is seen the oosphere with nucleus, No 3. When the antheridium bursts it frees the antherozoid, which is a spirally coiled thread, furnished with two long cilia, these find their way down the neck of the archegonia ; after impregnation the sporogonium is formed, containing spores. The sporogonium is furnished with elaters, peculiar long cells with brown spiral bands. The spore when germinating gives rise to the pro-embryo, on which the future plant arises from a bud on its surface.

J. F. R.

CAN any reader name me a book, with price, on Aphides and other micro slides ?—*William R. Wells.*

NATURAL HISTORY JOTTINGS.

FURTHER OBSERVATIONS ON THE IVY APHIS AND ITS ATTENDANT ANTS.

SEPTEMBER 10th, 1880.—To-day, on examining a number of small plants of ivy that have been planted in the interstices of the additional height of wall that has been added to the highest terrace-wall on the Measure Hill, St. John's Cemetery, Elswick, I observed that about a dozen of them were more or less infested with an apterous aphis clustered around the stem, leaf-stem, and from the leaf-stem, extending on to the under side of the leaves, and that most of these clusters were attended upon by a small red ant (Myrmica), which is here, along with a larger black ant (Formica), pretty plentiful in its season. What these ants were after I could not at first make out certainly ; they were neither injuring the aphides, nor attempting to carry them away, as I had very frequently seen ants doing with much larger and more powerful insects. On a closer examination with a lens, however, I found that the ants were running about over the small groups or clusters of the stout, dull, reddish-purple apterous aphides, gently and rapidly whipping them, as it were, with their long and versatile antennæ or horns, though evidently not disturbing them in the least, much less injuring them ; and, on several occasions, I distinctly observed an aphis respond to this treatment, elevate the posterior part of its body, and emit a drop of pellucid liquor from the very tip of the abdomen, not the cornua, which was immediately sipped up by one of the attendant red ants : here then was an exhibition of the aphis-milking proclivities and capabilities of the ants, accounts of which I had early read, but which I had never before been so fortunate as to observe.

On many subsequent occasions, up to Oct. 12th, I visited these aphis-infested ivy-plants, and found the aphides in numbers, and invariably attended on and caressed by the red ants, which I frequently observed repaid for their attentions and labour by the yielding up by the aphides of a minute drop of the coveted liquor.

Aug. 31st, 1882.—It was on the 21st inst. that, after having looked over my Natural History notes, and found that there was much interesting information jotted down respecting several species of aphis, or plant-louse, I determined on drawing up a short paper on the subject, and thought it desirable to make some further investigation of the habits and surroundings of the ivy aphis, if haply it were yet in existence, as I thought it quite possible it might have perished in the wreck and removal of the greater portion of the terrace-wall upon whose plants it had alone been observed. However, on going to the spot, there it again was, though only upon one of the few remaining small plants ; and, there, too, were the attendant red ants, caressing and milking the small group of apterous aphides, as their ancestors had done two years ago! Hence, during the past ten days, I have frequently visited this particular plant of ivy, as well as several other larger plants, which, on searching, I found likewise to be infested with this same species of aphis; and I have observed the gradual increase in numbers of the aphides, as also their gradual extension on to other plants, with other additional interesting facts in their economy; such as, that it is only the young and tender shoots of the ivy that they attack—extending themselves, not only on to the leaf-stems and the under side of the leaves, but also on to the adventitious roots, or rootlets, which the shoot of this climbing clinging plant throws out to grasp and adhere to the object over which it spreads itself; that there are at present not only apterous viviparous females, but also pupæ and imagoes (winged individuals), as well as a majority of larvæ or young; that the young are, in general, ushered into existence tail foremost and dorsum uppermost, and are apparently enclosed in an exceedingly delicate pellicle which is ruptured during parturition and worked backwards over the body towards the apex of the abdomen, and, on its completion, is observable ruffled up on the very tip or apex; that not only are they attended on and caressed by the red ant (Myrmica), but also in at least equal numbers by the larger and more irritable black ant (Formica), for the purpose of obtaining their anal emissions of honey-dew; and that they have an active enemy in the form of a minute jet-black fly with iridescent, almost veinless wings, short and obtuse (though acutely pointed) abdomen, and rather long, stout, clubbed, and kneed or downwardly-bent antennæ, which mounts upon the back of the chosen aphis, seats itself firmly with its tail towards the head of it, and evidently punctures it in the basal region of the abdomen, for the purpose undoubtedly of inserting its egg in the body of the aphis, which would shortly kick and plunge desperately as though in great pain and wishful to unseat its tormentor, while the fly would remain securely and calmly seated until it had effected its purpose, when it would dismount and again set out on an exploration amongst the herd of aphides, examining and passing over several (maybe already favoured with a visit) before fixing upon another victim as a living host for its carnivorous young.

That these aphides are benefited by the attentions paid to them by both species of ant, there can be little doubt; since, on the approach of an intruder, the ants are on the alert, elevating the anterior part of their body and widely and threateningly opening their powerful jaws, and when a grass-stem or other small object is presented to them, boldly seizing it with their jaws, and allowing themselves to be carried off with it; the black ant, which is the more irritable and combative, bites and apparently attempts to sting the intrusive object, and will always even mount and attack one's finger if intruded upon its milking-grounds. Thus, in all likelihood, predacious insects will be in a measure intimidated from preying upon the aphides, or laying their eggs in their bodies or amongst them. On one occasion I observed on the foliage of the ivy close by one of the aphid herds, numerously attended on by the black ant, the small parasitical fly already mentioned and partly described, which would undoubtedly be there for the purpose of laying its eggs in the bodies of the aphides; and, also resting near by, individuals of three different species of hoverer fly, or Syrphus, possibly there for the purpose of depositing their eggs on the foliage near by or amongst them, the grub or larva of which is terribly destructive to the aphides, rapidly clearing them off an infested shoot or leaf. Few indeed of the many species of aphis that I have taken note of are without this latter dire enemy, which, lying at its ease in the midst of the host or herd, feeds and fattens at its expense, and thus proves itself one of the best insect friends of the gardener and horticulturist, by effectually checking the increase of these too frequently injurious little creatures.

Though the different individuals of the same species of these two ants always attended on and milked the aphides in evident harmony, however crowded they might be—and I have seen from ten to sixteen of the red ants all engaged at once upon the aphides clothing not more than three inches of an infested shoot! —yet I never observed the two species upon a common milking-ground. Wishful to see what effect would be produced upon the individuals of one species by the introduction of one of the other, I took a red ant and placed it upon a shoot upon which were three black ants attendant upon a few aphides: it was immediately attacked by all the three, and a good deal of very evident reciprocal biting and attempted stinging went on between it and its three larger congeners; however, it at last managed to escape from them, apparently not much the worse for the very rough handling to which it had been subjected. CHARLES ROBSON.

Elswick, Newcastle-upon-Tyne.

ERRATUM.—In my former paper ("Oviposition and Description of the Ivy Aphis"), in the May issue of SCIENCE-GOSSIP, at line nine, page 105, for *aphides in feeding them* read *aphides infesting them.—C. R.*

SLOW-WORM.—I do not think Miss Kingsford's pets will thrive without their natural food, *i.e.* the small slugs found in a garden. I never fed mine with anything else, and it is not difficult to find them in damp spots, or, indeed, anywhere in wet weather. The common snake should be fed with live frogs (if there are no anti-vivisectionists in the neighbourhood), but very often they refuse all food, and cannot be kept alive.—*H. Ullyett.*

THE FLORA OF BEN LAOIGH.

[To our botanical friends who are going north for a holiday, the following paper will prove very important.—Ed. S.-G.]

Ben Laoigh (sometimes spelt Lui) forms a part of the Grampian range, its altitude being 3651 feet—only 213 feet lower, and about 35 miles south-west of, Ben Lawers—that mountain of world-wide fame. I have headed this "The Flora of Ben Laoigh," but, as 14 out of the 15 days I spent at the foot of it last summer were wet, I hope to be able to add to it, as my investigations were confined to the north-east and north-west watersheds, and these in no way complete. In the list of flowering plants eight of our rarer alpine ones will be missed from among those recorded from Lawers, but five will be found which I never gathered, or know to have been gathered, on Lawers; and as for mosses and especially hepaticæ, the north and west of Scotland seems to be little known. There is little doubt but that counties 15 and 16 form a much richer field for the collector than is generally supposed.

Thalictrum alpinum, Linn. *Anemone nemorosa*, Linn. *Ranunculus hederaceus*, Linn.; *R. Lingua*, Linn.; *R. acris*, Linn.; *R. Ficaria*, Linn. *Caltha palustris*, Linn. *Trollius Europæus*, Linn. *Cardamine pratensis*, Linn.; *C. hirsuta*, Linn.; *C. sylvatica*, Linn. *Arabis thaliana*, Linn.; *A. petræa*, Lam. *Cochlearia alpina*. *Draba incana*, Linn. *Capsella Bursa-pastoris*, Mœnch. *Viola palustris*, Linn.; *V. sylvatica*, Fries; *V. lutea*, Huds.; and var. *amœna*. *Drosera rotundifolia*, Linn.; *D. anglica*, Huds. *Polygala depressa*, Wender. *Silene acaulis*, Linn. *Lychnis diurna*, Sibth.; *L. Flos-cuculi*, Linn. *Cerastium triviale; C. alpinum*, vars. *lanatum* and *pubescens*. *Stellaria media*, With.; *S. Holostea*, Linn.; *S. graminea*, Linn.; *S. uliginosa*, Murr. *Cherleria sedoides*, Linn. *Sagina procumbens*, Linn. *Montia fontana*, Linn., var. *rivularis*. *Hypericum pulchrum*, Linn. *Linum catharticum*, Linn. *Geranium pratense*, Linn. *G. Robertianum*, Linn. *Oxalis Acetosella*, Linn. *Trifolium pratense*, Linn. *Spiræa Ulmaria*, Linn. *Alchemilla vulgaris*, Linn., and var. *montana; A. alpina*, Linn. *Sibbaldia procumbens*, Linn. *Potentilla Tormentilla*, Schenk. *Rubus saxatilis*, Linn. *Geum urbanum*, Linn.; *G. rivale*, Linn. *Dryas octopetala*, Linn. *Epilobium montanum*, Linn.; *E. tetragonum*, Linn.; *E. alsinifolium*, Vill.; *E. anagallidifolium*, Lam.; *E. alpinum*, Linn. *Sedum Rhodiola*, DC. *Saxifraga oppositifolia*, Linn.; *S. nivalis*, Linn.; *S. stellaris*, Linn.; *S. aizoides*, Linn.; *S. hypnoides*, Linn. *Chrysosplenium oppositifolium*, Linn. *Parnassia palustris*, Linn. *Bunium flexuosum*, With. *Heracleum Sphondylium*, Linn. *Cornus suecica*, Linn. *Galium boreale*, Linn.; *G. saxatile*, Linn.; *G. palustre*, Linn., var. *Witheringii*. *Asperula odorata*, Linn. *Valeriana officinalis*, Linn. *Scabiosa succisa*, Linn. *Carduus palustris*, Linn. *Saussurea alpina*, DC. *Gnaphalium supinum*, Linn. *Solidago Virga-aurea*, Linn., var. *cambrica*. *Tussilago Farfara*, Linn. *Hypochœris radicata*, Linn. *Leontodon hispidus*, Linn.; *L. autumnalis*, Linn., and var. *pratensis*. *Taraxacum officinale*, Wigg., var. *palustre*. *Crepis virens*, Linn.; *C. paludosa*, Mœnch. *Hieracium Pilosella*, Linn.: *H. holosericeum*, Backh.; *H. murorum*, Linn. *Campanula rotundifolia*, Linn. *Vaccinium Oxycoccos*, Linn.; *V. Vitis-Idæa*, Linn.; *V. uliginosum*, Linn.; *V. Myrtillus*, Linn. *Arctostaphylos Uva-ursi*, Wimm. *Erica Tetralix*, Linn.; *E. cinerea*, Linn. *Calluna vulgaris*, Salisb. *Pyrola rotundifolia*, Linn. *Gentiana campestris*, Linn. *Menyanthes trifoliata*, Linn. *Euphrasia officinalis*, Linn. *Bartsia alpina*, Linn. *Rhinanthus Crista-galli*, Linn. *Melampyrum pratense*, Linn., var. *montanum*. *Thymus Serpyllum*, Fries. *Prunella vulgaris*, Linn. *Pinguicula vulgaris*, Linn. *Lysimachia nemorum*, Linn. *Armeria maritima*, Willd. *Plantago maritima*, Linn. *Rumex Acetosa*, Linn.; *R. Acetosella*, Linn. *Oxyria reniformis*, Hook. *Mercurialis perennis*, Linn. *Urtica dioica*, Linn. *Alnus glutinosa*, Linn. *Betula alba*, Linn. *Myrica Gale*, Linn. *Salix aurita*, Linn.; *S. phylicifolia*, "Linn.," var. *Davalliana*; *S. repens*, Linn., vars. *prostrata* and *ascendens*; *S. herbacea*, Linn.; *S. reticulata*, Linn. *Orchis mascula*, Linn.; *O. maculata*, Linn. *Gymnadenia conopsea*, Brown. *Habenaria viridis*, Brown. *Narthecium ossifragum*, Huds. *Tofieldia palustris*, Huds. *Luzula pilosa*, Wild.; *L. sylvatica*, Beck; *L. campestris*, DC.; *L. multiflora*, Koch, and vars. *congesta* and *sudetica*; *L. spicata*, DC. *Juncus trifidus*, Linn.; *J. castaneus*, Sm.; *J. triglumis*, Linn.; *J. biglumis*, Linn.; *J. conglomeratus*, Linn.; *J. effusus*, Linn.; *J. acutiflorus*, Ehrh.; *J. lampocarpus*, Ehrh., and var. *nigritellus*; *J. bufonius*, Linn.; *J. compressus*, Jacq.; *J. squarrosus*, Linn. *Rhynchospora alba*, Vahl. *Scirpus palustris*, Linn.; *S. pauciflorus*, Lightf.; *S. cæspitosus*, Linn.; *S. setaceus*, Linn.; *Eriophorum vaginatum*, Linn.; *E. angustifolium*, Roth. *Kobresia caricina*, Willd. *Carex dioica*, Linn.; *C. pulicaris*, Linn.; *C. pauciflora*, Lightf.; *C. stellulata*, Good.; *C. curta*, Good.; *C. ovalis*, Good.; *C. atrata*, Linn.; *C. acuta*, Linn.; *C. rigida*, Good.; *C. glauca*, Scop., and var. *stictocarpa*; *C. pilulifera*, Linn.; *C. pallescens*, Linn.; *C. panicea*, Linn., *C. capillaris*, Linn.; *C. pendula*, Huds.; *C. binervis*, Sm.; *C. fulva*, Good.; *C. flava*, Linn., and var. *lepidocarpa*; *C. Œderi*, Ehrh.; *C. ampullacea*, Good.; *C. pulla*, Good. *Anthoxanthum odoratum*, Linn. *Phleum pratense*, Linn., var. *nodosum*. *Agrostis canina*, Linn.; *A. vulgaris*, With. *Aira cæspitosa*, Linn., and vars. *brevifolia* and *pseudo-alpina*; *A. flexuosa*, Linn., var. *montana*. *Avena pratensis*, Linn., var. *alpina*. *Holcus mollis*, Linn.; *H. lanatus*, Linn. *Triodia decumbens*, Beauv. *Kœleria cristata*, Pers. *Molinia cærulea*, Mœnch. *Glyceria fluitans*, Brown.

Poa alpina, Linn.; *P. glauca*, Sm.; *P. Balfourii*, Bab. *Cynosurus cristatus*, Linn. *Festuca sciuroides*, Roth; *F. ovina*, Linn., and vars. *tenuifolia* and *glauca*; *F. rubra*, Linn., var. *duriuscula*. *Lolium perenne*, Linn. *Nardus stricta*, Linn. *Hymenophyllum unilaterale*, Willd. *Pteris aquilina*, Linn. *Cryptogramme crispa*, Brown. *Lomaria spicant*, Dew. *Asplenium Trichomanes*, Linn.; *A. viride*, Huds. *Cystopteris fragilis*, Bernh., and var. *dentata*; *C. montana*, Link. *Aspidium Lonchitis*, Sw.; *A. aculeatum*, Sw. *Nephrodium Filix-mas*, Rich.; *N. dilatatum*, Dew; *N. Oreopteris*, Linn. *Polypodium vulgare*, Linn.; *P. Phegopteris*, Linn.; *P. Dryopteris*, Linn.; *P. alpestre*, Hoppe. *Botrychium Lunaria*, Sw. *Lycopodium alpinum*, Linn.; *L. selago*, Linn. *Selaginella Selaginoides*, Gray. *Equisetum arvense*, Linn.; *E. pratense*, Ehrh., and var. *alpestre*; *E. palustre*, Linn., and var. *subnudum*; *E. limosum*, Linn., var. *fluviatile*; *E. variegatum*, Schleich.

Mosses.

Sphagnum acutifolium, Ehrh., and var. *deflexum*, Schpr.; *rubellum*, Wils.; *quinquefarium*, Lindl.; *elegans*, Braithw.; *S. squarrosum*, Pers.; *S. rigidum*, Schpr.; *S. subsecundum*, Nees; *S. tenellum*, Ehrh.; *S. papillosum*, Lindl.; *S. cymbifolium*, Ehrh. *Andreæa petrophila*, Ehrh.; *A. alpina*, Turn.; *A. falcata*, Schpr.; *A. crassinervis*, Bruch. *Gymnostomum rupestre*, Schwg.; *G. curvirostrum*, Ehrh.; *G. commutatum*, Mitt. *Weissia viridula*, Brid.; *W. mucronata*, Bruch; *W. crispula*, Hedw. *Rhabdoweissia fugax*, Hedw.; *R. denticulata*, Brid. *Cynodontium virens*, Hedw. *Dicranella squarrosa*, Schrad.; *D. subulata*, Hedw.; *D. heteromalla*, Hedw. *Dicranum fulvellum*, Sm.; *D. Starkii*, W. and M.; *D. falcatum*, Hedw.; *D. Blyttii*, B. and S.; *D. arcticum*, Schpr.; *D. fuscescens*, Turn.; *D. scoparium*, L.; *D. majus*, Turn.; *D. palustre*, Bry. Brit. *Campylopus atrovirens*, De Not.; *C. flexuosus*, Brid.; *C. paradoxus*, Wils.; *C. Schwarzii*, Schpr.; *C. fragilis*, B. and S. *Ditrichum homomallum*, Hedw.; *D. flexicaule*, Schwg. *Barbula muralis*, L.; *B. unguiculata*, Dill.; *B. fallax*, Hedw.; *B. rigidula*, Dicks.; *B. convoluta*, Hedw.; *B. tortuosa*, L.; *B. fragilis*, Hook.; *B. subulata*, L. *Ceratodon purpureus*, L. *Distichium capillaceum*, L.; *D. inclinatum*, Hedw. *Eucalypta rhabdocarpa*, Schwg.; *E. ciliata*, Hedw. *Grimmia apocarpa*, L.; *G. pulvinata*, Dill.; *G. Schultzii*, Bred.; *G. torquata*, Grev.; *G. funalis*, Schwg.; *G. trichophylla*, Grev.; *G. Doniana*, Sm. *Rhacomitrium patens*, Dicks.; *R. aciculare*, L.; *R. protensum*, A. Braun; *R. sudeticum*, Funck; *R. heterostichum*, Hedw.; and var. *gracilescens*, Bry. Eur.; *R. fasciculare*, Schrad.; *R. lanuginosum*, Hedw.; *R. canescens*, Hedw. *Ptychomitrium polyphyllum*, Dicks. *Amphoridium lapponicum*, Hedw.; *A. Mongeotii*, B. and S. *Ulota Bruchii*, Hornsch. *U. intermedia*, Schpr.; *U. phyllantha*, Brid. *Orthotrichum affine*, Schrad.; *O. Lyellii*, H. and T.; *O. leocarpum*, B. and S. *Œdipodium Griffithianum*, Dicks. *Dissodon splachnoides*, Schwg. *Tetraplodon mnioides*, Hedw. *Splachnum sphæricum*, L. fil. *Funaria hygrometrica*, L. *Amblyodon dealbatus*, Dicks. *Meesia uliginosa*, Hedw. *Catoscopium nigritum*, Hedw. *Bartramia ithyphylla*, Brid.; *B. pomiformis*, L.; *B. Halleriana*, Hedw.; *B. Œderi*, Gunn. *Conostomum boreale*, Swartz. *Philonotis fontana*, L., and var. *falcata*, De Not.; *P. calcarea*, B. and S. *Breutella arcuata*, Dicks. *Webera acuminata*, Hoppe; *W. polymorpha*, Hoppe; *W. elongata*, Dicks.; *W. nutans*, Schreb.; *W. cruda*, Schreb.; *W. carnea*, L. *Zieria julacea*, Schpr. *Bryum pendulum*, Hornsch.; *B. inclinatum*, Swartz; *B. pallescens*, Schleich.; *B. erythrocarpum*, Schwg.; *B. alpinum*, L.; *B. cæspiticium*, L.; *B. argenteum*, L.; *B. capillare*, L.; *B. pallens*, Swartz; *B. pseudo-triquetrum*, Hedw.; *B. Schleicheri*, Schwg.; *B. filiforme*, Dicks. *Mnium undulatum*, Hedw.; *M. hornum*, L.; *M. serratum*, Schrad.; *M. punctatum*, Hedw. *Aulacomnium palustre*, L. *Tetraphis pellucida*, L. *Tetrodontium Brownianum*, Dicks. *Oligotrichum hercynicum*, Ehrh. *Atrichum undulatum*, L.; *Pogonatum nanum*, Neck.; *P. aloides*, Hedw.; *P. urnigerum*, L.; *P. alpinum*, L. *Polytrichum sexangulare*, Hœrk.; *P. strictum*, Banks; *P. commune*, L., and vars. *humile*, Schpr. and *fastigiatum*, Lyle. *Diphyscium foliosum*, L. *Fissidens osmundoides*, Hedw.; *F. adiantoides*, Hedw. *Hedwigia ciliata*, Dicks. *Antitrichia curtipendula*, L. *Neckera pumila*, Hedw.; *N. crispa*, L.; *N. complanata*, L. *Homalia trichomanoides*, Schreb. *Cylindrothecium concinnum*, De Not. *Isothecium myurum*, Poll. *Orthothecium rufescens*, Dicks. (fruits freely). *Homalothecium sericeum*, L. *Brachythecium Starkii*, Brid.; *B. rutabulum*, L.; *B. rivulare*, B. and S.; *B. plumosum*, Swartz. *Eurhynchium myosuroides*, L.; *E. Swartzii*, Turn. *Plagiothecium pulchellum*, Hedw.; *P. denticulatum*, L.; *P. undulatum*, L. *Amblystegium serpens*, L. *Hypnum revolvens*, Swartz; *H. uncinatum*, Hedw.; *H. filicinum*, L.; *H. commutatum*, Hedw.; *H. falcatum*, Brid.; *H. hamulosum*, B. and S.; *H. cupressiforme*, L.; *H. molluscum*, Hedw.; *H. ochraceum*, Turn.; *H. stellatum*, Schreb.; *H. cordifolium*, Hedw.; *H. giganteum*, Schpr.; *H. sarmentosum*, Wahl.; *H. cuspidatum*, L.; *H. Schreberi*, Ehrh.; *H. purum*, L.; *H. trifarium*, W. and M.; *H. scorpioides*, L. *Hylocomium splendens*, Dill.; *H. squarrosum*, L.; *H. loreum*, L.; *H. triquetrum*, L.

Hepaticæ.

Marchantia polymorpha, L. *Pressia commutata*, Nees. *Conocephalus conicus*, L. *Targonia hypophylla*, L. *Frullania dilatata*, Dum.; *F. fragilifolia*, Tayl.; *F. Tamarisci*, Dum., and var. *atrovirens*; *F. germana*, Tayl. *Lejeunea serpyllifolia*, Mich. *Radula complanata*, L.; *R. commutata*, Gottsche. *Porella platyphylla*, L. *Pleurozia cochleariformis*, Weiss. *Lepi-*

dozia reptans, L.; *L. setacea*, Mitten. *Bazzania trilobata*, L.; *B. tricrenata*, Lindley; *B. triangularis*, Schl. *Odontoschisma Sphagni*, Dicks. *Cephalozia bicuspidata*, Dum.; *C. Lammersiana*, Hübn. *Lophocolea bidentata*, L.; *L. heterophylla*, Schrad. *Chiloscyphus polyanthos*, L. *Saccogyna viticulosa*, Mich. *Kantia Trichomanis*, L. *Trichocolea tomentella*, Ehrh. *Blepharozia ciliaris*, Nees. *Herberta adunca*, Dicks. *Anthelia julacea*, Lightf.; *A. Juratzkana*. *Blepharostoma trichophyllum*, L. *Scapania undulata*, Dill.; *S. nemorosa*, L.; *S. resupinata*, Dumort; *S. purpurea*, Carr; *S. planifolia*, Hook. *Diplophyllum albicans*, L. *Plagiochila asplenioides*, L.; *P. spinulosa*, Dicks. *Mylia Taylori*, Hook. *Eucalyx hyalina*, Lyell. *Jungermannia crenulata*, Sm., and var. *gracillima*, Sm.; *J. lurida*, Dum.; *J. sphærocarpa*, Hook.; *J. cordifolia*, Hook.; *J. riparia*, Tayl.; *J. Mulleri*, Nees; *J. barbata*, Schreb. *J. Flœrkii*, Web. et Mohr; *J. quinquedentata*, Web.; *J. lycopodioides*, Wallr.; *J. ventricosa*, Dicks.; *J. incisa*, Schrad.; *J. minuta*, Crantz. *Nardia emarginata*, Ehrh.; *N. compressa*, Gray; *N. scalaris*, Schrad. *Gymnomitrium concinnatum*, Corder; *G. crassifolium*, Carr; *G. crenulatum*, Gottsche. *Blasia pusilla*, L.; *Pellia epiphylla*, L.; *P. calycina*, Tayl. *Aneura pinguis*, L.; *A. sinuata*, Dicks.; *A. multifida*, Dill. *Metzgeria furcata*, Dum.; *M. pubescens*, Schrank.; *M. conjugata*, Lindley.

P. EWING.

Glasgow.

THE SUN: ITS WASTE OF HEAT, &c.

MUCH speculation has been before the public for some time on this subject. On our little earth scientific men have for years told us that plants and trees, men and animals, decay and die, and are resolved into their respective elements to form new combinations and be utilised, and that nothing is lost; why, then, should the sun have loss? I give you the theory of an acute mind and good practical astronomer, Mr. Nasmyth, a first-rate engineer, as all know. His opinion is this, "Solar light, its main source appears to result from an action induced on the exterior surface of the solar sphere, a conclusion with which all observers of its surface will agree. I was led to consider whether we might not reasonably consider the true source of the latent element of light, to reside, not in the solar orb, but in space itself; and that the grand function and duty of the sun was to act as an agent for bringing forth into vivid existence its due portion of the illuminating or luciferous element, which element I suppose to be diffused through the boundless regions of space, and which in that case must be perfectly exhaustless," vide "Life of Nasmyth," by Smiles, p. 355. These words coming from such a man are well worthy of our most serious consideration. Allow me to suggest a theory of my own, recorded in my notebook long before I saw Nasmyth's autobiography. I know very well I shall have an army of spectroscope men down upon me at once. But let them tell us how many of their spectrum lines are due to our atmosphere. Of course we must all bow down to the undulatory theory of light—though some things in my experience of 45 years seem to militate against it. Taken broadly, the theory is a sound one. Now, whether the sun propagates waves of light, heat, and actinism all round into space, or, as Mr. Nasmyth suggests, inaugurates mesial vibrations in a medium of extreme tenuity, matters little to my theory. I maintain that however these waves are set in motion, they contain within themselves only latent heat, light, and actinism. For where a force is not energised it can hardly be said to exist except potentially. On meeting with a resistant body like our earth, the planets, or the moon, whether the soft cushion of an atmosphere, or the barren reefs and gigantic eminences of our satellite; then thrown into abnormal vibrations (a cross sea), these waves break into heat and light. Is there any heat or light from the sun outside these conditions? Ascend with Glaisher and a companion seven and a half miles above the earth's surface, and the cold is so intense that, but for the warm blood of a young man, the whole party would have perished. Imagine if you can, the cold 5,000 miles from our standpoint, and I fancy the polar regions would be genial compared with it. Light—if the sun is constantly wasting this on all sides in space—how comes it, that on a clear starlight night we have so little light; or rather, *mutatis mutandis*, why should we see the stars any plainer than at noonday in the Tropics? I will say nothing about refraction, which ought to give us more light at night, nor of the earth's shadow in space, of which I am quite aware. Take the following as illustrations of my meaning. The sun has been taking pictures for countless ages, but it requires the chemist's art and manual dexterity to develope a perfect photograph. I heave (I prefer the dear old Devon "Heüve" though no writing can express the softness of the *u* and *v*) a huge stone into a small pond. From the centre of depression, rings of tiny waves are propagated and reach the margin—still I am not aware that a drop of water is lost or wasted. . . . Watch a heavy ground swell coming in from the Atlantic. Not a cloud in the summer sky, not a breath of air—on they come, without a speck of foam or a break, massive, silent in their majesty—a cable's length from crest to crest. But let them meet a rocky islet, or an ironbound coast, and the passive becomes active—leaping up in wild horse's manes, and falling back in cataracts of foam, or in thunder searching out the recesses of each rock cave, shaking the earth around, and filling the mind with awe, and the potential becomes the actual.

A. H. BIRKETT.

RECREATIONS IN FOSSIL BOTANY.

(SPOROCARPONS AND ZYGOSPORITES.)

BY JAMES SPENCER.

No. X.

TRAQUARIA.—This is another very singular but most interesting organism. It was described some years ago by Mr. Carruthers, F.R.S., who gave it the name of Traquaria.

This sporocarpon is about the same in size as *S. elegans*, the diameter of the central disc being about $\frac{1}{60}$ in. on an average. It has a spherical body, which is furnished with long spine-like appendages, which are covered with muricated projections that in some of the older specimens have been developed into branches. Under a high power, these branches are seen to be round and hollow, like the parent spines, and to be arranged round the spines in verticels, four branches in each verticel. The spines appear to have been very flexible in the young state, but to have become rigid and brittle in the older specimens. A peculiar feature in this organism is that the whole of the body and appendages appear to have been enveloped in a plastic substance.

The sporocarpon wall is composed of a dark structureless membrane, enclosing the nucleus, a protoplasmic substance, which, in the mature specimens, becomes converted into round sphere-like cells.

A somewhat warm controversy has taken place concerning the real nature of these organisms. Their original describer maintained that they were of animal origin, and that they belonged to the class Radiolaria. That they have a strong resemblance to some of the latter forms, is unquestionable; and any microscopist examining them for the first time would be impressed with the idea of their animal nature. Professor W. C. Williamson, F.R.S., however, has always maintained that they were of vegetable origin. With a view of settling the point, he placed some of these Traquariæ in the hands of two of the highest authorities on the subject, Professors Haeckel and Strasburger of Jena, who both declared in favour of their vegetable origin.

At length the question was finally set at rest by the important discovery in our Halifax material of a Lepidostrobus containing Sporangia, in which some of these Traquariæ were enclosed.

There were three or four of them in each sporangia thus proving most conclusively that these Traquariæ are true macrospores. In my last paper, at the end of my description of *Sporocarpon pachyderma*, I said I was inclined to think that those organisms were a young stage of Traquaria. My reasons for this opinion are the following: 1st. They both occur in groups; 2nd. They are both enveloped in the same kind of structureless tissue; 3rd. The peculiar branching tubes of *S. pachyderma*, are of the same nature as those at the bases of the spines in Traquaria. It is impossible to say whether they really do belong to the same organism or not, until we have obtained further proof.

Sporocarpon cellulosum.—This is another seed-like object of which there appear to have been several varieties. It has a spherical body with a central nucleus, which generally contains a number of rather large spore-like cells. The sporocarpon wall is thin and structureless, but it produces externally a number of delicate wing-like expansions. In transverse sections there are generally six of these wings, which are united together at their bases by the same kind of gauze-like tissue. The wings are somewhat irregular in size, but this is probably due to the way in which they happen to have been cut through. In the form of their external coating and wing-like projections these seeds very much resemble what obtains in *Sporocarpon asteroides*, and yet no two species can be more distinct than these are. In the former organisms, the "wings" and sporocarp are composed of a thin walled parenchyma of very large cells, while in the latter the sporocarp is formed of a very thick walled parenchyma of small cells. This sporocarpon is generally smaller in size than any of those previously described, although a few specimens reach their average size. In consequence of their very delicate structure these sporocarpons are generally found with their "wings" in a more or less dilapidated state, so that although the species is by no means uncommon, yet good specimens are somewhat rare. Here again we have the same tale to tell, already often repeated, of our ignorance as to what these interesting organisms are, whether they are true seeds or spores, and we have not the least clue to the parent plants to which they belonged. Although, judging from what is known about analogous structures, it appears very probable that they are macrospores of some kind of Lepidodendroid plant.

Zygosporites.—Among the vast number of spores which are found in our coal-balls, there are none more interesting to the student of fossil botany, than those minute organisms which have been described under the name of Zygosporites. There are several varieties of these beautiful spores, and it is impossible for the geologist to examine them long without being struck with their resemblance to those well-known organisms which occur so abundantly in certain chalk flints, and which are familiar to us under the name of Xanthidia.

So great is the resemblance that upon the first discovery of these spores, and for some time after, we made use of the term Xanthidia as a matter of convenience in describing our new spores. The fact that no true and undoubted specimens belonging to the Desmidæ have as yet been discovered in the coal measures, caused Professor Williamson to incline to the opinion that these spores belonged to some unknown form of Lycopodiaceous fruit, rather than to the Xanthidia. Hence, by the term zygosporites it is simply meant that these spores are like zygospores, and not that they were true zygospores; thus leaving the question as to their botanical affinities an open one. The wisdom of this course has been fully demonstrated by the subsequent discovery of spores belonging to one of the species (*Z. brevipes*) in a true sporangium. I had the pleasure of reading a paper on this new discovery along with some others, before the geological section at the meeting of the British Association at York in 1881.

Zygosporites brevipes.—These spores vary from the $\frac{1}{100}$ to the $\frac{1}{300}$ part of an inch in diameter. They are spherical in form, and the whole surface is covered with curious appendages. When highly magnified the latter are seen to be hollow and turret-shaped and arranged in definite order around the spore. In the transverse section, from nine to twelve of these minute turrets may be seen projecting outwards from the periphery of the spore. The appearance of these appendages may be compared to that of the pieces on the chess board called castles, especially to some of those ornamental ones which have the battlements serrated or divided into segments. The whole organism however is so very small that it takes a $\frac{1}{6}$ or $\frac{1}{8}$ in. objective to bring out these results.

The perfection in which these and other minute organisms are preserved in our Halifax material is truly marvellous, especially when we take into consideration the fact that every atom of the original material has been changed or destroyed by what has been termed a process of slow combustion and replaced by mineral matter (chiefly, iron pyrites and carbonate of lime, the latter being by far the best material for the purposes of the fossil botanist), and yet this has been accomplished so exquisitely that the fossils are in every minute point (even microscopically minute point) of detail an exact facsimile of the original organism. It is only by the contemplation of the anatomy of such extremely minute fossils as these that the mind fully realises the wondrous powers of fossilisation, and also the extreme minuteness of the molecules forming the fossils. It has been remarked that in the process of fossilisation the natural colour of original plants has been destroyed, but this is no detriment to their examination under the microscope; on the contrary, it is a very great advantage to have them stained as they are, which

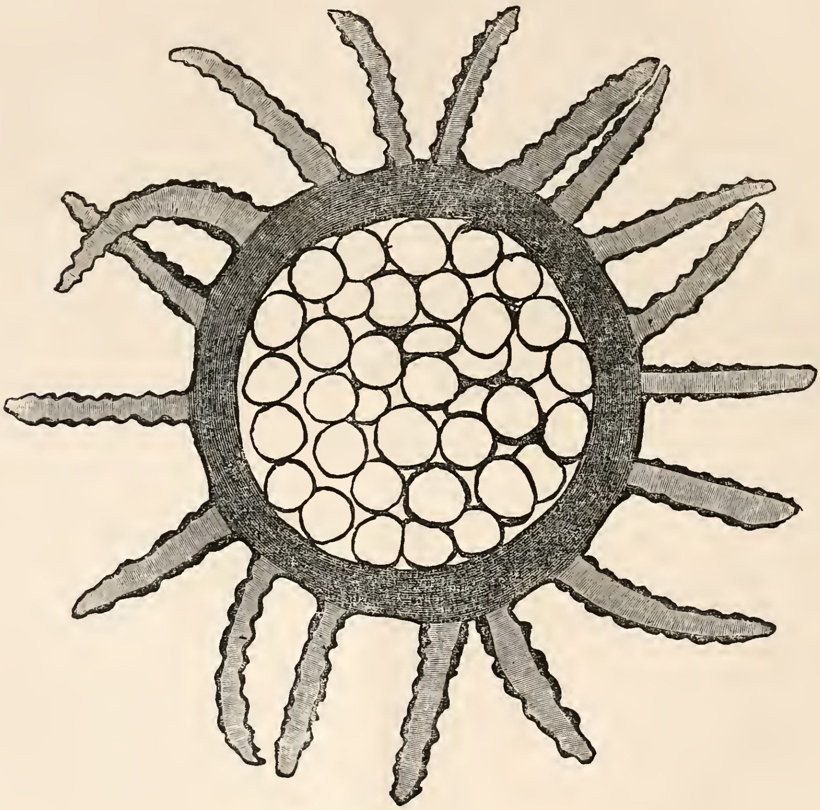

Fig. 98.—*Sporocarpon traquaria.*

brings out all their different structures in a most satisfactory manner. In order to examine the various tissues in recent plants under the microscope, the student finds it most advantageous to have his specimens double stained, but the fossil botanist finds this done for him, the process having been undergone in the laboratory of nature untold ages ere man himself came into existence. So that the so-called new process of double staining is another illustration of the old saying, "There is nothing new under the sun." The material in which these fossils are best preserved is a light carbonate of lime, which appears to have completely saturated the bed of vegetable matter which has preserved its original colour of deep brown. But while the prevailing colour of the vegetable debris is brown, yet almost an endless variety of shades of brown, and sometimes even other colours, are found in the various plant structures. Generally speaking, the walls of the vessels and cells of the plants are of some shade of brown, while the interiors of the vessels and cells and intercellular spaces are filled with calc-spar or pure carbonate of lime, which though frequently a pure white, is generally slightly stained.

Zygosporites longipes.—This is an egg-shaped organism and rather larger than *Z. brevipes.* The body is covered with spines, which are fewer in number, and are also longer than those of *Z. brevipes*, hence its specific name of *longipes.* The spines are seated on somewhat broad bases, and gradually become attenuated as they approach the tips, but these tips expand into a cup-shaped form, but which appear to be divided into four segments, as seen in their transverse sections. In transverse sections of the spore, six

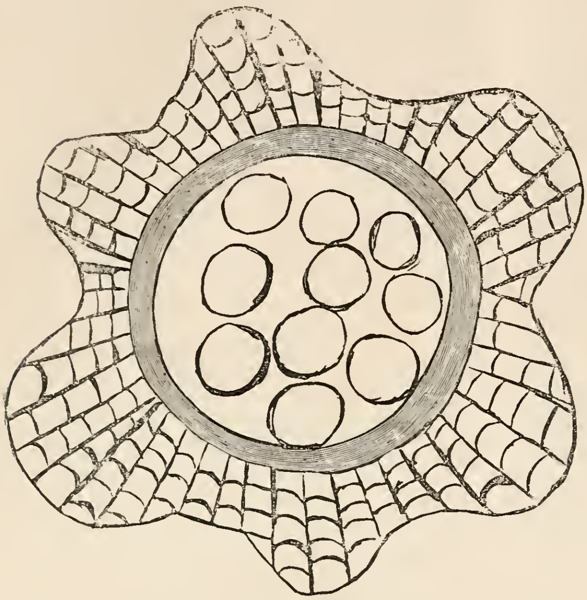

Fig. 99.—*Sporocarpon cellulosum.*

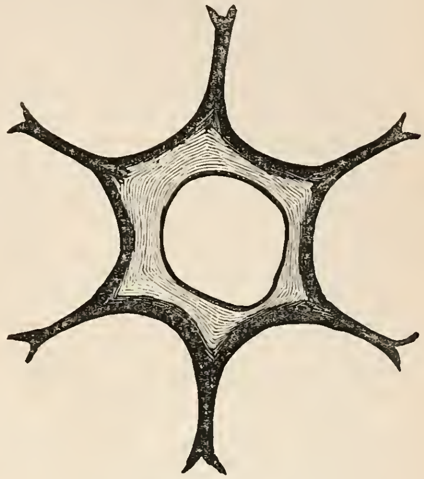

Fig. 101.—*Zygosporites longipes.*

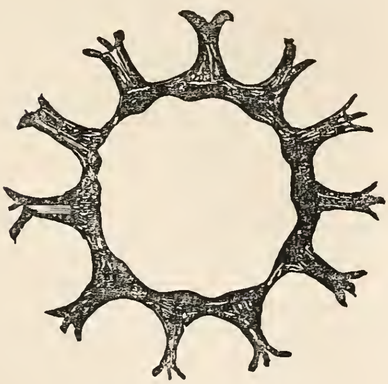

Fig. 100.—*Zygosporites brevipes.*

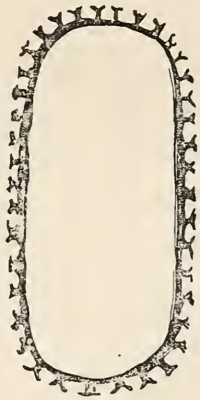

Fig. 102.—*Zygosporites oblonga.*

spines are visible, and they project out of the sporocarpon wall at regular intervals, and present an appearance not unlike a number of short-pronged and long-handled hay forks. In tangential sections the spore may be seen bristling with these long spines.

These organisms have not yet been seen inside of a sporangium, in the same manner as I discovered *Z. brevipes*, but it is not improbable that such will eventually be found to have been the case, as it is very probable that they are the spores of some kind of cryptogamic plant.

Zygosporites oblonga.—This is another species of spore, belonging to the same group of zygosporites. It is the smallest spore of the three. It is a barrel-shaped organism, about two-and-a-half times as long as it is broad, hence its specific name *oblongus*. It is thickly covered with short stumpy projections, which are more numerous and much shorter even than those of *Z. brevipes*. They are round and hollow like the others, with thick rims which are broken up also into segments like the others. It is about the $\frac{1}{250}$ in. in length, and about the 600th part of an inch in diameter. This must be taken as about its average dimensions, as, within certain limits, it is very variable in size. Tangential sections of the spore shew that it is thickly covered with these spinous projections, and in longitudinal sections as many as thirty of them may be seen projecting from the spore wall all around the periphery. The spines in all the three species are unicellular structures and are simply protuberances of the spore wall.

Halifax.

MICROSCOPY.

Botanical Mounts.—We have received from Mr. B. Piffard, of Hemel Hempstead, a series of mounted objects illustrating botanical structures. The sections are stained and coloured, and are among the neatest we have ever seen. Mr. Piffard has adopted the idea of using an ordinary glass slide for mounting more than one object according to size. Thus we have sections of the common brake, casuarina, and spruce-fir, neatly arranged on one slide; of acacia, abutilon, geranium, croton, and lemon on another; and sections of the petioles of salvia, lemon, abutilon, geranium, aristolochia, croton, fuchsia, eucalpytus, and spiræa (nine in number) on another. The latter are most elegantly arranged in a circle, with the largest in the centre, and an engraved number on the glass denotes each object. These slides are a true botanical *multum in parvo*, and their neatness and high finish render them almost artistic objects.

The Methods of Microscopical Research.—Under this title has appeared Part I of a work by Mr. J. E. Ady, who has proved his thorough fitness for the task by the able articles he contributed to Coles' "Studies in Microscopical Science," nearly all of which were from his pen. "The Methods of Microscopical Research" is intended as a Preliminary to Vol. ii. of "The Studies in Microscopical Science." The first part deals with "Reagents," "Methods of Preparation," "Microscopical Art," &c.

Pond Life in Winter.—It may be interesting to some of your readers to know that, even in the severe winters of Northern Michigan, an abundance of microscopic life exists under the ice. I first noticed it in January of this year, in cutting holes through a foot or eighteen inches of ice, to water my team, in the valley of the Au Sable. Having no lens with me, I could not distinguish any of the species, but they were easily discernible with the naked eye. The winter here has been a severe one, and to-day (May 21st), there has been a slight fall of snow.—*H. H. Hindshaw, East Saginaw, Mich.*

ZOOLOGY.

Direct Reproduction of Tape-Worms.—It is well known that these creatures usually require two or more hosts, in whose bodies they pass through their metamorphoses. M. P. Mégnin, however, gives an account in the "Comptes Rendus" for May 7th of one species, *Tænia serrata*, which directly reproduced its young in the body of a small dog.

"The Butterflies of Europe." By H. C. Lang, M.D., F.L.S. (London: L. Reeve & Co.)—Part xiii. of this valuable work has just been issued; the coloured plates are in our opinion the best which have appeared, including illustrations of *Argynnis aglaia*, *A. Niobe*, var. *Eris*, *A. Adippe*, *A. Laodice*, var. *Chloradippe*, and *Cleodoxa*, *A. paphia*, var. *Valezina*, *A. pandora*, *A. Hecate*, *A. Lathonia*, *A. Eliza*, and *A. Alexandra*.

Vanessa Callirhoë.—I read Mr. Swinton's article in the May number of Science-Gossip with great interest, especially his remarks on *V. callirhoë*. I have found this species in Madeira, in 1879. It is common in gardens in February. It flies like atalanta, and is often seen settling on a path or road with expanded wings, basking in the sun, in which position it is easy to approach. The larva lives on nettle (*Urtica dioica*), and resembles that of *Vanessa atalanta*; it lives, like atalanta, in a rolled-up leaf in which it changes to a pupa. I have now an empty pupa-case before me; it resembles that of atalanta, but is, perhaps, a little lighter in colour. I have found the larva and pupa in April. *V. atalanta* does not seem to occur at Madeira, but *V. cardui* is common in the sugar-cane fields in March. The Madeira specimens are rather larger and finer than any I have caught in England. The larvæ are found on the thistles which grow in the sugar-cane fields in May. Is not *V. callirhoë* the same as *V. indica*, and *V. vulcana?*—*T. D. A. Cockerell.*

Helix personata in Ireland.—It was I who found the specimen of *Helix personata* in Ireland, and as I have never yet made any public statement of the circumstance, perhaps I may be permitted to do so now. Mr. Christy is right in saying that the claim of this species to be regarded as British rests on a single dead shell. Some years ago I was searching for mosses over the sandhills at Newcastle, county Down, Ireland, and filled my vasculum with tufts of the various forms that I met with. On my return to Belfast the same evening, I proceeded to examine my plants, and at the roots of a tuft of a hypnum I found a snail shell which I did not know, but which was subsequently identified by Dr. J. G. Jeffreys as *Helix personata.* At first I thought of a fossil bed, but the shell is not a fossil; though dead, and filled with sand it is quite fresh, and I can find no trace of a fossil deposit in the locality. Nevertheless, I do not regard *H. personata* as a British shell. Subsequent searches in the same sandhills have all been unsuccessful, and unless there should be better reason than I have stated, it is better to leave this species out of our list. The shell in question was not introduced with ballast, it was found a long way off the quay, and there are no ballast heaps about the little port. Newcastle is one of the most popular watering places in the north of Ireland, and it is no unusual occurrence for people to stop there for a time who have also been at watering places on the continent. Shell collecting is one of the amusements of such resorts, and it is quite likely that some person, having foreign shells, dropped the specimen about which I write. This is my theory, but there are many ways by which the presence of this shell may be accounted for, without supposing it to have lived on the spot.—*S. A. Stewart, Belfast.*

Nature-Printing.—We have to notice a novel style of printing from natural objects which has just been perfected by Mr. Thos. Stonywood. In this process the impressions are taken directly from the objects themselves, thereby possessing a vigour and a freshness, to which mere copying, however artistically done, could never attain. Articles as diverse as a spider's web and a mutton chop are reproduced with almost photographic exactitude, round objects and flat being copied with equal facility. Thus leaves are copied with exquisite effects. As impressions of both large and small specimens can be transferred and on any substance, many channels are opened for the employment of this ingenious method of printing.

Insect Life on the Mountains.—During a walk in May last, in North Wales, over that shoulder of Carnedd Llewelyn that stretches away below the bold peak of Yr Elen, I was struck by the abundance of insect life among the grass and moss of the mountain; for over a space of at least two miles of my route, the singular creature commonly called the "Harry long-legs" was so abundant as almost to cover the surface, rising up at my steps; and when I looked again and again to observe them, they were seen in swarms. Small beetles also of two or three kinds were very numerous, high up among rocks and short grass, at elevations varying from 1000 to 2500 feet; so that I was led to reflect how varied and widespread, how profuse and generously scattered, are the forms of life in such wild and remote spots, generally looked upon as barren and desolate. Probably such lavish multiplication of insect life thus, is to provide plenty of food for birds up there; at least one reason among others. I may remark that I had gone there specially, selecting a good vantage ground, to see the magnificent precipices of Cefn Ysgolion Duon, plunging sheer down from the summit ridge of Carnedd Dafydd almost to his base, and forming a grand mural section of the rocks, said to be about 2000 feet nearly perpendicular: an estimate I should suppose not far from the reality. It needs braving a little unpleasant very boggy ground, which, even by keeping close to the streams, can scarcely be avoided altogether; but the sight of this great wall of rock is worth considerable trouble to obtain, and when gazed upon from a good position will not soon be forgotten. From Bangor, as a resting-place, the base of the cliffs, or perhaps, better still, the grassy shoulder of Yr Elen, may easily be reached by leaving the main road a little beyond the village of Bethesda. I can recommend following up the Caseg stream, on its far side from the main road, and crossing it high up so as to strike over the shoulder of Yr Elen as before mentioned: the tourist then will soon find himself in a glorious solitude, surrounded by scenery of much beauty and grandeur.—*Horace Pearce, F.L.S., Stourbridge.*

Swallows Hibernating.—Will the old controversy of swallows hibernating never be buried in oblivion? I cannot imagine what proof of hibernation is afforded by "Plutarch's" note in your last number. The swallow invariably arrives here (Northallerton) in April, and we are about 40 miles north of Leeds, where "Plutarch" saw his swallow on April 3rd. The following extracts from my diary show the times of appearance of swallows for several years back: 1863, April 16th; 1868, April 14; 1869, April 13th; 1872, April 29th (some had been seen by a friend before); 1873, April 16th; 1879, April 28th (sandmartin seen on the 7th); 1881, April 23rd; 1882, April 27th (martin on the 16th and sandmartin on 23rd). I cannot believe that the bird was a hibernated specimen, because it was seen a week or two earlier than usual.—*J. A. Wheldon.*

BOTANY.

THE ÆCIDIUM OF RANUNCULUS FICARIA.—This pretty Æcidium is well known to many readers of SCIENCE-GOSSIP as a microscopic object. It is always interesting as being one of the first, if not the very first uredine to make its appearance in spring. Our knowledge of its life history, as derived from works in the English language, has, however, hitherto been either incomplete or inaccurate. Any one who places a few ripe spores of this fungus upon a drop of water on a glass slide, will find they germinate in less than twenty-four hours. If the spores be sown upon a healthy leaf of *Ranunculus Ficaria*, no result ensues; for the fungus is unable to reproduce itself. As an Æcidium, as we have seen, the spores germinate at once, and hence are incapable of reproducing the Æcidium in the following year even if the germ tubes could be persuaded to enter the stomata of the leaves of its host plant, which they cannot be. Unless we are wholly occupied in the mere collection of specimens of leaf fungi simply because they are interesting microscopic objects; it is quite worth our while to inquire, how this fungus is kept alive from the spring of one year to the same season of the ensuing. There is not very uncommonly found a species of Uromyces upon the same ranunculus, and it has been suggested that because these two fungi occur upon the same host plant, that therefore they are states of the same fungus. This is, however, a pure assumption, and is not borne out by experimental culture. The Æcidium has never yet been produced from the Uromyces, neither has the sowing of the Æcidiospore ever been followed by the development of the Uromyces. It has however been shown by Dr. Schröter, that if the spores of *Æcidium Ficaria* be sown upon various species of Poa, a Uredo, and subsequently a Uromyces, is the result. This Uromyces differs from the *Uromyces dactylidis*, Ottho (*U. grammeum*, Cooke), in various points, but notably in the absence of paraphyses in its Uredo, which the Uredo of *U. dactylidis*, always, possess. Up to the present time *Uromyces poa*, Rbh., however, has never been found in Britain. It must therefore follow that, either the Teutonic savant is wrong in his views of the life history of *Æcidium Ficaria*, or else our British fungus must have a different life-history. Believing, however, that Dr. Schröter was right, I took an early opportunity this year of searching carefully around any specimen of the Æcidium I came across upon the grasses, and was as a matter of course rewarded upon the 25th May, by finding the Uredo, and soon after the teleutospores of *Uromyces poa*, Rbh., upon *Poa trivialis*. This is one more illustration of the fact, that careful experimental research is of infinitely more value than the haphazard destructions of the closet naturalist, however eminent he otherwise may be. If any of your readers are sufficiently interested in the subject, I have no doubt they will find as much *Uromyces poa* as they may want, if they only look for it on the grasses (Poa) contiguous to plants of *Ranunculus Ficaria*, which have earlier in the season been affected with *Æcidium Ficaria*. Since writing the above, I have received specimens of *Uromyces poa* from my friends, Mr. H. T. Soppett, of Saltaire, and from Mr. W. Marshall, of Ely, both of whom were kind enough to search for the fungus in question in the situation indicated above.—*Charles B. Plowright, King's Lynn.*

OUR CHARAS.—As one of the "few enthusiastic and isolated workers" who for the last few years have studied the life history of the Characeæ, and assisted in working out their British distribution, I most gladly welcome the article of Mr. Saunders that appeared in your pages last month. Some of his statements, however, appear to be slightly misleading, and as the article is written for the purpose of helping students in their study of these little known plants, perhaps I may be allowed to compare them with my own experience in collecting. Mr. Saunders says, "it is equally useless to search for them in shady pools or on the shady side of them." Whilst not disputing the accuracy of this statement as a record of the writer's own experience, I think it certainly is not correct in all cases, nor should it be accepted as a reliable guide in collecting. In the district worked by myself, the neighbourhood of the port of Goole and the rich tracts of marshland adjoining, charas are commonly found in shady places. *Chara vulgaris* is very common in deep shady ditches in Goole Fields, and at Polleric Carrs near Doncaster. A fortnight ago *Nitella opaca* was most abundant and in perfect condition, with ripe fruit in several ditches quite shaded by large hedges, and in Adlingfleet drain, near Goole, it flourishes abundantly in like circumstances, and also under the low arch of a bridge. That "they appear to grow only in such situations as are exposed to direct sunlight," is an observation quite new to me, and the species named in support of the assertion, "*Tolypella intricata*," does not quite justify that, nor the following statement that "in the summer they are in the best condition, and their curious fruits are ripe." *Tolypella intricata* is, according to my observations, developed very early in the year, and is in the best condition with ripe fruit in April, or early in May. After this time it rapidly decays, falling to the bottom of the ditch or pond. I have at present before me specimens, now almost rotten, gathered from a locality where in April they were strong and vigorous. *Tolypella glomerata* is also in best condition early in the year; it occurred abundantly last year here, and was at its best in April; after June it was not to be found. In keeping living specimens, my experience differs from that of Mr. Saunders. *T. intricata* in a glass jar soon died when constantly exposed to direct sunlight, whilst some kept on a shelf in the somewhat dark corner of a room was beautifully green and fresh the whole of the summer, decaying in autumn, and reappearing from the sand with bright green slender simple stems in January this year. Charas are like many other plants, in the best condition when their fruits are ripe, and in the before-mentioned species this is early in the year. Such species as *Chara fragilis*, which ripens its fruit in July or August, will no doubt then be in the best condition; but my experience after some years of collecting is, that charas may be looked for with the best prospect of success in early spring, before the coarser vegetation which fills many of our ditches has started into growth.—*Thomas Birks, jun., Goole.*

LEONTODON TARAXACUM.— I think both the classification and description given by A. H. Swinton liable to mislead and confuse younger botanists in their attempts at identification. To begin with, the commonly accepted name of this genus is *Taraxacum Leontodon*. The full name is *Taraxacum officinale*. Then the varieties are not *major*, *minor*, and *palustris*. There are four varieties, as follows (vide "London Catalogue," last edition, and Sowerby's "English Botany," 3rd edition) with the separating characters for each; 1. *T. Dens-leonis*. Leaves bright green. Inner phyllaries simple at apex; outer ones narrow, recurved. 2. *T. erythrospermum*. Leaves dull green. Outer phyllaries lanceolate, spreading. 3. *T. lævigatum*. Leaves dull green. Outer phyllaries ovate-lanceolate, erect. 4. *T. palustre*. Leaves often almost entire, usually sinuo-dentate with the lobes approximating. Outer phyllaries ovate, acuminate, and more adpressed than in 1, 2, or 3. Varieties 2 and 3 have a tiny ligulate appendage below the apex of the inner phyllaries, but may be separated as above, and by the fact that the achenes in var. 2 are dark red, and in var. 2 olive-coloured. The term "leaflets" is wrongly used here. The leaves are simple, with variously-shaped lobes. Var. 4 is not usually in flower until late summer.—*H. W. S. Worsley-Benison.*

FLOWERS OF DUCKWEED.—I took *Lemna minor* and *L. polyrrhiza* with flowers at Beccles last August, and *L. gibba* and *L. trisulca* near Willesden a week or two later, the former with a very few flowers here and there. *L. triscula* I have seen in flower in Chepstow, Monmouthshire.—*H. W. S. Worsley-Benison.*

FLOWERS WITH DOUBLE COLOURS.—Mr. Hermann Müller has very clearly explained why such flowers as the common lungwort (*Pulmonaria officinalis*), and others of the same natural order, have two colours, red and blue. The former colour is generally assumed first, and the latter as the flowers get older. He proved by examination that all the blue flowers of the lungwort were empty of honey, and the stigmas of their pistils were supplied with pollen. Mr. Müller concludes that the blue colours of the older flowers of the lungwort, whilst increasing the conspicuousness of the clusters of flowers, at the same time indicate to intelligent bees, such as anthrophora, to which flowers they should restrict their visits, to their own as well as to the plants' profit. The more intimately we are acquainted with the biological relationships of flowers, the more do we discover that "every freckle, streak, and stain" has a distinct meaning and bears some active relationship to the well-being of the plant. In many flowers belonging to other orders the colours change as the flowers get old, as in hawthorn blossom and the little celandine, and these faded colours may also indicate to insects where their visits would be unnecessary and useless.

FLOWERS OF POLLARD WILLOWS.—Can any reader kindly tell me if there is any reason for the great preponderance of pistillate plants amongst pollard willows? I have examined a great number, and have failed as yet to find a single staminate one. Is there any preference for the one as being more suitable for the purpose of pollarding? Many of the trees were very old ones.—*C. D. B.*

THE FERTILISATION OF WILLOWS.—Having frequently heard it stated that the bee visited only the male catkins of the willow, I have, during the last few weeks, carefully observed the behaviour of these insects in their dealings with this plant. Fringing the Ouse embankment at Bedford, is a large growth of *Salix triandra*, and close by there are extensive beds of *S. viminalis*. The male catkins are yellow and decidedly attractive, but the females are green and less conspicuous. The bees also show the superior attracting-powers of the male over the famale catkins. Two or three times a week for the past month I have visited these willows, and only on one of these occasions have I seen the bees visit the female catkins, and then only because no males were near. Both sexes produce nectary glands, and the question arises what can be the object if the insect rarely visits the female catkins? The view I have formed (correctly or incorrectly I know not) is as follows: Amentiferous plants dependent entirely upon the wind for fertilisation have pendulous catkins, but in the willow the catkins are upright and elastic. The humble-bee is a heavy insect, and it almost invariably mounts to the summit of the catkin which is borne down by its weight. On the bee taking flight, the catkin springs suddenly to its original position, and thus shakes out the pollen-dust in the male, and further distributes that which may have lodged in the scales of the female catkin—both of which processes would be advantageous to the plant. The presence of the nectary-gland in the female catkins I explain, partly on the principle of correlative growth, and partly by the slight encouragement it receives by the visits of the bee.—*J. Hamson, Bedford.*

GEOLOGY.

"The Age of the newer Gneissic Rocks of the Northern Highlands."—Whilst Professor Geikie has been endeavouring to demolish the Archean rocks of Wales, other geologists have been finding Archean rocks in Scotland, and have thus succeeded in carrying the war into the enemies' camp. A paper on the above subject has just been read before the Geological Society, by Mr. C. Callaway, D.Sc., F.G.S. The object of the author was to prove that the eastern gneiss of the Northern Highlands, usually regarded as of "Lower Silurian" age, was to be placed in the Archæan. While admitting that this gneiss frequently overlies the quartzo-dolomitic group of Erriboll and Assynt, he held that this relation was due to dislocation accompanied by powerful thrust from the east, which had squeezed both formations into a series of folds, thrown over toward the west, so as to cause a general easterly dip.

The Carson Footprints.—Professor Leconte, a well-known American geologist and naturalist, has been personally examining these footprints for several days, and he writes to "Nature," stating that the conclusion he has arrived at is that the tracks are not human at all, but were most probably made by a gigantic ground sloth, such as the Mylodon, the remains of a species allied to which were found in the Upper Tertiary Strata of Nevada.

"The great Ice Age."—At a recent meeting of the Royal Society, Professor James Geikie said that the limits were indicated of the Great Scandinavian ice-sheet which pushed itself southward over north Germany and over the watershed of Central Russia, and westward across the German Ocean towards our islands, thereby modifying the trend of the native ice-streams that have left their traces all over our hills and round our coasts. As an indication of the great power of this agent it was mentioned that some portions of the brown coal beds of Saxony which have been long worked are really not *in situ*, but have been pushed out of place by the ice-sheet. In describing the fluviatile deposits, Professor Geikie drew attention to a suggestion made by Darwin, that frozen snow accumulating in the valleys below the glacier limits might easily act as barriers and give rise to extensive flooding.

The Liverpool Geological Society.—Part 4 of Vol. iv. of the Proceedings of this, one of the oldest established of our provincial Geological Societies, is to hand, containing the following papers:—"Traces of an Interglacial Land Surface at Crewe," by D. Mackintosh, F.G.S.; "Marine and Peat beds of Formby and Leasowe, recently disclosed by the cutting for the outer sewer at Hightown," by T. M. Reade, F.G.S.; "Mammalian Remains from ditto," by F. G. Moore: "Subsidence of Land in the Salt Districts of Cheshire," by Thomas Ward; "The Carboniferous Limestone and Cefn-y-Fedw Sandstone of Flintshire," by G. H. Morton, F.G.S.; "The base of the new red sandstone in the country around Liverpool," by G. H. Morton, F.G.S., &c.

The Estuaries of the Severn and its Tributaries.—Professor Sollas read a paper before the Geological Society on June 6th on this subject. Various sources have been ascribed to the mud which is so characteristic of the estuaries of the Severn and its tributaries, such as the rivers themselves, the waste of mud shoals, or of bordering cliffs, or the sea. The author considered the effect of these sources of supply, and showed that, although the first three are doubtless to a certain extent correct, they are inadequate to account for some very important phenomena. The tidal silt, on microscopic examination, is found to consist of both inorganic and organic materials, the former being argillaceous granules, grains of quartz, flint, &c.; the latter, coccoliths, coccospheres, Foraminifera, occasional sclerites of Alcyonaria, fragments of Echinodermata, and triradiate spicules of Calcispongia, together with numerous spicules of siliceous sponges, a few Radiolaria and a variable quantity of Diatoms. These organisms (described in detail by the author) are marine, and yet they occur on the banks of rivers at a great distance from a truly marine area. The author showed it to be improbable that they can have been derived, at any rate to a considerable extent, either from the older formations through which the Severn flows, or from the alluvial flats of its estuary; for although the latter do contain marine organisms of a generally like kind, the spicules, &c., indicate corrosion, and are generally not so well preserved as those which occur in the tidal silt. It seems therefore necessary to conclude that a considerable proportion of the organisms now present in this have been brought from the sea; but sponges are not known to grow in any quantity nearer Bristol than the coasts of Devon and Pembrokeshire. It would therefore appear that these organisms, contrary to what might have been expected, have been drifted up into the tidal estuaries of the river for a very considerable distance. The author concluded by describing in detail the alluvial tracts of the Severn, which he considers to have been formed (with certain differences of level) much as tidal deposits are formed at the present day; and by pointing out the bearing of his investigations on the question of the probable results of the discharge of sewage into tidal rivers. In the discussion which followed, Professor Boyd Dawkins said that he congratulated the author upon the way in which he had dealt with the phenomena which he had brought before the Society. The bearing of his remarks upon the sewage question was very important. The physical change implied by the submarine forest in the area examined by the author and which Professor Dawkins had studied for many years, was to be observed all round our coast where the shore was a shelving one. The forests of oak, yew, and Scotch fir occupy a belt stretching from about Ordnance datum to below low-water mark, and he had identified the short-horned ox, goat, sheep, and hog among the animals discovered in them at various points. Between Porlock and Minehead he and the Rev. H. W. Winwood had found numerous flint chips and flakes. The forests, therefore, flourished in the age of the domestic animals, or the Prehistoric period, most probably in the Neolithic stage of that period, and formed a belt extending from our shores to an unknown distance seawards. With regard to the section at Porlock Weir, he could not agree with the author that there was a second bed of peat. It was, as Mr. Godwin-Austen describes it, merely a surface-growth of Iris. Dr. Hicks said that he could quite confirm, from personal observation, the views of the author in regard to the extension westward of the old forests. That the mud went landward instead of seaward was a point with important physical bearings. He remarked upon the distribution of the materials according to their weight and volume. Mr. Whittaker said that the paper had an interest from the analogies of the Severn deposits with others of a like kind. He had recently been working near the Wash, the low land bordering which was formed of material deposited by the up-tide, so that the materials were derived from the Yorkshire coast. The sections of the Severn alluvial flats corresponded with those of the Fenland. He thought it would be better to say that submerged forests occur at the junction of a river with the sea, rather than on a low shelving shore, as stated by Professor Boyd Dawkins. "Submerged forests" and "peat-beds" were substantially the same phenomenon. It was, however, important to remember that the subsidence need only be slight. He had lately heard some facts with reference to the action of the tide in the Thames:—experiments had been made with floats, and in some cases the floats were found after a fortnight or more to have travelled up the stream; others, however, had slowly descended. It was therefore evident that much remained to be learnt about the tides. Professor Sollas was glad to find that the results of his study of this particular estuary were sufficiently in harmony with Professor Dawkins's generalizations. He differed, however, in two particulars; the first was with reference to the deposits immediately beneath the peat, which he regarded as not fluviatile, but tidal or marine; and the next, as to the extent of the submergence which had taken place subsequent to the formation of the peat; he thought the land need not have stood more than 20 feet higher than at present for the growth of the first peat-bed, and 10 feet for the second.

NOTES AND QUERIES.

LAND SHELLS.—In reference to Mr. C. Ashford's note in the April number of SCIENCE-GOSSIP, I may say that hitherto I have taken *H. obvoluta* in woods to a distance of five miles due west of Winchester, but have never had time to search further west. I don't know whether other collectors have noticed the abundance of *Clausilia Rolphii* this year: here it is certainly the case, though *C. laminata* and *Helix lapicida* are less common than usual. Perhaps it is rather early for them. *Cyclostoma elegans* occurs in plenty, while in the water I have seen a great profusion of young *L. truncatula* and *stagnalis*.—*B. Tomlins.*

LAND SHELLS.—List of land and fresh-water shells taken during 1882 within a radius of twelve miles of Middlesbrough-on-Tees:—*H. aspersa*, *H. nemoralis*, *H. hispida*, *H. virgata*, *H. caperata*, *H. pulchella*, *H. arbustorum*, *H. hortensis*, *H. hybrida* (1 specimen), *H. Cantiana*, *H. fusca*, *H. lamellata* (1 specimen), *H. aculeata*, *H. ericetorum*, *H. rotundata*, *H. concinna*, *Clausilia laminata*, *C. rugosa*, *C. dubia*, *Zua lubrica*, *Pupa umbilicata*, *P. muscorum*, *P. Anglica*, *Carychium minimum*, *Acme fusca*, *Helicella cellaria*, *H. allaria*, *H. crystallina*, *H. pura*, *H. nitidula*, *H. excavata*, *Vitrina pellucida*, *Succinia elegans*, *Anodonta cygnea*, *Cyclas rivicola*, *C. cornea*; *C. cornea*, var. *flavescens*; *Pisidium pulchellum*, *P. amnicum*, *Valvata piscinalis*, *Bithynia tentaculata* (also pellucid white var.), *Planorbis carinatus*, *P. albus* (1 specimen), *P. marginatus*, *P. spirorbis*, *P. vortex*, *P. contortus*, *Limneus pereger* and vars. *lineatus*, *ovata*, and *acutus*; *H. stagnalis* (very rare and small), *Ancylus fluviatilis*, *A. oblongus*, *Paludina Lesterii* (dead shell). Along the coast-line of the Tees Bay commencing at Saltburn, we find the sand dunes occupied principally by *H. nemoralis* and *H. caperata*, between Saltburn and Redcar. Between Redcar and the Tees mouth, *H. virgata* and *H. aspersa* greatly outnumber *nemoralis*. North of the Tees, between the river and Seaton, *virgata* thins out and *nemoralis* becomes more abundant; *caperata* ditto; but near Seaton and towards Hartlepool *H. ericetorum* takes the lead. I have not found *H. hortensis* nearer to the sea than about seven miles; *arbustorum* comes within a quarter of a mile of the sea in Saltburn woods.—*Baker Hudson.*

HELIX ASPERSA.—I recently took one of these snails with a bright pink lip to its aperture, and should be glad to know if this peculiarity is of common occurrence, as I have never observed it before. The inside of the outer lip is as distinct and bright a pink as sometimes may be observed in *Helix pisana*.—*J. W. Cundal, Bristol.*

STRANGE FOOD OF SLUG.—Mr. J. W. Slater's note on a predacious slug (Nov. 1877) calls to mind an instance of, perhaps, a stranger taste in an animal of the same kind. In a city publishing-house, about two years ago, I discovered that the (cloth) binding of a number of books had been destroyed by the colouring matter having been scraped off. A slimy track over the books and shelves left no doubt as to the author of the mischief, but the most careful search for it proved ineffectual. Since that period the damage has been repeated to a greater or lesser extent, almost nightly. About a year ago it was captured and placed in a match-box, in order to save it for me, but on opening the box I found it was empty. A few months since it was again caught and killed by an assistant who was not aware that I wanted it; but the damage still goes on, and I am still in hopes of knowing the species which has developed such a strange taste. During all this period they must have subsisted on this colouring matter entirely, for there is no vegetation of any kind on the establishment, and although fresh leaves have been laid down at night from time to time with the hope of trapping them, they have remained untouched. I may add in conclusion that a decided preference has been shown for books in crimson bindings.—*E. Step.*

DREDGING OFF SIDMOUTH.—The Sidmouth coast varies very little from the coast from Hopes Nose to Langston Head. A similar class of anemones are to be found all round the bays from Hopes Nose to the end of the eastern cliffs. The class of anemones are as follows: *Caryophyllia Smithii* (madrepore); *Sargartia viduata-anguicoma; S. troglodytes*, 5 sorts; *S. candida; S. miniata; S. rosea; S. nivea; S. bellis*, 4 sorts; *S. parasitica; S. venusta*, rare; *S. Aurora*, rare; *S. aurantiaca*, rare; *S. pulcherrima*, rare; *Corynactis viridis; Bunodes alba; B. gemmacea; B. thallia*, rare; *B. clevata*, very rare; *B. crassicornis*, very plentiful; *Actinia Mesembryanthemum.* The strawberry sorts very large, and the finest in England is to be found on this coast; 4 sorts *Anthea cereus*, fine and common; *Adamsia palliata*, rare; *Edwardsia sphæroides = vestita*, rare. The following also are found all round the coast: naked and tubed Hydroida, star fishes and sea urchins, sea cucumbers, tube and other worms, crustacea, barnacles, polyzoa, and a great many kinds of mollusk, and fishes. The Sidmouth coast I have found much cleaner than the western coast, being open to the south and south-west gales. Having collected upwards of forty years on this coast, I shall be happy to give any information to inquirers coming my way.—*A. J. R. Sclater, Naturalist, Bank St, Teignmouth.*

NATURAL HISTORY OF NORTH WALES.—In reply to W. J. R., asking for information as to any books treating on this subject, Williams's "Guide to Llandudno" contains a very good account of the natural history of the surrounding district.—*J. E. W., Chester.*

BEES AND COLOUR.—On Sunday, the 3rd of June, a large bumble bee got into our church during the afternoon service. The east window was of stained glass, and the bee soon made his way to it. I watched with some little interest to see which colour he would select, and found a curious confirmation of Sir John Lubbock's researches, by noticing him go straight to a blue band, about two inches broad, which formed a canopy over the side-light, although there were two other much more prominent colours for him to choose from. He crawled all along this, just as a bee crawls about in a flower.—*F. C. Peecock.*

BUMBLE BEES AND CATS.—In explaining the difficulty experienced by E. L. R., in the June number, it has to be remembered that the nests of bumble bees are frequently ravaged and destroyed by mice. The mice in their turn are destroyed by cats. Hence where cats abound mice do not, and therefore bumble bees do. This is how the fertilization of clover depends (indirectly) on the number of cats in the neighbourhood.—*Henry Ullyett, Folkestone.*

BUMBLE BEES AND CLOVER.—Humble bees are (as explained by Darwin and Lubbock) aided in the struggle for existence by cats killing field-mice, which are very destructive to their nests.—*Edward J. Gibbins, The Craig, Heath, Glamorgan.*

SPECIES OF CHRYSOMELA.—Last week I found near Hendon, Middlesex, six specimens of a very interesting species of chrysomela, which I am unable to name. Would some reader kindly name it for me? Its description is as follows: It is a little smaller than *C. polita*, its thorax is green with brassy reflections; its legs are green, its elytra are almost brick red, with brassy reflections; both the elytra and the thorax are covered with minute punctures; the antennæ are black (reddish at their bases); parts of the feet are covered with golden hairs.—*T. D. A. Cockerell.*

SENDING LEPIDOPTERA BY POST.—I should recommend A. E. Gibbs, if he has not done so already, to try the simple plan of affixing a separate label to the box in which the insects are. It is the stamping on the box which smashes it. The best way is to have a properly corked box, and surround it by wadding outside. The label generally prevents the box being smashed, even if it is only cardboard, which it should never be. Messrs. H. W. Marsden & Co., 37 Midland Road, Gloucester, have some very strongly made boxes, on purpose for postage of butterflies.—*R. A. R. Bennett, Walton Manor Lodge, Oxford.*

VARIETY OF ARGYNNIS EUPHROSYNE.—It may prove interesting to some of the readers of SCIENCE-GOSSIP to hear that, whilst collecting in Belstead Wood last week, I captured a variety of the above in very good condition. On the upper surface it is deeply blotched along the outer margin of both fore and hind wings, and with only two spots on the costal margin of fore wing. Hind wings are very deeply blotched. On the under side the hind wings are of a pale greenish tint, with broad blotches of pearl, and a curious dark band on the outer margins of both wings. The under side is almost exactly like a variety of *A. Selene* in the cabinet of Mr. Bond, figured on page 37 of Newman's "British Butterflies."—*Harry Eaton, Ipswich.*

THE ALLEGED HABIT OF HIBERNATION OF SWALLOWS (C. G. Abbott, S.-G., March 1).—I read this with great interest. But allow me to bring to your notice, and that of your readers, two facts within my own knowledge. 1. The wife of our village blacksmith was the daughter of a respectable farmer, renting under the Harcourts at Newnham, and incapable of a falsehood. She told me this: "When I was a young girl, we had lots of swifts nesting under the eaves. Father thought they brought in a deal of dirt and vermin, so when the birds were gone in the autumn he had all the holes plastered up. The spring of next year was very early, fine and warm; and sister and I were disturbed by a strange scrabbling noise. Told Father. He said, Rats, and had the skirting board knocked away, and out came what we all thought was a great bat. Father took it up, and it was a swift, and we took out about forty of them, and as the poor birds were mere skin and bone we tried to feed them. No use; so the poor things were tossed out of the window and flew away." 2.

Many years ago I was at Sidmouth, in the winter. The autumn had been stormy. In December the weather changed, became mild, and on Christmas Day it was like June,—a blue sky, a hot sun, and not a breath of air. Coming up to the wooden bridge over the Sid, I saw an old gentleman looking attentively at something in the pool. I soon joined him, and he said, "Look there, swallows flying about, sometimes touching the water, as they do in summer —sand-house martins, and there a true chimney swallow; not tens, but hundreds of them." "Have they come from Egypt, sir, do you think?" I said. Old gentleman: "No sane man could believe it; how could they get here in twenty-four hours?" —*A. H. B.*

"APPEARANCE OF THE SWALLOW."—Under this heading, "Plutarch," in June SCIENCE-GOSSIP (p. 140) assumes that a swallow hibernated on the very small evidence of its being the first one he saw, and that he chanced to see no others for some time afterwards. The swallow was seen here (Glamorganshire) in considerable numbers on the same day (April 3) as "Plutarch" saw his supposed hibernated bird. The average of twelve dates of the swallow's first appearance this year, in different parts of the country, was the 10th of April. Barnsley (Yorkshire) sent date as 2nd of the month. Taking these facts into consideration, I think we cannot agree with "Plutarch's" assumption that his early swallow is another proof that the swallow does not always leave us.—*Edward J. Gibbins, The Graig, Heath, Glamorgan.*

TAME AND WILD BLACKBIRDS.—Walking by some cottages last March, my attention was attracted by an unusual fluttering of birds, and, on looking, I saw a caged cock-blackbird, which was being violently attacked by a wild one; the caged bird kept shifting from side to side, apparently from fear, and it was followed by the other. Is this a common occurrence?—*C. D. B.*

WOOD-PIGEONS AND OWL.—At first sight it does seem strange that pigeons should show no fear at the approach of an owl. But your correspondent will recollect that white owls rarely (do they ever?) prey upon birds; they frequently make their nests in pigeon cotes, surrounded on all sides by those of the pigeons, and doubtlessly prove of service in keeping down vermin that might be of more danger to the doves than the owls are.—*J. A. Wheldon.*

INGENUITY OF THE LAPWING.—When in the country this spring, my cousin told me of a curious thing he had noticed performed by a lapwing. When harrowing a field, one day, he accidentally crushed three eggs in a lapwing's nest, so that small pieces of the shell were wanting, and the rest much cracked. He noticed that incubation was well advanced, and placed them on one side. In the afternoon he went to look at them, and was surprised to find them all plastered and mended with mud, which was dry and set, quite covering the broken parts and cracks. The next afternoon the young ones were hatched. An elder brother told me he had seen the same thing done.—*R. McAldowie, Aberdeen.*

GOLDEN PLOVERS AND LAPWINGS.—In reply to the query on this subject in the last number of SCIENCE-GOSSIP, a gentleman who has had much experience tells me that in Ireland he found to his cost, while shooting, that these birds frequently associate. He would frequently come across a number of both these birds feeding together, when the watchful lapwings would give the alarm before he could get near them; if the golden plover were alone, a good shot might be obtained. On the other hand, in the south of England, he has met with flocks of golden plovers alone, which were fully as watchful as any lapwing.—*H. C. Brooke.*

STARLING'S EGGS WHITE.—On the 14th of May last, a boy brought me five eggs taken from the nest of the starling, two of which were white, although the two white eggs were the same size and shape of the others, I have doubts as to their being starling's eggs, never having heard of a similar case. I questioned the boy as to where he got them. He said he got them in a hole, in the wall of a cart-shed on the farm where he stays, and he had to put in his arm the full length before he could reach them, and he firmly asserts that all the five eggs were in the same nest. If any of the numerous readers of SCIENCE-GOSSIP could throw any light on the subject by past experience, it would be very acceptable.—*A. Foster, Rodger Street, Anstruther.*

CURIOUS EGGS.—Two remarkable specimens of eggs have just come under my notice; one is that of a common pigeon, a little bigger than a swift's egg, and exactly resembling it in shape; another is that of a wood pigeon, which is rather smaller than that of a wryneck. Also I have seen a pair of thrush's eggs, not more than half the usual size, and some starling's eggs white, and almost round, being rather larger than a wryneck's.—*H. C. Brooke.*

ASH AND OAK.—In answer to Mr. F. A. Dymes, I may say that the oak is always in full leaf here before the ash. The oak referred to is the var. pedunculata of *Quercus robur.*—*J. A. Wheldon.*

NAME FOR STOAT.—There is no doubt that the word "clubster" is a corruption of "clubstart." Stoats are still called "clubstarts" amongst the country people about Scarborough, and in other parts of Yorkshire.—*J. A. Wheldon.*

SEA ANEMONES.—I should be much obliged if some kind reader of this paper could tell me how to preserve sea-anemones by the dry process.—*G. A. D.*

SLOW-WORM.—Its food is generally of an insect nature, and it seems to be fond of small slugs; its other name is the blind-worm (*Anguis fragilis*); it is called fragile on account of its custom of snapping itself in two when struck. Snakes can be fed on tadpoles, or small fishes. They do not want feeding during the winter, but should always have a bath if kept in confinement; a soup-plate answers that purpose very well, into which you can put the tadpoles at feeding time. They also eat small frogs and newts, or even mice.—*G. A. D.*

LOCAL NAME OF STOAT.—I have to thank your two correspondents, Mr. Southwall and Mr. Lynn, for their replies to my note on this subject in the April number of SCIENCE-GOSSIP. Clubstei was of course a misprint for Clubster, and the origin of the local word is now clear. The early dwellers in the north, wishing to give this animal a name to distinguish it from the weasel, would see in the black-tipped comparatively short tail its most distinguishing feature and would not unnaturally term it "club-tail." Halliwall is somewhat indefinite in calling clubster a north-country word. I never heard it spoken of by this name in Cumberland. This name cannot, I think, be a corruption of Lobster, but is it not just possible that the latter might be a corruption of Clubster? Doctors seem to disagree as to the derivation of stoat. Some connect it with the Belgic stout, bold; in Stormonth's English Dictionary I find "stoat (from a supposed analogy to a stallion-horse; Dut. Stuyte; A. S. Stodhors, a stallion or studhorse.") Something as to the times and causes of the stoat's becoming white would be interesting. Some authors seem to speak as though the stoat were never white in England, but only farther north.—*John Hawell, M.A., Ingleby Vicarage, Northallerton.*

Slow-Worms and Snakes.—Having kept many of both of these reptiles, I think I may safely give the results of my experience. With regard to feeding, I believe the slow-worm will not eat anything but white slugs and worms, preferring the former. The snake feeds on frogs and newts and tadpoles; occasionally I have had them take mice, bread and milk, fish and insects; but I think these are exceptional cases, and they do not thrive so well as when fed on frogs and newts. They should both be kept in light and airy cases, with a saucer of water for drinking and bathing. A piece of turf is also beneficial; and the box should be so arranged that they can get sun or shade as they like. They both, especially snakes, like a strong-stemmed plant to climb about in.—*H. C. Brooke.*

Mind in the Lower Animals.—I wish to answer some of Dr. Keegan's questions. When I say the word "Biscuits" (which is equivalent to meat), the dog does get up and beg. When I whisper the word "Cats," the dog does go where cats are likely to be found. Another dog, if the word "Mouse" be uttered, straightway rushes to a cupboard where he caught a mouse a long time ago; while, if "Sugar" be said, he dances around one expecting that favourite luxury. When I say, "Out for a walk?" the dog straightway rushes to the hall door; if I shake my head, he runs to the other way out. I have often tried the "crucial experiment" of taking a dog upon my knees and saying to it, "You're a stupid," or "You're a beast," as if it was something very exciting. The dog looked at me in a vague way, as if it would like to understand me. If, however, I say or whisper in a slow and measured tone, "Do you want to go out for a walk?" the dog instantly is very excited and rushes to the door. I have often stopped short at "Do you want to—"; the dog looks very eager, for those words always precede something pleasant, but it is not till the words "Out for a walk" are spoken that he gives way to his delight. I intend to try the experiment of exciting the dog by saying "Do you want to—" and then to inquire if it wishes to be whipped; if it manifests delight and runs to the door or to the biscuit cupboard, I shall admit that Dr. Keegan has proved his point. If, as I expect, it attaches no idea to the words, "Do you want to be whipped?" I shall consider that Dr. Keegan must give a fuller explanation than he has yet given.—*A. Dixon, Trinity College, Cambridge.*

Mind in Animals.—In the article "Mind in the Lower Animals," in the April number of Science-Gossip, the writer seems to think that animals are quite devoid of reason (the power of thought). I have always been fond of animals of all sorts, and I must say that as far as my knowledge goes I have found many cases which make me think the contrary. One instance which came under my notice was in connection with a black and white rat; as the writer mentions his cats and dogs as lower animals, I think I may be pardoned if I call a rat a lower animal. The incident in question was as follows:—A friend of mine had a pair of rats, which he kept in a large wooden cage. This cage was sometimes hung outside on a nail driven into the wall, but more frequently was kept indoors. Some little time before the event I am about to relate happened, the mother rat brought into the world four very handsome young ones, in which she had great pride. One day when the cage was in the garden, a sudden shower of rain came on, and we went into the garden to fetch the cage in. Noticing some small particles of wool sticking out of a small hole in the roof of the cage just over the nesting-place in which the young rats were, my friend opened the door of that compartment (which for ventilation had a few bars of wire across, in place of the wood which had been cut away). On doing so he found the mother fixed with her feet on to the door, so that part of her side and back rested against the hole; and not only this, but she had poked some wool from the nest into the hole, but finding this not enough to keep her young from getting wet, she had placed herself in the position we found her in. Now, I think that this shows that the poor mother, finding her young getting wet, had *thought* out the cause, and came to the conclusion that the water came through that hole, and that therefore something must be done to stop the inflow of water from that hole. At any risk she therefore, with something more I think than instinct, first tried to stop it with wool; but finding this of no avail, she acted with true mother's love, which is always ready to sacrifice its own comfort to that of her children. I think this proves that animals not only think, but are capable of acting on their thoughts. Should you think it worth while, I shall be happy to send you some more incidents of like nature.—*A. G. Powis.*

Mind among the Lower Animals.—Though recognising the merit of Dr. P. Quin Keegan's paper on the above subject, I must admit that I cannot agree with all his assertions; and without attempting to refute his logic, yet should like to hear his views upon the following instance of equine sagacity. A few days since I had occasion to avail myself of the tramway in order to proceed from the centre of the town to a suburb. I entered the car, and the horse started away merrily until we came to a place where the line branches, one line of rails running about east and the other north. The car I was seated on should have kept on the east line, but the horse decidedly refused to proceed in that direction; in fact used every endeavour to get on to the north line. The whip, coaxing, patting, and leading were alike brought to bear upon the animal, but without success. As soon as the leader left the animal's head he again endeavoured to proceed northwards; and it was only after a delay of some minutes and a thorough good thrashing, combined with a strong arm at his head, that he was persuaded that eastward he must go. I inquired the reason of his obstinacy, and was informed by the conductor that each horse had a certain number of runs to make (eastward), when he then took the car along the north line (at the end of which are the company's stables), and that at the terminus of that line a change of horses was effected. The conductor further explained that they were short of horses that day, and had to make an extra journey: this, he said, the horse objected to (no doubt wanting his corn), and that it was not the first time they had had the same trouble with him. Dr. Keegan states, nay asserts, that the lower animals cannot perform the simplest feat of mental arithmetic, and that any problem which requires for its solution that several reminiscences must be conjured up at will is utterly beyond the scope and resources of the said lower animals' mind. I had his words in my mind when the incident I have related occurred, and it seemed to give the direct negative to his assertion. I should therefore be glad if he would be kind enough to look at the matter again, and let us have his opinion.—*Baker Hudson*, *Middlesbrough.*

MIND IN LOWER ANIMALS.—I should like to place one or two facts before Dr. Keegan bearing upon the above question. I had a black retriever dog from a puppy. When I first had him, I had a lodger in the house, and he never failed to distinguish betwixt persons who came to visit me and those who came to visit the lodger. My friends could go about the house with impunity at any hour of the day or night, but not so the friends of the lodger. He manifested the most determined dislike to their leaving the house after dark; while a friend of mine, whom he saw for the first time, would be recognised the first day. With regard to understanding language, he was fed much on biscuits, which are always called cakes, and the word cakes always roused him, however spoken. He would always be close to my feet, if possible; and many a time for the amusement of others, I have introduced the word "cake," into a sentence addressed not to the dog, but to them, without emphasis, and with my back to the dog. He never failed to show his recognition of the word, even if it went no farther than looking round to see whether it concerned him or not. The expression of his face was a study sometimes. If the word was repeated he was sure to bark, having been taught to ask for food in that way. But a further fact, he could tell a lie. Now I think this an unquestionable proof of reasoning power. I was accustomed to feed him at one o'clock, and he knew the hour within ten minutes. He would sit as nearly in front of me as he could get, pattering with his paws, wagging his tail, and looking straight in my face. If I turned away he would come round to face my new position, and if ordered away, would give two or three short barks, but would not cease his importunities until fed. Now if I was away and someone else gave him his dinner, he would go through all this performance when I returned. If told him to go away, he had had his dinner, he always redoubled his exertions, and barked in a manner which I perfectly understood to mean denial. Several times he succeeded in duping me. The fact that my dog could tell a lie was well known to a number of people, and after he was found out, was a source of amusement to us. How will Dr. Keegan explain this without allowing some mind to exist in this dog? However, I could cite other instances of other dogs quite as conclusive as this, only that I do not wish to occupy valuable space.—*Edwin Holmes*, 149 *Essex Road, N.*

MISCELLANEOUS NOTES.—Seeing in the pages of SCIENCE-GOSSIP something about *Paris quadrifolia*, I might mention that I have found it growing in a wood not very far from Cockermouth, on the banks of the river Derwent; it is rather rare. I have not seen it in any other district. The geological formation of this part of the country is mountain limestone, which seems to be very rich in fossils. I have collected a good many specimens of shell fossils and ecrinites, &c. Could any reader give me some information on mountain limestone, as I know next to nothing about geology? There are a good many species of ferns growing about here, the beech fern (*Polypodium Phegopteris*), also the oak fern (*Polypodium Dryopteris*), which is very common, in some places, almost carpeting the ground. The parsley fern (*Allosorus crispus*) grows in great quantities on our Fell sides.—*A. Maud Dixon*, *Wood Hall, Cockermouth.*

CLIMBING POWERS OF THE DORMOUSE.—Dormice can climb, and climb well. I have seen one climb up a curtain with the greatest ease, and hide away under the cornice at the top of a high window. Rats are expert climbers in a larder, though I know that farmers build their corn-stacks on raised foundations, erected on pillars, in order to prevent mice and rats from getting at the grain; but I have seen both species climb a rough surface, or anything like cotton or woollen stuffs to which they can cling with their sharp claws, with wonderful quickness.—*Helen E. Watney.*

PARCELS POST.—A public notice has just been issued to merchants, traders, farmers, seedsmen, florists, and the public generally, that the Inland Parcels Post is appointed to commence on the 1st of August next. As regards science, geologists and mineralogists will probably benefit by this post, but it is doubtful whether the rest of the fraternity will reap an abundant harvest, since the measure is designedly framed for the convenience of dealers in glass bottles, fish, game and meat. By the way, has any brother naturalist in this nation of shopkeepers ever made experiment of the Sample Post, "Patterns" and *échantillons sans valeur* arrangement? Only last autumn I carried out an exchange of entomological specimens with the curator of a public museum in Italy. The matter was one of barter, and I considered myself justified in transmitting my butterflies and moths by the said post. As chance had it, my box proved in excess of the dimensions permissible, and after a detention of some weeks it was supposed at the Post Office that a question might originate as to the propriety of the proceeding. Rather than create any unpleasantness I procured small boxes, lavished some ten shillings' worth of stamps on the labels, and sent them off letter post. My correspondent, allowing for the rough ordeal of the Channel passage, received the consignment in a tolerable state of preservation, and then having restocked the boxes, he returned them to me "sans valeur" for less than that number of pence. Can any statist say what is the actual operation of this measure that renders possible the transmission of parcels into the United Kingdom at one-twelfth the charge of their transmission abroad? Perhaps I take a partial view!—*A. H. Swinton.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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.

F. A. STEEL.—Your specimen is the grape hyacinth (*Muscari racemosus*).

MISS T.—It is not unusual for tortoises to lay eggs in this country, but we have never heard of any that were not infertile.

L. LEE.—The specimen of the plant you sent us is *Euphorbia amygdaloides.*

H. W. KIDD.—Your paper shall appear shortly.

C. O. LOWE.—We shall be pleased to have your paper and sketch.

S. STURT.—You cannot do better than get Gosse's "Marine Zoology," 2 vols. Landsborough's "Sea-Weeds" (with coloured plates) would help you to the algæ.

A. J. SHAW.—Get Dr. Cooke's "British Fungi," price 6s. Send us another specimen and we will name it for you.

W. D.—We do not undertake to name exotic shells or specimens.

A. H. FISHER.—It is a popular fallacy that the cuckoo sucks the eggs of other birds. The favourite food of the cuckoo is large caterpillars, which it consumes in numbers. Possibly the idea as to its egg-sucking habit may have arisen because the cuckoo is often chased by small birds, the latter possibly mistaking it for a hawk. See chapter on the cuckoo in Harting's new book "Sketches of Bird Life," and the article 'Cuckoo' in the last edition of the "Encyclopædia Britannica," by Professor Newton. The goatsucker obtains its name from the current belief in Italy that it sucked the goats, hence its specific ornithological name of Caprimulgus.

T. H M.—From your sketch we judge that your zoophyte is not a Sertularian, but a Polyzoon. It is very like *Valkeria imbricata*.

T. H.—We do not undertake to return the specimens sent to us to be named. All our answers are gratuitous, and are intended to help students, not to do their work for them and save them trouble (although many of the queries sent us are for the latter reason). You can procure a cyanide bottle, for placing your insect captures in, from any dealer in entomological apparatus. You will find full instructions in "Collecting and Preserving Natural History Specimens," edited by J. E. Taylor, price 3s. 6d. See chapters in the above by Dr. Knapp and E. C. Rye.

F. W. CRICK.—Many thanks for specimens of *Clepsine hyalina*. Answer next month.

A DRAPER.—Could you send us another specimen of the parasite in Andonta?

A. BEALES.—Rimmer's "Land and Freshwater Shells," contains photographs of every species. Price 10s.

MRS. BELL.—The best work on grasses is the volume of Sowerby's "Botany" on Gramineæ, which may be obtained separately. It has a coloured illustration of every British species.

E. J. G.—You will find a good summary of Gadow's paper on the colours of the feathers of birds in the Proceedings of the Zoological Society for last year.

EXCHANGES.

WANTED the following nests and eggs in exchange for others: nightingale, night-jar, golden-crested wren, goldfinch, hawfinch, red-backed shrike, stone chat, lesser whitethroat, linnet, jay dunlin, golden plover, snipe, waterrail, ducks (any).—H. Walton, Birtley, Chester-le-Street, Durham.

SIXTY species land and freshwater shells in exchange for small typical collections of fossils from either Silurian, Oolite, Cretaceous, Eocene, Pliocene.—C. T. Musson, Burton Road, Carlton, near Nottingham.

FOR foraminiferous sand send stamped and directed envelope to F. A. A. Skuse, 143 Stepney Green, E.

SCIENCE-GOSSIP for 1879-81, clean, unbound; what offers? or exchange for vol. i. "Amateur Work."—H. G. Birch, 98 St. Michael's Street, Folkestone.

WANTED fossils from chalk, Silurian or Gault, in exchange for foraminiferous sand from India, British land and freshwater shells, or a few Inf. Oolite fossils.—J. Rewcastle, 16 Hill Grove Hill, Stokes Croft, Bristol.

WILL exchange Mitchell's "Dictionary of Sciences," Schoedler's "Treasury of Science," Beeton's "Wild Animals in Freedom and Captivity," Chambers's "Practical Mathematics," Magnus's "Elementary Mechanics," for birds' eggs, shells, coins, British or foreign.—John Molony, 33 Gauden Road, Clapham, S.W.

IRISH eggs of dipper, grey wagtail, goldfinch, chough, hooded crow, heron-ringed plover, dabchick, swan, cormorant, puffin, razor-bill, guillemot, lesser black-backed and other gulls, and other species chiefly in clutches. Wanted in exchange good British-laid eggs in clutches. Send list of duplicates to R. J. Ussher, Cappagh, Lismore.

POLYCISTINOUS earths, from Bermuda, Springfield, and Cambridge deposits, 6 slides per oz. of either, or books on natural history, or Valentine's knife in exchange.—Tylar, 35 Burbury Street, Birmingham.

FOR tentacles of the barnacle send a stamped directed envelope to W. H. Gomm, The Green, Somerton, Somerset.

300 microscopical slides for sale or exchange; will exchange for polariscope or mounting materials.—M. S. Ridgway, 3 Burlington Building, Redland Park, Clifton, Bristol.

A LIVING plant of the *Trichomanes radicans*, dried specimens of foreign ferns, British mosses and shells, for other foreign ferns and shells.—T. Rogers, Oldham Road, Manchester.

OFFERED 250 injected (trans and opaque), injected and stained, and stained preparations of 20 different kinds, all finished in cement, for micro cabinet, micro apparatus, or good slides. Send for list.—C. A. Lowe, Mill House, Old Park Road, King's Hill, Wednesbury.

BRITISH marine shells for others new to my collection.—C. D. Salt, Maplewell, Loughborough.

To exchange or otherwise, *Mangelia striolata*, *M. costata*, *M. linearis*, *Venus ovata*, *Calptræa vinensis*, *Fusus Islandicus*, *F. antiquus*, *Lamellaria perspicua*, *Natica nitida*, *Ianthina communis*, *Trochus exiguus*, *Emarginula rosea*, *Nucula nitida*, *N. radiata*, *Tapes pullastra*, *T. decussata*, *T. virginea*, *Tellina solidula*, *Dentalium Tarentinum*, *D. entalis*, *Lacuna pallidula*, *Trochus granulatus*, *T. magus*, *Pandora rostrata*, *Ceratisolen pellucidus*, *S. marginatus*. Will take Cape shells for any of the above.—A. J. R. Sclater, 23 Bank Street, Teignmouth.

FOR exchange, over 50 varieties of rare parasites, Ixodes and Acari; wanted, other parasites.—W. A. Hyslop, 22 Palmerston Place, Edinburgh.

LARVÆ of Lacustris offered for British specimens of *Betula Pruni*, *W. album*, Arion, Lucina, Cassiope, *Pansicus Actæon* and *C. album*, also Sesiidæ.—T. A. Dymes, Eastbourne.

FOR flower of *Sparmannia Africana* (a lovely object for the micro.), send slide or interesting material.—B. B. Scott, 18 Chiswell Street, Needham Road, Liverpool.

IMAGOS of Machaon, Edusa, Hyale, Rhamni, Galathea, &c., for other Lepidoptera or eggs of cuckoo.—J. B. Pilley, 2 High Town, Hereford.

DUPLICATES: *H. lapicida*, *H. rupestris*, *H. pulchella*, *H. arbustorum*, *S. putris*, *P. marginata*, *Planorbis complanatus*, &c., in exchange for other British or foreign shells, micro slides (palates and Diatomaceæ preferred), &c.—P. T. Deakin, 46 Princess Road, Edgbaston, Birmingham.

To exchange, "Naturalist's Library," "British Butterflies" (1 vol.), "British Moths" (1 vol.); required, British birds' eggs, side blown, British land or freshwater shells.—E. F. Bechen, Hill House, Southwell, Notts.

WANTED, SCIENCE-GOSSIP, 1871-81, unbound; will give foreign shells.—J. R., Stonyhurst College, near Blackburn, Lancashire.

Pillischer's Monocular, in case; mechanical stage, 1½ inch objectives, two eye-pieces, &c.; in good condition, figured, described, and priced in "Hogg on the Microscope," new edition, p. 93; one-third original value.—A. Stokes, Vestry Hall, Paddington, W.

To microscopists: I have wings of those superb exotic butterflies, *Papilios Buddha* and *polyctor*, *Diadema bolina*, *Agraulis moneta*, *Apatura laurentia*, *Morphos Menelaus* and *Sulkowskyi*, and *Urania rhypheus*; microscopic objects not wanted.—J. C. Hudson, Railway Terrace, Cross Lane, Manchester.

MOUNTED specimens of *Batrachospermum moniliforme* for slides of other Algæ (freshwater).—E. Wagstaff, 3 Waterworks Road, Edgbaston, Birmingham.

"ENGLISH MECHANIC," vols. xxx.–xxxvi., unbound, for "Midland Naturalist," or other works.—W. R. Wells, Greenbrook Terrace, Taunton.

BOOKS, ETC., RECEIVED.

"A Tour in the States and Canada." By Thomas Greenwood. London: L. Upcott Gill.

"A Handbook to the Fernery and Aquarium." By J. H. Martin and James Weston. London: T. Fisher Unwin.

"Half-Holiday Handbooks: Wimbledon, Putney, and Barnes." London: T. Fisher Unwin.

"Third Annual Report of the Hampstead Naturalists' Club.'
"Land and Water."
"Midland Naturalist."
"Journal of Conchology."
"Natural History Notes."
"Ben Brierley's Journal."
"American Naturalist."
"Science."
"American Monthly Microscopical Journal."
"The Botanical Gazette."
"Canadian Entomologist."
"Cosmos: les Mondes."
"Le Monde de la Science."
"Feuille des Jeunes Naturalistes."
"The Popular Science News."
&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 12TH ULT. FROM:—F. A. S.—S. A. S.—W. C.—N. A.—W. H. G.—H. G. B.—C. T. M.—F. A. A. S.—W. H. H.—H. W.—T. H.—E. S.—W. J. H.—R. I. U.—C. D. B.—J. M.—Miss T.—A. H. F.—P. E.—J. R.—"M. D."—W. T.—J. H.—W. H.—E. L.—T. A. C.—C. D. S.—C. B. P.—J. W. C.—M. S. R.—T. R.—R. M. McA.—L. L.—C. A. L.—S. A. S.—E. J. B.—H. W. K.—W. B.—A. I. R. S.—R. I. U.—I. C. W.—E. H.—W. H. G.—F. H. P.—A. H. S.—G. S.—I. S.—T. B., jun.—E. T. S.—M. D.—W. T. H.—I. C. T.—H. U.—R. A. R. B.—F. C.—H. R. A.—A. M. D.—I. R.—E. J. G.—R. J. U.—J. A. W.—H. C. B.—H. W. S. W.-B.—E. F. B.—P. T. D.—K. F.—G. A. D.—A. D.—J. B. P.—B. B. S.—J. H.—A. F.—W. D.—A. J. R. S.—B. H.—A. D. S.—J. C. H.—T. A. D.—W. A. H.—Mrs. B.—H. P.—R. Y. G.—W. R. W.—H. H. H.—E. W.—W. H. H.—J. O.—Dr. A. C., &c.

THE DANISH FOREST.

By JOHN WAGER.

V.—The Relationship of Associated Trees.

HAVING indicated the zones of the several species of Danish trees, I pass on, continues Dr. Vaupell, of part of whose works this and the following chapters are merely a summarised translation, to consider their relation to each other when associated in the forest; for there is, in reality, not a mere aggregation of different trees and species, but also a certain relationship between them. They influence each other—form and transform, so that they may be regarded as parts of an organism, which absorbs and appropriates the natural elements. As regards the occurrence of the different species in the Danish forest, they are most unequally distributed; while of one species large associations are found in nearly every forest district, there are of several other species but few unmixed collections, such being, in general, dispersed on plots in the forests, or upon their outskirts. The reason why they appear with comparatively so few individuals in mass, or do not form entire woods, must not be sought in sterility, or in want of capacity for associated growth; for each species of our trees would certainly extend itself, and form entire woods, if not prevented by other species. Thus the oak copses of Jutland are of oak only; there are purely oak-woods in South Zealand and Holland, and woods exclusively of hornbeam, of lime, of birch, and of alder, are also found. Thus we see, that not the beech only, but other species of trees tend to predominate and exclude the rest.

The growth and extension of a species of plant is in general determined by the physical conditions—the presence of warmth, moisture, and nutritive soil, in sufficiency to enable it to grow and develop ripe seed. But these conditions, which suffice for the isolated plant, are not determinate when different species are associated during years of growth; for then the relative growth depends also upon the degree in which one species can endure the proximity of another, and the interference and influence it exerts. In this respect there is great difference; not because the one tree by respiration or contact can injure the other, but because it withholds from the other some portion of light. Conditions of light exercise a far greater influence upon the existence and growth of forest trees than of herbaceous plants.

The different species of trees have a difference of adaptability to local physical conditions; but each endeavours to cover the ground with growths of its own kind, and contention among them results. Some species of willow send forth an immense quantity of seeds; the mass of winged fruit which in a single year falls from the ash, and is carried around by the wind, is so great that it could cover all Zealand with ash-forest if the seed got leave to develop itself; and the same, in part, may be said of the birch and the elm. Birds every year sow all the forests with rowan-seed, yet it is rare to meet with even a small rowan-wood. Thus every species presses forwards, and there is struggling and strife in the woods. As with animals, so with trees, the one species oppresses the other. The beech dislodges the oak, the oak dislodges the fir; the species which is in harmony with the special physical conditions obtains the sway. Meantime the fight is not without end; when the tree has got the better of difficulties, it can peaceably unfold its properties, and form forest after its nature. In the forests of former times the contest was between the aspen, the birch, the Scotch fir, and the oak. This development obtained rest by the oak-forest becoming the dominant forest of the land. The oak's domination became disturbed by the intrusion of man into the forest, and perhaps at the same time by that of the beech, which is master of the oak. In many localities the new species made great progress; but natural and social conditions impeded for many centuries its extension; when these were removed the beech renewed the contest in all places. The new beech-forest now occupied all forest districts, as a result to which the agency of different other species had led. The fir, the aspen, the birch, and the oak, had all contributed to the formation of a soil suitable for the beech-forest, which in its natural, and not maltreated state, has first gained general extension in our days. In its completeness it presents itself with high, straight trunks, whose heads form an enclosing leafy roof. Seen from below, the heads appear small, but in reality are so large as to include a third or fourth part of the tree's height, and the leafy roof is so close, that light enough cannot struggle through to support the life of any species of tree upon the ground. Grass cannot grow in a good beech-wood; of the numerous herbs, but very few kinds can be content with the sparse supply of light which reaches the soil when their leaves unfold. It is especially the wood-ruff and the wood-sorrel which form green garlands among the brown beech-leaves, and are living witnesses that the mutual bearing and order of the trees are what they ought to be.

The following chapters are an attempt to show in what manner the natural conditions either do not hinder, or highly favour the aggressive tendency of the beech in the Danish forest, and to investigate the influence which heat, soil, moisture, light, and power of self-sowing exercise upon the distribution of tree-species in the forest.

DAISY SLEEP.

WHEN cycling along the highways and by-ways of South Beds, during some of the sunny afternoons of the spring of 1882, my attention was arrested by the contrast in appearance of the hedgebanks on the opposite sides of the roads. Those with a northerly or easterly aspect, wore a dull yellowish-green hue, by reason of the abundance of mosses on them, whilst those with a southerly or westerly aspect were gay with daisy blossoms. The bright sunlight which encouraged the growth of the latter, was fatal to that of the former, which luxuriate in the comparative shade and moisture of the cooler side. Or, in other words, when these banks were constructed, only those plants, to which direct sunlight was advantageous maintained their hold in the struggle for existence, whilst the others either perished or were but feebly represented.

These contrasts just referred to, were, however, not always so strongly marked. On cloudy days, or as twilight came on, there was less dissimilarity between the two. The sides that had been all aglow with the white-rayed daisy heads were almost as sombre as the moss-covered banks. And why? The daisies had gone to sleep; or, in scientific parlance, had assumed their nocturnal position. The white ray-florets had folded inwards, covering the golden discs, and had themselves been partially concealed by the green linear bracts which surround the flower-heads. By these complicated movements, to which the term nyctitropism has been applied, the pollen is protected from the night dews and rain, and is reserved for those insects whose visits are necessary to ensure pollination. This is the transference of the pollen to the stigmas, without which fertilisation of the ovules would not take place, and hence no seeds would be formed. Since these insects fly about only during the hours of bright sunshine and frequent the sunniest spots, it is evident, that only in such situations and during such periods, expanded flower-heads are of greatest service to the plants. It has also been mentioned to the writer by a keen observer, that when fertilisation has been accomplished, the flowers are less sensitive to the variation of light and shade. This has been confirmed by recent original observations.

Thus far the subject presents but little difficulty; when, however, we come to enquire by what forces these mechanical movements are effected, much caution should be exercised in attempting to reply. When thinking over the subject, with the hedge-banks rapidly passing in review, as one sped pleasantly onwards, the problem forced itself on one's mind, and the following is an attempt at its solution.

It may be presumed that at least two forces are concerned, viz., the varying turgescence of the interior and exterior sides of the involucral bracts; and, the stimulus of direct sunlight on the ray florets. The latter is probably the most potent factor, and it is also accompanied by varying turgescence of the cells in the organs affected.

Upon the examination of any bud of a daisy, it will easily be understood that during its development the exterior or lower sides grow more rapidly than the interior or upper. The difference though slight, is real, and is demonstrated by the fact that the convex side must necessarily be longer than the concave; and as they both start from the same growing-point, the growth of the former must have been greater than that of the latter. When they have attained to comparative maturity, growth in length is reduced to a minimum, although perhaps not absolutely arrested. During the hours of the night previous to the first opening, the air surrounding the flower is comparatively moist and cool, and transpiration is hence but slight. As soon as the sun's rays fall upon the spot, the temperature is rapidly raised, and transpiration from the exposed surfaces of the involucral bracts is increased. This diminishes the turgescence of the cells of the exposed sides, the cell walls of which contract in consequence, and the whole organ is reflexed. It is also probable that some of the water passes from the exterior side to the intercellular spaces of the interior one, which is hence rendered more turgid and forces the other back. Under these circumstances the inner side would be in a state of active tension, and the outer of passive. These conditions continue during the expôsure to direct sunlight, but when dense clouds intervene, or darkness comes on, the phenomena are reversed. Temperature is diminished, transpiration decreases, the cells of the exterior become turgescent, probably by the transference of water from the cells of the interior side, and consequently the length of the exterior portion is increased, whilst that of the inner is proportionally diminished. Or in other words the exterior sides are in a state of active tension, and the inner of passive.

Coincidentally with the processes that are going on in the green involucral bracts, the ray florets are being acted upon by the sun's rays. These cause them to expand their internal surfaces so as to reflect the greatest possible amount of sunlight and thus render the flowers conspicuous. In this way they are more readily distinguished by the insects who seek food in the tiny florets, and who are thus the unconscious agents of fertilisation. But how it is that the sunlight causes the ray florets thus to expand themselves is not easy to determine, or at least a ready solution is not present to the mind of the writer. Possibly it is a power inherited from the true foliar organs, from which they have been modified, as leaves possess the power of expanding their lamina so as to catch the greatest possible amount of sunlight. This is very conspicuous in the rosette of radical leaves of the daisy, in which the arrangement is a compressed spiral. The thought also suggests itself that this compressed spiral of radical leaves is repeated in both the involucre and the capitulum. In the case of true foliar organs, this power of exposing their broadest surfaces to the sun is for the purpose of assimilation, whereas when they are modified into floral organs it is to render them attractive to insects. It is also noteworthy that in the latter case they no longer assimilate, but consume, for their tissues are constructed from the materials elaborated by the true leaves and other green organs.

In the closing of the ray florets when no longer stimulated by direct sunlight, they are probably passive to the force exerted by the closing of the surrounding bracts. They are also doubtless affected by the diminution of light.

The movements induced both of the ray florets and the involucral bracts are not uniform through their whole length, but are most active in a zone near the base of the bracts and just above the tube of the ray florets. Whether these movements are accompanied by growth in length, or otherwise, would require careful observation to determine, but the increase in length, if any, would be exceedingly small, and could only be expressed micrometrically. Such growth is possible, and its probability is suggested by the fact that it is always preceded by turgescence of the cells. To the phenomena of unequal growth of the sides of bilateral organs, the term Nutation is applied.

In all these complicated movements the real agent is the protoplasm of the living cells. It is this which has the power of imbibing water and also of parting with it into the adjacent intercellular spaces. These movements of the water contained by the protoplasm are accompanied by the exertion of considerable force. This force is converted by the elasticity of the cell walls into motion, which affects the whole organ. The elastic cell walls are passive to the energy of the protoplasm which they enclose, and from which they were originally formed. This is the only living thing in the plant, and it is this which is sensitive to external stimuli, such as light and heat. It cannot be too strongly maintained that the protoplasm is the essentially vital principle in all plants. In its substance the whole of the materials from which their tissues are constructed was originally formed, and by its energy their various organs have been differentiated.

J. Saunders.

Luton.

THE ELECTRIC LIGHT APPLIED TO THE MICROSCOPE.

In the part of the Journal of the Royal Microscopical Society for February last is an article by Mr. Stearn, the inventor, on a Special Microscopical Swan Incandescent Electric Lamp. As I have bought one, perhaps my experience of it may be interesting to some readers of this paper. The lamps are miniatures of Swan's, being with the battery, &c., made by Mawson & Swan, of Newcastle-on-Tyne. Each lamp consists of a glass globe $\frac{7}{16}$ in. diameter, in which is a carbon filament $\frac{1}{10}$ in. long and $\frac{1}{100}$ in. diameter. At the bottom of the globe the glass is fitted into an ebonite socket about $\frac{5}{8}$ in. high, on each side of which is a strip of brass for connecting with the wires from the battery. The lamp weighs about $\frac{1}{8}$ ounce, and costs 10*s*. 6*d*. The battery consists of five large special new form Leclanché cells in a wooden box, price 37*s*. complete. These, with 1*s*. worth of covered wire, are the only essential things. Any other battery sufficiently powerful will do, if the fumes are not objectionable. Each Leclanché cell would, when empty, hold about three pints. Each contains a central column with six grooves, surrounded by six thick circular pencils of carbon mixed with carbon-dioxide. These are held together top and bottom by two india-rubber rings which prevent contact with the hollow cylinder of zinc by which they are surrounded. There is no porous cell. The electrolyte used is merely sal-ammoniac dissolved in water. There is nothing acid, poisonous, corrosive, or objectionable, about it. Ammonia is given off, but in such small quantities that I have never noticed any smell. Holders for the lamp are sold at 21*s.* each, including stand; but I have contrived a holder to fix on to the stand of my bull's eye condenser for 8*s.* The condenser has a ball joint top and bottom. Into a small hole, which happened to be ready made in my Crouch's condenser, just above the upper ball joint and just below the lens, a small steel rod 2 in. long fits with a shoulder, and a screw thread with a minute nut. It can turn round in the hole. At the end of the rod is a cradle-joint (a universal ball joint would be better, (cost 5*d.*) of black silk covered ladies' iron bonnet wire as fine as possible. I have divided this into six pieces, and wound each into a double coil, that is, the wire should be doubled in the middle and the length of double wire thus obtained wound in a spiral. There is no self-induction in a coil so wound. The six coils might be arranged in a circle between two circular boards, and the ends after unwinding the silk inserted through holes in the upper board so that the end of one touched the end of another.

Then, if the brass handle of a dining-room bell-pull, cost 1*s.* 3*d.*, be fixed so as to turn in a circle on a spindle in the centre of the circular boards, contact may be made or broken with one, two, three, four, five, or six coils, by turning the handle. One of the battery wires is connected to the beginning of the first coil, and a wire from the lamp is connected with the bell-pull near the centre hole. I have made this, and find that it does answer. See Jenkin's

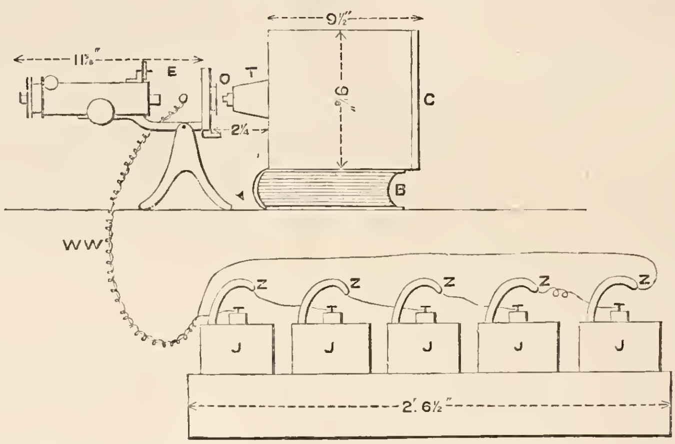

Fig. 103.—Micrographic Camera, microscope used as slide holder and electric battery. C, camera; T, tin and indiarubber cone; B. book to raise camera; E, electric light; W W, double covered wire; J, jars of battery; Z, zincs; O, objective. Scale, 1 inch to 1 foot.

but the cradle joint answers every purpose). Attached to the joint is a short tube of brass, as made for stage-forceps. Through the tube slides a steel rod 5¾ in. long over all. At one end of this steel rod I have attached the forcep-jaws of the ordinary stage-forceps, at the other a cylindrical piece of ebonite about ⅞ in. long, fixed at right angles to the rod. To the sides of the ebonite two oval-oblong slips of brass are screwed with two brass screws each. The screws must not touch the steel rod, and the distance between the brass slips is ⅜ in., the diameter of the lamp socket. Under one screw at each side is inserted one strand of a two-foot length of green silk covered flexible double copper wire. The wires to the battery need not be so ornamental. Mr. Stearn recommends a resistance-coil to be placed in circuit by which the intensity of the light may be controlled. As this coil is not absolutely essential and rather costly, I have made one myself, of two coils of twenty-four feet each "Electricity and Magnetism," p. 234 (Longmans, 3*s.* 6*d.*) The only precaution to be observed is to connect one cell at a time, so as not to break the carbon by the full strength of the current.

I am perfectly satisfied with the electric light, it is quite steady, very convenient, can be used close to the object, and shows colours like daylight. I believe that it is perfectly adapted for photography. The Rev. W. H. Dallinger, F.R.S., tells me better light for the microscope can be obtained in other ways, but I like it more than anything I have seen.

Tapton Elms, Sheffield. BERNARD HOBSON.

SPECIES OF CHRYSOMELA.—Your correspondent, T. D. A. Cockerell, asks for information about a Chrysomela like *polita.* His description exactly suits *C. polita.* Has he not hitherto mistaken *C. staphylaca* for *C. polita?*—*W. C. Hey.*

BUCKINGHAMSHIRE MOLLUSCA.

THE county of Buckingham, in spite of its proximity to the metropolis and the university towns, appears to have been so imperfectly investigated by conchologists that it is quite worth while to publish an account of a small collection made for me by my friend the Rev. H. H. Slater, M.A., F.Z.S., during his brief residence at Chersley Vicarage, near Aylesbury. It will also be useful to summarise the present state of our knowledge of the molluscan fauna of the county, so far as Mr. Slater's finds and the published records go.

Mr. Slater did not pay special attention to mollusca during his residence at Chersley, but at my request he collected for me last winter such forms as at that season he was able to secure.

The specimens he sent included:

Sphærium corneum, L.; *Pisidium amnicum*, Müll.; *Anodonta cygnea*, L.; *Neritina fluviatilis*, L.; *Paludina contecta*, Millet.; *Bithynia tentaculata*, L.; *Valvata piscinalis*, Müll.; *Planorbis vortex*, L.; *P. complanatus*, L.; *P. carinatus*, Müll.; *P. corneus*, L.; *Limnæa peregra*, Müll.; *L. auricularia*, L.; *L. stagnalis*, L.; and *Succinea putris*, L., all more or less abundant in the river Thame, in Chersley parish. *Helix aspersa*, Müll., which was an abundant pest in the kitchen gardens of Chersley Vicarage. *Zonites nitidulus*, Drap.; *Helix rufescens*, Penn.; *H. hispida*, L.; *H. concinna*, Jeff.; *H. nemoralis*, L., and *Clausilia rugosa*, Drap., all of which were of more or less plentiful occurrence on hedge-banks. The specimens sent of *H. nemoralis* were of the var. *rubella*, Moq. (their band-formula = 00000). On another occasion Mr. Slater sent me a box of slugs, including *Arion ater*, L.; *A. hortensis*, Fer.; *Limax maximus*, L., and *L. agrestis*, L., all of them abundant.

In his accompanying letter Mr. Slater stated that the deficiency of woodland in his parish accounted for the absence of some species from his consignments. The specimens have all been seen to by my friends, Messrs. J. W. Taylor and William Nelson, so that there is no room for error. As Mr. Slater was not paying special attention to mollusks when in Bucks, the specimens he sent me can only be regarded as a contribution towards the working out of the Buckinghamshire molluscan fauna, but in this respect they have their value, more especially as at the present time it is desired to get together a series of reliable county lists based upon authentically named specimens.

BIBLIOGRAPHY.

The following books and papers are, so far as I am aware, the only ones which contain references to the land and fresh-water mollusca of Buckinghamshire.

1786. *Lightfoot.* An account of some minute British shells, either not duly observed, or totally unnoticed by authors: in Phil. Trans., 1786, vol. 76, pp. 160–70, and plates i. ii. iii.

1803. *Montagu's* Testacea Britannica, pp. 89, 195, 406, 430, 443, 463, 485.

1823. *Sheppard's* List of Suffolk Shells: in Linnean Trans., xiv. 154, 162.

1834. *Strickland's* List of Shells found near Henley-on-Thames: in Loudon's Mag. Nat. Hist., vii. 494–5.

1855. *J. D[alton]*. Land and Freshwater Shells in the vicinity of Oxford: in Morris's Naturalis for 1855, pp. 200–3.

1857. *Norman.* Notes on the Oxfordshire Shells: in Zool., xv. 5609–13.

1862. *Jeffreys'* British Conchology, vol. i. pp. 90, 220, 279.

1880. *Rimmer's* Land and Freshwater Shells of the British Isles, pp. 44, 173.

1881. *Taylor's* Life History of *Helix arbustorum*: in Journal of Conchology, Jan. 1881, iii. 259.

These works include, in addition to the fourteen fluviatile and twelve terrestrial forms sent by Mr. Slater, notices of the following species and varieties as having been found in Bucks:—*Sphærium lacustre*, Müll.; *Planorbis lineatus*, Walk.; *P. nitidus*, Müll.; *P. carinatus*, var. *disciformis*, Jeff.; *Ancylus fluviatilis*, Müll.; *A. lacustris*, L.; *Helix aculeata*, Müll.; *H. arbustorum*, L.; *H. fusca*, Mont.; *H. rotundata*, Müll.; *H. rotundata*, var. *alba*, Moq.; *H. pulchella*, Müll.; *Pupa secale*, Drap.; *Clausilia rugosa*, var. *albinos*, Moq.; *Cochlicopa tridens*, Pult.; *Cyclostoma elegans*, Müll., and *Acme lineata*, Drap.

Montagu also gives an account of an attempt once made without success to introduce *Helix pomatia*, L. into a Buckinghamshire locality.

Summarising the information, it would appear that the census of the Buckinghamshire mollusca yields a very meagre result, only 43 forms (three of them being merely varietal ones) being known for a county which is so close at hand to the metropolitan collectors that we might reasonably have expected that they would long ago have exhaustively worked out its fauna, instead of leaving our present knowledge of it to be based on scattered and isolated and ancient records (those of Lightfoot being now nearly a century old), and upon a single collection made by a gentleman who was not specially studying conchology. We can only conclude with the hope that—by the labours of resident or metropolitan conchologists—we may some time hope to see a full and complete and reliable catalogue of the Buckinghamshire mollusca.

W. DENISON ROEBUCK.

Leeds.

HOW TO CONSTRUCT A MICROSCOPE.—Could any of your readers give me any information as to how to construct a compound microscope, what lenses would be required, their probable cost, and how to arrange them?—*Amateur.*

MICRO-FUNGI BATHONIENSES.

[*Continued from page* 147.]

No. III.

WITH this paper I shall complete my list of Micro-Fungi as far as my researches have gone.

During the present year (1883) I hope to add very largely to the list given at the end of this paper.

To those who may read these notes, and be at the same time well acquainted with this district, a thought may arise that I have kept too much to one quarter of the country outside Bath, without paying sufficient attention to other equally interesting and productive regions, lying away on other sides of the city. Should such a thought occur, it will without doubt be perfectly correct. In justice to myself, however, I may say that my researches have been made chiefly at times when time would not permit of my going very far afield. However, at some future time I will, if it should be thought advisable, note specimens found on other than my own side of the town.

I must add four more Puccinia to my list:—

P. Polygonorum on *Polygonum aviculare*, at Conquell.

P. Syngenesiarum on thistle leaves, common in the neighbourhood.

P. Violarum on violet leaves, sides of road leading to Claverton.

P. Silenes on *Silene inflata*, cornfield near Sham Castle.

Of Uromyces, I must add one specimen, *U. intrusa*, on *Alchemilla vulgaris*, Combe Down.

Two specimens of Uredo: *U. Potentillarum* on various Rosaceæ, common. *Uredo bifrons* on *Rumex acetosa*, Hampton Down.

At the top of Bathwick Hill I have several times found *Cystopus candidus* on *Capsella Bursa-pastoris*. *Trichobasis Petroselini* is found on various Umbelliferæ, widely distributed, and also *T. suaveolens*.

This, then, so far finishes my list.

As I have before pointed out, if those who take an interest in this branch of microscopy would but turn their attention to an examination of their own district, many valuable discoveries would doubtless be made. The field is large and the examiners, I regret to say, very few.

The pursuit is a pleasant one and abounding in interest. Much too can be learnt of other subjects of natural history while pursuing this one.

I would refer those of my readers who may be about to commence collecting specimens, and who may also wish to mount them, to Cooke's "Microscopic Fungi," 4th edit. chapter xiii.; also to the "Introduction to Micro-Fungi: when and where to find them," by Mr. Thomas Brittain, and to my own articles on the subject in SCIENCE-GOSSIP for 1879, page 3, and 1881, page 97.

In conclusion I shall give a list of all those Fungi I have so far found, and which have been named in these papers.

ÆCIDIACEI. — Peridermium: *Peridermium Pini*. Æcidium: *Æ. quadrifidum*, *Æ. Epilobii*, *Æ. Ranunculacearum*, *Æ. Taraxaci*, *Æ. Tussilaginis*, *Æ. Violæ*.

PUCCINIÆI.—Phragmidium: *P. bulbosum*. Puccinia: *P. Polygonorum*, *P. Malvacearum*, *P. Compositarum*, *P. Syngenesiarum*, *P. variabilis*, *P. Umbelliferarum*, *P. Saxifragarum*, *P. Violarum*, *P. Silenes*.

CÆOMACEI.—Uredo: *U. Potentillarum*, *U. bifrons*. Coleosporium: *C. Tussilaginis*, *C. Sonchi-arvensis*. Cystopus: *C. candidus*. Lecythea: *L. Rosæ*, *L. Valerianæ*. Trichobasis: *T. Petroselini*, *T. suaveolens*, *T. Geranii*.

USTILAGINEI.—*U. segetum*. Urocystis: *U. Pompholygodes*.

ERYSIPHEI.—Erysiphe: *E. graminis*.

CHARLES F. W. T. WILLIAMS.

Bath.

A CONCHOLOGICAL RAMBLE AT TENBY.

WE were fortunate in securing most comfortable lodgings on the North Cliff. Tenby is divided into the North Cliff and South Cliff, and while the whole of it is eminently picturesque, yet the palm must, I think, be given to the North Cliff, with its beautiful fringe of trees stretching down to the shore, its great mass of rock—called Goskar—standing out conspicuously from the sea; its views of Waterwinch, Ferncliff, Monkstone Point, and, far away in the distance, Amroath, with its submerged forest, and Pendyne with its wondrous stretch of sand. No. 2, Kent House—this was the name of the house we lodged at—so-called because the chief part of its woodwork was made from the timbers of a vessel named "The Kent," which foundered off Tenby many years ago. The morning is beautifully fine, and we start on our rambles; past the Gatehouse Hotel, then sharp to the right, then sharp to the left, by the old walls, along the Esplanade, down by the wooden steps, over the sand, and on to the Burrows, for we intend to begin our excursion with a search for some of the rarer land-shells that are to be found in this locality. And here, on almost every blade of grass, are innumerable specimens of *Bulimus acutus*, some almost colourless, some streaked with brown, and some with a single dark band; while the variety *bizona*, with its two dark bands on the body-whorl, is seen at very rare intervals. Quite as numerous are the specimens of *Helix pisana*, a shell only found, I believe, on the coast line, and never inland. Here, however, they are to be picked up by thousands, adhering to dead brambles, blades of grass, the spikes of *Carex arenaria*, and the withered branches of the Burnet rose (*Rosa spinosissima*), which grows here in profusion; while the pieces of old newspapers left here and there by the various picnic parties seem to have an especial attraction for them, for every piece we meet with is literally covered all over with these snails. The variety *alba* is very frequent, and some of the shells are especially beautiful, having a rosy band inside the mouth, probably the effect of exposure to the sun. *Helix virgata* also abounds in every possible variety of size, markings and colour—dark brown, light chestnut, single banded, many banded; bands white, dark brown, continuous, and interrupted so as to give the appearance of the shell being spotted. On a bank dividing a lane from the adjoining fields, we come upon *Helix caperata*, feeding after a shower. Leaving the Burrows and reaching the downs above Giltar Point, we espy among the grass some fine specimens of that elegant shell, *Helix ericetorum*, and its variety *alba*; but the finest specimens are to be found on the cliffs above Lydstep Haven; some of them measure nearly three inches in circumference. Here, also, is another elegant land shell, the *Cyclostoma elegans*, hiding away under the root-leaves of the common musk thistle (*Carduus nutans*) and the ox-eye daisy (*Chrysanthemum leucanthemum*). On a hedge bank are plenty of specimens of *Helix sericea*, with its epidermis thickly covered with downy hairs, and also what we believe to be its variety *cornea*, for the shells are "horn-coloured, semi-transparent, and very thin." Dwelling on the same bank are *Helix nemoralis*, *Helix rufescens*, *Helix concinna*, *Helix aspersa*, *Helix hispida*, *Helix rotundata*, *Clausilia nigricans*, and, on old wall close by, *Balea perversa*, *Cochlicopa lubrica* and *Helix rupestris*. The reversed monstrosity of *Helix aspersa* is in our thoughts, but, alas! only there; for though we pick up some hundreds of specimens of *aspersa* of all shades of brown, and yellow-ochre, and of all sizes, the much-wished-for monstrosity is not to be found.

The tide is now low, and we hurry down to the shore to try and add a few marine beauties to our store. Our first capture is *Patella pellucida*, with its bright blue lines. We find it sticking to the large broad, dark olive fronds of the Laminaria, or oar-weed, while we dislodge its stronger and less elegant variety *lævis* from its shelter in the root. On a large boulder close by, and covered by the tide at high-water, is a numerous colony of *Purpura lapillus*, some white with orange-coloured bands, others white with brown bands, some light yellow, some dull red, some with purple mouths, others with orange mouths, some thick, some thin, some smooth, some imbricated (var. *imbricata*) of every size and age. Here we take one specimen, with the body-whorl puckered up in neat folds at the suture. On the same stone, in the same endless variety, dwells *Littorina rudis*, some of which stand out more conspicuously than the rest, in consequence of their bright scarlet colouring. We notice also large colonies of *Patella vulgata*, with its variety *elevata*, covering a portion of the stone like an encampment of Lilliputians, and in a shallow, rocky pool, some beautiful specimens of its first cousin (not very easily removed) *Patella athletica*. We know that *Fissurella reticulata* is to be found here, but though we make diligent search we are unsuccessful. While we are hammering at the rock, we are greeted with a miniature shower-bath, and on looking closer find the source of these waterworks in the little shell, *Saxicava rugosa*, which has completely honeycombed the stone. With considerable trouble—for the stone is particularly hard—we dig out several specimens, which we determine to place in our cabinet with their siphons extended and stuffed with cotton wool. In the crevices of the same rock, and underneath the hanging seaweeds, we take several specimens of Chiton, namely, *fascicularis*, *ruber*, *cinereus* var. *maculatus*; and safely imbedded between the cells of the Balani we discover *Turtonia* (Cyamium) *minuta*, while high up on the rock above, beyond high-water mark, we take *Littorina neritoides*.

H. MILNES.

(*To be continued.*)

ANOTHER GARDEN PEST.

PERMIT me to call attention to another garden pest exceedingly plentiful this season, and which I have found to be very destructive to the French and kidney beans and onions in my garden, so much so, in fact, that it became necessary to repeat the sowing of seed.

The grub, when full-grown, measures three-tenths of an inch in length, with an average width of one-twentieth of an inch; it is made up of thirteen articulations, some of which, however, are not very clearly defined. The two anterior articulations contain the mandibles, which consist of two powerful (for the size of the creature) curved jaws, with one tooth on each, which work against two similar teeth situated immediately beneath the mandibles; when examined in the living grub they show the wonderful adaptability of the organs for excavating a channel up a small stem of a plant; the head, if such it can be called, tapers off to a blunt point, while the posterior articulation is by far the largest, and is furnished with sixteen prominent spines of a somewhat cartilaginous texture, the object of which is evidently to enable the creature to obtain a firm hold in the burrow, to enable it to drive its jaws into the stem, while by continually rotating its body it contrives to attack the exact centre of the plant. The legs, if any, are of a most rudimentary character, consisting of mere elevations on the skin, while the most powerful objective I possess has failed to detect anything that would pass current for eyes.

The tracheæ are plainly visible, extending along the back of the grub in two parallel lines, and terminating in four spiracles of a most remarkable character, two are situate posteriorly, and two on the anterior part of the body. I have found them to vary slightly on different individuals, in some particulars, but they all bear the same general characteristic form; they are pedunculated; those on the fore part vary very considerably from those on the posterior portion, the former expand into a fan-like shape, and terminate with a varying number of small tubes, each of which again contain two smaller tubes. I have found the number of tubes to range from six to twelve on different creatures, those on the posterior part of the body are of lenticular form, slightly concave, and contain in the concavity three orifices of the ordinary stigmatic form; they are, however, much larger. I should judge their capacity for admitting air would be quite equal to the entire number of openings on the anterior spiracles. Unlike other creatures of this class I have been unable to detect any form of spiracles along the sides, this clearly indicates another special adaptability of means to an end, the original burrow being only sufficiently large to admit the grub; air would be obtained with difficulty if the ordinary arrangement were maintained, whereas, by the one indicated, all difficulty in this respect is obviated.

I have taken as many as fifteen grubs from one small plant; one is the pioneer, the others follow in groups.

Fig. 104.—Grub enlarged 9 diams. *a*, anterior spiracle; *b*, posterior spiracle.

Fig. 105.—Mandible. *a*, lower teeth in position, magnified 82 diams.

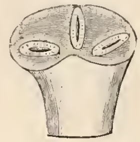

Fig. 106.—Posterior spiracle. × 200 diams.

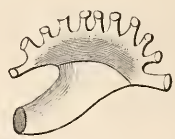

Fig. 107.—Anterior spiracle. × 200 diams.

Fig. 108.—One tube, showing position of small tubules. × 680 diams.

The grub is hatched from an egg, which in form is cylindrical, very slightly curved. It measures ·05 in length, the surface is very elegantly marked with fine reticulations, pearly white in colour, and is a very pretty object under the instrument.

The egg is deposited just under the surface of the ground by the parent fly, which belongs to the order Diptera, and is one of the exceedingly numerous family of the Muscidæ. Species? In size it is about equal to the ordinary house-fly, the males being the smaller of the two; it is of a dull greyish-green colour, the upper portions of the thorax and abdomen are covered with rather strong hair. In the female when distended with eggs the under portion of the abdomen changes slightly in colour; under the microscope this change is seen to consist of alternate stripes of two shades of similar colour, giving it the appearance of a brownish-green; the central portion, however, is of the same nature as the upper surface, and is likewise covered with stiff hairs. This forms a neat pattern on each articulation, which unitedly has the appearance of a fine streak. The wings are strongly veined, and the lateral margin carries numerous strong hairs or fine spines, which gradually change into hair at the apex, and continue round the opposite margin to the base. The ovipositor is capable of being extended considerably, and defies description by me; the proboscis or tongue is of the usual type of this family, and the following is Mr. Wood's description in his "Insects at Home." This organ is "short and membranous, and terminated with two large lobes. These are seen to be traversed by a number of air-tubes of a rather peculiar structure, all radiating from two principal tubes, one to each lobe. Generally the air-tubes, or tracheæ of insects, are kept in shape by a spiral thread, between two layers of which they are composed, but in the air-tubes of the proboscis the place of the spiral thread is taken by a number of incomplete rings, called false tracheæ. These incomplete rings look something like the ancient torque, or, to speak more familiarly, like a horse-shoe. The open part of each ring is downward, and the result of this structure is that they form a sort of strainer through which the liquid portion of their food is passed." It is rather rapid in flight, easily disturbed, and, on account of its colour, not very easily seen, unless closely looked for. On dissecting a grub fully-grown, a mass of matter is met with which, to all appearance, looks like ova in an embryonic state. It comes out in a flat plate-like form, and under a power of 300 diameters is seen to consist of a large number of separate cells, closely packed side by side. The further development may be traced in the perfect insect more clearly by taking them in different conditions. The next stage is reached when the egg can be seen to be partly developed; it then consists of an oval-shaped form, and is contained in a thin membrane. One end of this body is semi-opaque, and is the first clearly-defined indication of the future egg it has been my lot to observe (as I have not yet been able to obtain the pupæ stage). The other half is translucent, and contains about sixteen small bodies of a somewhat circular form, each containing a central nucleus. Attached to this end are two small sac-like bodies, also semi-opaque, likewise covered with a thin, and apparently structureless, membrane. The succeeding stage is reached when the egg appears in the cylindrical form, but has still attached to it at one end three cells, the one adjoining the egg being the largest, but each may be seen to contain the small bodies above described, the office of which is doubtless the formation and nourishment of the egg.

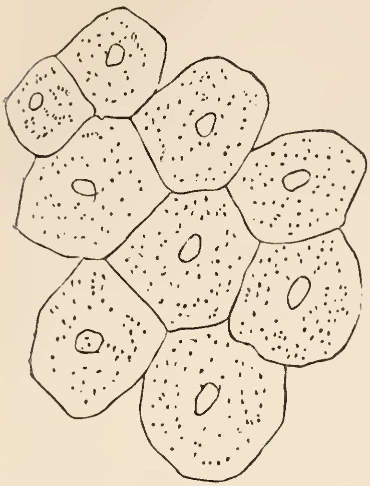

Fig. 109.—Ova taken from grub, first stage of development. × 200 diams.; average size ·004.

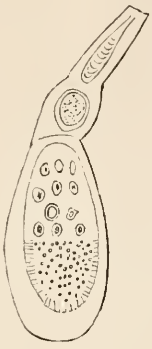

Fig. 110.—Partly developed egg. × 46 diams.; ·03 long.

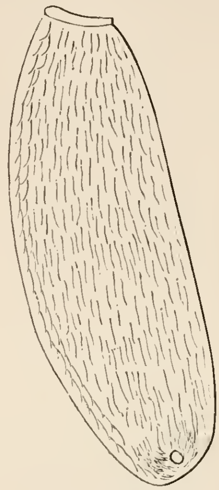

Fig. 111.—Perfect egg. × 46 diams.; ·05.

Fig. 112. — Further stage. × 46 diams.; ·04, *a*, ·01.

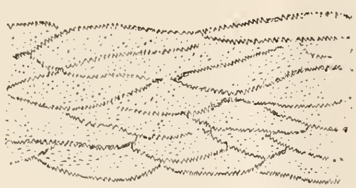

Fig. 113.—Small portion of empty egg-case, showing the general arrangement of reticulation.

The perfect form is now reached, the reticulations are visible, which consists of two distinct descriptions. At first sight the egg appears to be simply a network of elongated cells, but if a high power be used, these appear to be formed by the thickening of the outer covering, and the spaces between will be seen to be very finely marked with small circular dots.

From the region of fact I would for one minute turn aside to that of speculation, and ask what object in the economy of the creature these delicate markings on an external covering of the egg are intended to serve? That it is not for purely ornamental purposes we may be quite sure. I believe the true reason must be sought in the necessity of the enclosed germ to obtain air, and possibly moisture. If observations were continued under still higher powers, possibly the dots would be found to be small apertures through which these necessaries are obtainable. The development of the grub in the egg would be a useful study, but I fear my ability is unequal to the task.

After the deposition of the eggs, the mission of life being fulfilled, the fly soon dies, and may be taken off neighbouring plants as though unwilling to quit the neighbourhood of the great object of its creation.

A few words as to getting rid of this pest may not be out of place. In the "Garden" newspaper of this week, 16th of June, 1883, I came across the following, and I can only say I wish it had been published sooner:

"The onion-fly is a great pest in many places; some have found by keeping the roots earthed-up that the flies cannot get at them to lay their eggs; it is a very sure preventive. In thinning the crop care should be taken to disturb the ground as little as possible; for the same reason, sowing sand which has been soaked in petroleum over the beds, or watering them with one pint of petroleum in two gallons of water has been useful in keeping away the flies. When an onion is infested there is nothing to be done but to remove it carefully and burn it; this is best done by digging up with a trowel, for if any of the grubs are left in the ground, or are allowed to drop out, they will probably find their way to other roots. If this method be carried out, the next brood of flies will be very much decreased in numbers."

I had tried soot, and diligently kept the surface of the ground stirred, and thus I suppose have assisted this creature to lay the foundations of a future crop of the pest in my garden.

The skin of the grub, as it approaches its full growth, becomes appreciably harder, and ultimately is changed into a chitinous condition. When the pupa form is complete, it measures one quarter of an inch in length, and is just one-third of this in width at the widest part.

On opening one of the pupæ, a quantity of white fatty matter escapes; the insect may then be extracted entire. The jaws, now being useless, are cast off in the pupa case; the pedunculated spiracles are also discarded.

Opening the now semi-metamorphosed creature, we again meet with the ova in a stage slightly advanced from that in the grub form; they have grown to ·007, are more distinctly granular in structure, more easily separated, and are quite spherical in form.

I have observed with satisfaction that something prevents all the grubs from changing into the pupa condition. I have transplanted infected plants into pots, and thus compared the changes with those in the open ground, and I think I may say only about one-fifth thus change. The cause may be primarily this: the stock of food in the onion attacked being exhausted, and the creature, being devoid of legs, becomes exhausted and dies before it can wriggle to another plant. Possibly they have an enemy of which I am not as yet cognisant.

W. H. Harris.

Cardiff.

DEMOISELLE CRANE. GRUS VIRGO, (*ANTHROPOIDES VIRGO*).*

At the request of the present editor of the new edition of Yarrell, I made some inquiries as to the occurrence of this bird near Wincanton in this county, Somerset, a notice of which appeared in Science-Gossip for 1876, p. 66, and was copied from there into the "Zoologist" for the same year, p. 4928. I received from Mr. Bidgood, the Curator of our Museum, who at my request made a good many inquiries into the matter, the two following letters, which seem to show beyond doubt that the record cannot be considered trustworthy. One letter from Mr. Galpin of Harwood, near Wincanton, says, "The supposed Numidian Crane was found by Mr. Henry Dyke, son of the late Mr. John Dyke of Myland. He described it to Mr. Wm. Herridge, now of Clinger Farm, Archlington, who consulted 'Cassell's Natural History,' and sent the note to Science-Gossip. I have written to Mr. Dyke asking if the bird was preserved, who saw it besides, and other particulars, and herewith enclose his reply. The persons whom he names as having inspected it, are both dead." Mr. Dyke's letter was as follows: "In reply to your letter respecting the bird, I do not remember very much about it; we kept it several days, and then it was thrown away. Father and Mr. Jukes both said they had never seen such a bird before. It was some kind of a heron, but had such a very long tuft on its breast. I cannot say more about it as I do not remember." I think it worth while to send you this note on the subject, as the record of the occurrence of the demoiselle crane near Wincanton still remains in Science-Gossip without any contradiction or explanation, and might lead to difficulties in the future, more especially as it has been perpetuated in the "List of British Birds," published by the 'Ibis' Committee, and also in the last number of the new Yarrell, though in neither of these publications has *Grus virgo* been allowed a place as properly belonging to the British list. I think now, however, that

* Science-Gossip, 1876, p. 66.

all ornithologists will agree with me, at least as far as the Somerset reported occurrence is concerned, in a verdict of "not proven." I may add that I am much obliged to both Mr. Dyke and Mr. Galpin for so kindly writing to give Mr. Bidgood all the information they could on the subject. I have not written to Mr. Herridge who recorded it, as he appears never to have seen the bird himself.

CECIL SMITH.

THE ADMISSION OF CERTAIN LAND SHELLS INTO THE BRITISH LIST.

BEING away from home, I must ask Mr. Sherriff Tye to excuse a very detailed answer to his courteous reply (SCIENCE-GOSSIP, July, 1883, p. 146) to my former observations (p. 112). It seems to me that there is now no further cause for difference between us, since Mr. Tye confesses that he quite agrees with me as to the "probability" (*vide* top of p. 146) of certain of the species under discussion having been introduced by human agency. Now, this is all that I wished to contend for; and it seems to me that this confession of Mr. Tye's hardly agrees with his former statement, that "in the absence of any information to the contrary," we must regard them as indigenous. I do not think that *Succinea oblonga* can fairly be compared with *Helix villosa.* Had only three or four specimens (some of them dead) ever been found in England, and had there not been at least one inland locality, I should certainly have urged "introduction" on its behalf. With regard to *Helix personata* I may observe that my conjecture, that this species at least is an introduction, is so fully confirmed by Mr. Stuart's note (p. 159), that probably not even Dr. Jeffreys will now retain his belief in its being a native. In this case the question as to whether or not a species is likely to occur in Ireland which has never been found in England, is not now essential to my argument, and I am free to confess that in writing I overlooked the two instances of this which Mr. Tye points out; but, nevertheless, I believe I am not wrong in repeating that, seeing the mollusca of Ireland is as much a "derivative" one as that of England, and that the Irish species in their migrations must, at some time or other, have crossed England, the probability at least is, that they will still occur here, although, as already mentioned, there are at least two well-known exceptions to this. I fear I have written obscurely if Mr. Tye is under the impression that I wished to dispute the fact of any migration having taken place. All I objected to was his statement that "the theory of migration points in a N.W. direction," which I hold to be a somewhat odd expression, and his assertion that the species under discussion are therefore more likely to occur in the S.E. of England than elsewhere, the reason for which I still fail to see—perhaps wrongly. As to *Helix lamellata* and Mr. Tye's suppositions concerning it, I may remark that, unless my memory greatly deceives me (I have no books or notes here to refer to), I have found this species in one of the latest of the Tertiary deposits of Essex. I thank Mr. Tye for having called my attention to his remarks on the distribution of *Helix cantiana.* In conclusion, I desire again to state my belief that, on account of the extremely few specimens that have hitherto been found of the species under discussion, and their striking proximity to seaports, there is not only a probability, but every probability, of their having been introduced by human agency.

Liverpool. ROBERT MILLER CHRISTY.

CURIOUS MOTION IN THE FRUIT OF THE LIME-TREE (*TILIA EUROPÆA*, L.).

EVERY one is familiar with the singular inflorescence of the genus Tilia, in which the long peduncle, really auxiliary to the large papery bract, is so adnate to this for about half its length, as to appear to spring from the middle. Well known as are these lindens, or limes, and especially the *Tilia Europœa*, L., I do not recall having seen any mention of the use that the plant makes of this scale in distributing the fruit. As the globular nuts ripen, the scale becomes more dry and papery. It also bends back upon itself from the point where the peduncle becomes free; it is weighted as it were by the fruit-balls below; sometimes, moreover, there is a lateral twist to the wing, making it not unlike the fluke of the propeller. Now when a breeze disengages this apparatus, it falls by its own weight, but, through the influence of the wing, at once begins to revolve rapidly upon its axis, looking like the governor of a steam-engine in rapid motion. I take it there is here a chance for mathematical research, but this is unfortunately out of my line. Will not some botanist of a mechanical turn, if such a being exists, study into this matter a little? I take it that the purpose of the apparatus is, as in the case of the ash, to propel the fruit outside of the immediate radius of the tree. So like butterflies do these scale-borne nuts in the air appear, that I have been repeatedly deceived by them. It seems to me that the subject would reward the diligent study of one who combined good powers of observation with certain mathematical attainments. I would add that the nuts more or less break off before the disarticulation of the scale from the tree, one or two only remaining, and these standing somewhat at right angles to the main peduncle. May not this throwing the weight to one side itself induce the revolution?

PROFESSOR W. BAILEY.

ON BRITISH FRESH-WATER MITES.

By C. F. George.

[*Continued from page* 82.]

NEXT to Arrenurus, I shall deal with the sub-family Atax. There is some confusion about the term Atax, in consequence of different writers mandibles alone, but as these organs differ considerably in different species of Atax, they would not by themselves serve to separate them readily from all the other sub-families; the front pair of legs are, however, sufficiently peculiar to answer that purpose. They are, as a rule, somewhat thicker than the other legs, and bent almost like the blade of a scythe; but the characteristic part is, that they have very strong

Fig. 114.—Fore-leg of Atax (magnified), showing swimming thorns.

Fig. 115.—Mandibles of Atax (mag.).

Fig. 116.—Sexual discs. ⅔ objective.

Fig. 117.—Sexual discs. ⅔ objective.

applying the word to mites belonging to different families; I shall, however, use it to signify creatures so called by Koch; these are numerous in species, he having described twenty-one, a little more than half the number attributed by him to Arrenurus. They would easily be distinguished from Arrenurus by the and rigid swimming bristles attached to projections in such a manner that, when the creature uses these legs in one direction, these bristles or thorns shut up like the blade of a knife, and, on the contrary, whilst making the effectual stroke in the other direction, they remain rigid at right angles; one can understand what very powerful aids to progression these organs must be. The left front leg of a species of Atax shows the swimming thorns, and in Fig. 114 we have a portion much magnified ; the lower thorn is bent out of place, the other two are in position.

These mites have soft bodies, and long legs. The bodies vary in shape in the different species. They swim in a very peculiar manner, making a few energetic strokes, and then resting with outstretched legs until they gradually sink for some distance, sometimes to the bottom of the vessel in which they are kept ; when they walk, the fore legs are kept stretched out in front, like antennæ, and not used for progression. The palpi have on the outer side of the last joint but one, a large process, and on the inner side, two smaller ones, so that in extreme flexion, the last joint would have the one process on the outside,

Fig. 118.—Atax. 2 inch objective.

and the two smaller ones on the inner side, and hence give the creature a powerful grip of anything capable of being seized by them ; the figure shows the outer side of the upper mandible, and the inner side of the lower one ; the processes mentioned are well shown, they are not, however, so well developed in all species of Atax, the eyes are very curious, and can be moved by powerful muscles ; each eye has two lenses, one in front, and the other at the side, as in some species of Trombidium. The termination of the body, and the arrangement of the sexual discs, or cups, is very variable. I have very generally found it difficult to make any specimens agree with those figured by Koch. Fig. 118 represents an Atax, under a two-inch objective, it resembles Koch's *Atax elegans.* The Y-shaped mark is yellow, the cœca black, and the legs green ; the eyes are a dark cinnabar red.

THE COMMON ORCHIS (*ORCHIS MASCULA*).

Mr. Malan, in his paper on this subject, falls into some errors with respect to the fertilisation which, unless they are corrected, will be certain to lead those who have not been able to obtain this flower very much astray. I will endeavour to point them out, and also make a few remarks on other portions of his paper. On page 76 he says : "Directly the rostellum is touched a viscid drop exudes, which sets hard and fast like cement, and when the bee withdraws its head a pollinia is firmly attached." He very curiously gives this as a quotation from Mr. Darwin. Instead of that, Mr. Darwin's description is as follows : "Let us suppose an insect to alight on the labellum, which forms a good landing-place, and to push its head into the chamber, in order to reach with its proboscis the end of the nectary. Owing to the pouch-formed rostellum projecting into the gangway of the nectary, it is scarcely possible that any object can be pushed into it without the rostellum being touched. The exterior membrane of the rostellum then ruptures in the proper lines, and the lip or pouch is most easily depressed. When this is effected the one or both of the viscid balls will most infallibly touch the intruding body, and whatever they touch they firmly stick to." It will be noticed that this quotation is very different from Mr. Malan's, and I conclude he gave it from memory, and in so doing has confounded the fertilisation of *Orchis mascula* with that of *Listera ovata* or *Neottia nidus-avis*, both of which explode ; and they are, I think, the only English orchids which do so.

Mr. Malan does not seem to have noticed the lip or pouch which plays a most important part in the fertilisation, covering, as it does, the viscid balls which are attached to the base of the pollinia. Should the pouch be depressed without the pollinia being removed, it rises and protects the viscid balls ; or if only one be removed it rises and protects the other. This, as will be seen, is most essential, as otherwise, the viscid matter setting in about thirty seconds, the pollen would be wasted. Again he says : "The viscid disc drying causes the pollinia to sweep through an angle of about ninety degrees." This, I venture to say, is rather misleading. If the viscid disc as a whole dried, the pollinia, as any one who will think for one moment will see, would not go through any movement of depression; but would remain in an upright position. It is caused by the drying of a small portion of the disc on the side nearest the centre of the flower, on the opposite side to the pouch. Mr. Malan says that in April the tubers are two inches below the surface of the ground, whereas in August they are six. Therefore they must make two journeys annually; one downwards between April and August, and another upwards between August and the following April. If this is so, why did not the tuber mentioned by Mr. Malan as being planted deeply, rise to the surface? As to the new tuber going down for the purpose of obtaining fresh ground, this is obtained—and to my mind in a more effectual manner—by its growing by the side of the old one, and travelling always in one direction. Lastly, as to the breaking of the spike rendering the next year's tuber abortive, this from Mr. Malan's own reasoning I cannot understand. He argues that the tuber has little or nothing to do with the flowers and leaves, but simply converts itself, as it were, into a new one; and mentions a case where he saw a perfectly healthy plant minus the tubers. Now if this is so, what can the breaking of the scape of the old flower have to do with the new one? The old tuber takes no part in the growth of the spike, and of necessity would not be injured by any damage to the scape; how then can the new tuber be thus affected? I hope that Mr. Malan will take these notes in the spirit intended—that of obtaining all the facts possible about this very interesting plant.

G. M.

THE SUN-DEWS.

On the skirts of the New Forest, about a mile out of Lymington, following the coast line towards Hordle Cliff, you come upon Pennington, a straggling village, as all villages are in that part of the county; you soon emerge on a large stretch of open uncultivated land, the first portion, near the church, and it may be presumed the centre of the "village," for there is no other evidence of the fact, the common proper commences, a place devoted to cricket, the browsing of donkeys, and the privileges of the commoners generally. Beyond this, still bearing towards the coast, for half a mile, you reach primitive ground; land trodden often, but untouched by plough or spade since the days of the Red King. In the distance the fir tops, black and weird, backed by an angry setting sun, can only be compared to the roofs and spires of a far distant city. But we are not here to contemplate the distant, so much as to seek for curious plants, and here they may be trodden down and crushed at every footstep. In this respect, the spot is full of interest; here and there the shallow stratum of gravel has been pared off, revealing the chalk subsoil, leaving pools of surface water, which trickle away into boggy patches; such a pool is the metropolis of Rotifera, Polyzoa, Diatoms, Desmids, and the many marvels of microscopic life. Large tussocks of water-loving mosses, and soft treacherous places become the nidus of a minute and strange vegetation; and it is here (associated with, and modestly hidden by, its constant companion, the Sphagnum) may be found in great abundance, that strange insect-sucking plant, the spider of the vegetable world, sun-dew (*Drosera rotundifolia*). It is supposed to be somewhat rare and localised, but its minuteness renders it liable to be overlooked, except to the practised eye (and sharper eyes than mine first detected it on these commons). It can only be discovered by one who knows the plant, and who purposely seeks for it; to reveal its peculiarities it requires a magnifying power—its habitat is that of a dry sunny atmosphere (attractive to insects), with a constantly wet and extremely rich boggy soil; it shuns interference, could never be transplanted or cultivated without the most constant attention, as it would require "feeding." In this part of the county it was supposed to be found only in the recesses of the picturesque woods and preserves of Arnewood House, about a mile beyond; without doubt, Drosera is common enough when you have observant eyes to "spot" it.

The readers of SCIENCE-GOSSIP are too well acquainted with the plant to need any botanical description, but it is possible that many have never seen it under the most favourable circumstances. In Mr. Darwin's "Insectivorous Plants," most admirable drawings are found of its structures; microscopical preparations of its leaves, hairs, and tentacles are within easy reach, as well prepared as they could possibly be. Again, you may endeavour, but in vain, to preserve it in "captivity," a term not inexplicable, for it would require "feeding;" and even if taken fresh from the bog, and as speedily as possible carried to your microscope, in every case its unique peculiarity and beauty would be lost. In a word, to behold it in its integrity, and to see the adaptability of the plant to the purposes of its peculiar necessities, it must be examined on the spot; if ever a plant was born to blush unseen, it is Drosera; lifting it from its bed, and examining at once through a good platyscopic pocket-lens, is to behold what no drawing could illustrate, no pen could describe. In six plants examined, the leaves of all, with few exceptions, contained the integuments of insects sucked dry: ants and the smaller diptera seem to be the principal prey, but the interest of the plant consists in the singular conformation of its catching apparatus; the centre glands of the leaf are obviously a modification of the outer tentacles which entirely surround the leaf. An insect coming into contact with only one of these processes is at once enveloped and delivered up to the centre glands to do their work; the tentacles again expand for the capture of fresh prey. These glands and tentacles, seen under a lens, are singularly beautiful; each is tipped with a droplet of tenacious and treacherous liquid, gleaming in the sunlight like diamonds. Any insect (and often many are of considerable size) touching them at once stimulates the entire circle, and escape is hopeless; so adhesive is this secretion that the entire plant may be suspended from the tip of a finger by only touching one of the leaves. Associated with the sun-dew are the butterworts, and they may be found here in abundance.

The solitude of the district is strikingly apparent. The naturalist may revel without fear of interruption; few people are to be seen, and even the cottages straggle and settle themselves in obscure corners; the villages have no cohesion, it is actually impossible to be assured when you are in a village. When a new cottage is contemplated, it is not built next door to an old one, but is hidden in some obscure corner, as far from human ken as possible. Hordle, about two miles beyond, bears the palm in this respect; this unostentatious parish has carried the peculiarity of scattering itself to so interesting a point that it would seem as if the people had some idea of ascertaining how far neighbours could live apart and yet be social. They may have an intense craving for breathing room, or possibly they cultivate "straggling" as a Fine Art, for it is a positive fact, that although Hordle is a large and considerable parish, take away the church and you could not find it, nor could any one tell you where it was, except the startling information that you were "in it." Taking its focus of interest, the post-office, which is combined with a bakery and general emporium (the only place of business for miles around) as a centre, the village takes to rambling, and with a cottage here and there, rarely two together, it spreads in all directions, over downs and commons, through "roughs," round plantations, up back lanes, until its outskirts are lost in the distant horizon, where its appetite for space is somewhat appeased, but even then unsatisfied. It originally started in the sea, for the surf now seethes over the foundations of the old church. The present churchyard is of considerable interest; it was always a drear and uncanny place, with its surrounding belt of firs, and although of late years it has been much improved and the church rebuilt, it is still a peculiarly sombre spot, full of sad reminiscences: on one side a couple of rows of nameless graves, the dead and gone deluded Shakers—it may be remembered that Hordle was the headquarters of the priestess of these silly people; on the other some little hillocks, each marked with a small rude cross in wood, inscribed with one word—and that word a Christian name—pitiable to see. These are the graves of orphan babes, once the occupants of a so-called "Home"—what mysteries these homes contain!—established in the neighbourhood, uprooted, dispersed by epidemic and death; with straitened means the fight was unequal, and ended in the churchyard; and perhaps it were better, for these deserted innocents, it should be so.

But in this churchyard there is a monument, carrying an inscription of so extraordinary a character as to deserve recording. In the district there is much interesting and curious folk-lore, but this is a specimen perfectly unique and authentic. Some years ago, a gentleman of importance in the neighbourhood shot himself in his library—the house where it happened is well known. Among other testamentary wishes he desired that over his grave should be erected a granite memorial, on which was to be inscribed his name, date of death, and the following declaration (it cannot be called an epitaph):—"Here lies the Friend of the Poacher!" nothing more! It may be imagined that such instructions somewhat puzzled the executors, and the clergy especially. It was conceived that so emphatic a declaration of friendship emanating from a county squire, and through the jaws of the grave, to such a class of men, might prove a bad example, especially when constantly paraded before the eyes of the rustics coming to their church; it certainly was not conducive to morality, or, of far more importance, the preservation of game. So in the perplexity of the situation, a plan was devised to remove the difficulty; it was possible, at all events, to postpone the baneful influence of this gentleman's sympathy, for at least another generation. So it was decided in carrying out the testator's wish, to put it "delicately, in French," and to this day may be seen, deeply cut in the granite, "Ci gît l'ami du braconnier." In another generation, the School Board (if ever it reach Hordle) will frustrate this artful and ingenious resource, and one may contemplate the poacher of the future with the last French novel in his capacious pocket, reading this message from the grave, and slapping his velveteens, lamenting perhaps, with an expletive, the gross injustice done to his grandfather, who had passed away without being cognizant of the friend he had lost, bamboozled by a foreign language, and frustrated in Nature's impulse to drop a tear over such honoured remains.

To the general naturalist the whole of this part of Hampshire—to say nothing of its folk-lore—is of the deepest interest; to an entomologist, a Paradise! Any one who can be contented with his own thoughts, a few books of reference, a microscope and sketch-book, may have a very good "time" by making Lymington headquarters. Within a radius of five miles he will find every diversity of broken country, and an easy walk takes him to a sea-beach replete with geological interest. Along the coast, from Keyhaven to Barton, the strata are laid bare; it is said that nowhere in England is the Eocene better displayed than at Hordle Cliff; the formations are exposed and tilted up like the leaves of a book, dog's eared, broken, and crumbling with the excess of fossil remains. In the cliff below the amazing Past, in the bogs above the inscrutable Present, and the Drosera, the text of this little paper may be taken as the type of some of Nature's intricate puzzles.

E. T. D.

Crouch End.

MICROSCOPY.

"Studies in Microscopical Science." By A. C. Cole.—We are glad to welcome No. 1 of the second volume of this work, of which the first volume deservedly won golden opinions among microscopists and naturalists generally. The present part deals with "The Morphology of the Cell."

"The Methods of Microscopical Research." By John Ernest Ady.—Part ii. of this useful work treats on "Instruments and their Uses." The work is issued as a preliminary to vol. ii. of the "Studies in Microscopical Science," by A. C. Cole, F.R.M.S.

Hygrometricism.—Examining some spores of *Equisetum palustre* the other day, whose elaters were highly hygrometric, I detached one from the rest and carefully observed the action of the elaters. These contracted and expanded with their well-known jerky action, according as they were subjected to the influence of watery vapour. By means of the jerky action of the elater the spore was carried to the distance of one inch and a quarter before the elaters were detached. Two other spores under observation were carried relatively one inch and a half, and seven-eighths, before the separation of the elaters from the spores. This sensitive action of the elaters converts them into locomotive organs for the dispersion of the spores, and so makes them the equivalents of the cilia in zoospores. Has any one noticed that the spores of *Ophioglossum vulgatum* are hygrometric? I carefully opened the sporangia of a ripe specimen the other day, and detached some of the granulated spores. Examining them upon a dark ground with a bull's-eye condenser, I observed that, as the clusters of spores became dry, they flew about in all directions with great rapidity. On introducing a small quantity of water beneath the cover glass, the spores grouped themselves together very regularly into almost equivalent groups. On drying they dispersed again, until the individual spores appeared to be arranged at regular distances from each other all over the field of view.—*J. E. Taylor.*

Dale's Illustrated Photographic Catalogue.—We beg to call the attention of those of our readers who are interested in practical photography to this very full and complete catalogue. Among the various novelties recently brought out by this enterprising firm may be specially mentioned their patent multiple back, which must prove very serviceable to tourists and travellers, as it does away with the necessity of changing boxes.

Mounting Insect Organs.—I should be obliged if any one would inform me the best method of preparing and mounting sting and tongue of bees, &c. I have tried first soaking in diluted acetic acid, also diluted nitric acid, and also turpentine, but find none of these produce that clearness and transparency which is so characteristic of those sold by opticians.—*W. B.*

A good Cement required.—I should be much obliged if any reader could inform me of a reliable cement for fixing, and rendering more secure, objects mounted in Canada balsam, where oil of cloves has been used in the preparation. I find the oil of cloves prevents the balsam becoming hard for a long time, and most cements either run into the balsam, or else chip off the slide and allow leakage.—*M. D.*

Bedding Material for Section Cutting.—Mr. G. E. Davis, in "Practical Microscopy," states that Mr. John Barrow has made an improved bedding material for section cutting, by mixing naphthalin and stearine in certain proportions. I shall be glad to know these proportions, and also if the material can be obtained ready mixed, and where.—*J. Deans.*

The Postal Microscopical Society has just issued its July part, in which we find the usual wide range of subjects. First comes a paper by Mrs. A. Cowen on "The Application of the Microscope to Geological Research," forming a short guide to this comparatively new line of research. A paper on "The Palpi of Freshwater Mites," by Mr. C. F. George, follows. Mr. Edward Lovett contributes "A Day's Microscopic Shore-hunting among the low-tide Pools of Jersey." Mr. Fred. Fitch's "The Fly" is a paper that will be read with interest. Mr. John Brigg has a thoughtful article on "Imitative Colouring in Fish." Besides these there is "Half-an-hour at the Microscope" with Mr. Tuffen West. The collectanea are well edited and comprehensive, and including various forms of practical research in this and general microscopic work.

The Royal Microscopical Society.—The June part of the Journal of the Royal Microscopical Society contains a very important paper on "The Cultivation and Life-history of the Ring-worm Fungus (*Trichophyton tonsurans*)," by Malcolm Morris, F.R.C.S., and G. C. Henderson, M.D. By means of a number of detailed experiments, under varying conditions, the gradual development of this fungus is traced, a short account being also added of the researches of previous observers. Amongst other conclusions arrived at are those that the spores of *T. tonsurans* grow freely at temperatures between 15° and 25° C., and that it is the spores of the second generation which reproduce ring-worm on the human skin. Dr. R. L. Maddox contributes a paper "On a Portable Form of Aëroscope and Aspirator." This instrument is intended to facilitate the study of the morbific conditions of the atmosphere in the course of zymotic and contagious diseases, and should attract the attention of those interested in such researches. The largest and most valuable portion of the part consists of a summary of original and current researches relating to zoology and botany, and amongst these will be found some very interesting articles. Nearly 130 separate subjects are here dealt with, as well as a large section appropriated to microscopic apparatus.

ZOOLOGY.

Pine Marten in Northumberland.—Mr. W. Yellowby writes to "Land and Water," stating that a fine specimen of this rare British mammal has been caught at Chirton. A few still linger in the wilder parts of Cumberland and Northumberland.

Distribution of Acme lineata v. alba, *Jeffr.* —Mr. Rimmer in "The Land and Freshwater Shells of the British Isles," gives the latest account of the distribution of this form, from which it appears to have been noticed only in Ireland at Ballinahinch, co. Galway (Jeffreys), and Killarney (Barlee). In England the only locality cited is the "rejectamenta of the River Avon at Bristol" (Jeffreys). It has however been found near Folkestone, Kent, by Mr. Fitzgerald, whose zeal and success in scientific research are so well known; and recently Mr. W. West, of Bradford, Yorks, an enthusiastic cryptogamic botanist and conchologist, has detected it at Helks Wood, near Ingleton. Its range is thus widely extended, but further records are very desirable.—*J. W. T.*

Monograph of the Land and Freshwater Mollusca of the British Fauna.—Mr. J. W. Taylor, the editor of the "Journal of Conchology," is accumulating materials for a work with the above title. He desires to enlist the assistance of all persons interested in the exhaustive study of the species and varieties of British mollusca, and with this object has issued a short announcement detailing the chief features of the proposed work, and advising those willing to help in what their aid is required, and how it may be most serviceable. It is intended to devote special attention to the following points:—Variation; Distribution, local, general, and exotic; Biological aspect, under which head embryological development will be treated; Relation to environment, including habits, parasites, popular superstitions, vernacular names, &c. &c. Communications of all kinds, specimens, &c. should be forwarded to the care of Mr. J. W. Taylor, office of "Journal of Conchology," Leeds.

Natural History Societies.—We are glad to see from the "Transactions of the Yorkshire Naturalists' Union," that the important work of cataloguing the fauna and flora of Yorkshire is still being carried on. The different branches are worked by local specialists: Conchology, by Messrs. William Nelson and John W. Taylor; Hymenoptera, by S. D. Baristow, F.L.S., W. Denison Roebuck, and Thomas Wilson; Lepidoptera, by G. T. Porritt, F.L.S.; Botany, William West and F. Arnold Lees, F.L.S. The "Report and Transactions of the Penzance Natural History and Antiquarian Society for 1882–83," is somewhat bulky, denoting an active year. The Vice-President, Mr. John Ralfs, M.R.C.S., contributes a paper on "The Lichens of West Cornwall;" J. Bernard Magor, some notes on "Two of the Common Brittle-Stars;" Mr. E. D. Marquand, on "The Aculeate Hymenoptera of the Land's End District;" Mr. John Ralfs, M.R.C.S., "Additions to the Fungi of West Cornwall;" Mr. S. Tait, "Wild Flowers at the End of the Year;" Edwin P. Marquand, "The Lepidoptera of West Cornwall;" Mr. J. Bernard Magor, "Teeth of Fishes;" Ernest D Marquand, "Desmids and Diatoms of West Cornwall." Two papers on "Sussex Folk-lore and Customs," connected with the seasons and local superstitions, by Mr. Frederick Ernest Sawyer, F.M.S., from the Sussex Archæological Collection, are very interesting. The third Annual Report of the Hampstead Naturalists' Club contains the address of the President (Mr. William Boulting, L.R.C.P. Lond.). It consists of a very clever summary of "Organic Evolution."

Land and Freshwater Shells near Middlesborough.—Your correspondent, Mr. Baker Hudson, gives a list of land and freshwater shells taken during last year within twelve miles of Middlesborough. I can add to them the following species taken by myself: *Vertigo substriata*, *V. pusilla*, *Zonites radiatulus*, *Cochlicopa tridens*, *Limnæa palustris*, *Physa fontinalis*, *Bulimus obscurus*, *Vertigo edentula*. Also the rare reversed variety of *Helix aspersa*.—*Wm. C. Hey.*

New Variety of Neritina fluviatilis (*Cerina, Colb.*).—Last May, I took in the Avon and Bath Canal, near Timpley, Stoke, the "var. *cerina*" of *Neritina fluviatilis*, which Mr. Taylor, the editor of the "Quarterly Conchological Journal," has kindly noticed in his last journal as being a new variety for England, although it has long been found on the Continent. I have specimens from Italy and Dalmatia, but the specimens from the Avon Canal are smaller, although of quite as brilliant a yellow colour. I have taken several *Helix aspersa* near Bristol, with the bright pink lip Mr. W. Cundal describes. I think they are a beautiful hybrid between the type shell and the var. *exalbida*. They are a rare form.—*F. M. Hele, Bristol.*

Provincial Societies, &c.—The June number of the "Transactions of the Hertfordshire Natural History Society" contains capital papers on "The Agricultural Geology of Hertfordshire," by J. Vincent Elsden, illustrated by two geological maps of the country; "The Importance of Minute Things of

Life in Past and Present Times," by Prof. J. Rupert Jones; "Phenological Phenomena observed in Hertfordshire during the year 1882," by Jno. Hopkinson; and "Notes on Insects observed in Hertfordshire during 1882," by Eleanor A. Ormerod. Besides these there is the Anniversary Address of the President, George Rooper, in which he gives a short sketch of the older works on Natural History. "The 'Westbury House' School Ephemeris," is still flourishing, and the great variety of subjects treated in its pages shows the scientific interest with which our school-boys are now regarding all branches of Natural History. We have also received the "Report of the Boys' Association for the Improvement of the Mind" (Ackworth School), giving a summary of the work done by another active section of our practical boy naturalists. The first number of "The Rochester Naturalist" has just been published. This is founded as a quarterly record of the Rochester Naturalists' Club, and contains some useful local papers, such as the "Geology of the Rochester District," by C. Bird F.G.S.; "Rochester Umbelliferæ," by J. Hepworth; Reports, Excursions, Notes, &c.

BOTANY.

"OUR CHARAS." — Your correspondent, Mr. Birch, jun., is thanked most heartily for his kind communication, emphasising the article on this subject in SCIENCE-GOSSIP for May. Most of what is there written is cordially endorsed, especially the hint that collectors should "begin early in the season." To this one might add, "don't leave off." The writer's practice is to keep on, year in and year out. If the weather is fine, then enjoy it, if not, endure it. Many a time last winter was the ice broken on the surface of ponds, so as to grope about underneath with a long stick. Anything good found out of season can be noted, and revisited at the proper time. This was the case with *Tolypella intricata*, which Mr. H. Groves has run down to Bedfordshire to gather when in good fruit. It may interest some to know that that gentleman uses a small drag, which can be carried in the pocket. The advantage of this for large ponds and streams is sufficiently evident, and it involves but little outlay.—*J. S., Luton.*

"LEONTODON TARAXACUM."—In my correction, on p. 161 (July), of Mr. Swinton's note with the above heading (appearing in June) I am represented as saying "the commonly accepted name of this genus is *Taraxacum leontodon*. This is an error in printing. I said simply Taraxacum, that being the generic name, and I immediately went on to say "The full name is *Taraxacum officinale*." Curiously enough, on p. 152 of July number, there occurs not only this genus rightly named, and its variety *palustre*, but also the genus Leontodon, two of its species being named, namely, *hispidus* and *autumnalis*. To this genus alone is the term Leontodon rightly given. —*H. W. S. Worsley-Benison.*

LEONTODON TARAXACUM.—My remarks on the dandelion were certainly not intended to mislead young botanists, who, if in the first instant unobservant, would soon, I fear, be fairly floored when it came to synonymy. My intent was simply to draw attention to the influence of the soil and surroundings in fostering races of dandelions, nettles, and other succulent plants. Certainly the dandelion has here its races under the hedgerow, on the bare downs, and, as my friend Mr. Kidd notices, on the old walls too. The nettle too varies, and has races in all sorts of places, the most pleasing I have seen being a slim, long, knotted sort, I noticed in a covert close to Waverley Abbey a little back. I quite despair of getting any trivial names for all I see in my rambles, but I think the local habitation should be more important than the name. My friend, perhaps I am at liberty to mention, would term the cutting of the dandelion leaves as found on old walls "laciniated," which I conceive to be apt.—*A. H. Swinton.*

FASCIATED STEMS.—Perhaps it may be of interest to note that this monstrosity in plants, and other similar malformations, did not escape the old savans of Charles the Second's time. John Evelyn says in his "Silva": "At Hall, near Foy, there is a faggot which consists but of one piece of wood, naturally grown in that form, with a band wrapped about it, and parted at the ends into four sticks, one of which is subdivided into two others. It was carefully preserved many years by an Earl of Devonshire, and looked on as portending the fate of his estate, which is since indeed come into the hands of four Cornish gentlemen, one of whose estates is likewise divided betwixt two heirs. To this class may be referred what is affirmed concerning the fatal prediction of oaks bearing strange leaves, which may be inquired of; and of accidents fasciating the boughs and branches of trees, as noticed by Dr. Plott in willows and other soft woods, especially in an ash at Bisseter, uniformly wreathed two or three times round. Such a curiosity also hangs up in the portico of the physic-garden at Oxford, in a top branch o holly. Wonderful contortions and perplexity of the parts may be seen and admired in tea-roots." Concerning strange leaves, I may observe that some ash stumps cut and grubbed round by navvies at Guildford, have put forth leaves, many of which are shaped like those of the horse-chestnut with four or five fingers. Let us hope that these portents are not sinister for our new line of railway.—*A. H. Swinton.*

THE PRESERVATION OF PLANTS.—In reply to Mr. T. S. Wickes' question in the May number of this magazine, p. 118, I can recommend him to apply to

Mr. English, of Epping village, for the information he requires. Mr. English is the originator of a method of preserving plants, with their blooms retaining not only their proper colours, but also their natural form. The *modus operandi* may be learned from a treatise published by him containing full recipes. He has also applied his method to the preservation of fungi with equally surprising success, and as I have had several opportunities of seeing many specimens of these short-lived plants, generally so difficult to deal with, treated by him to perfection, besides numerous flowers of various orders, which, after the test of years, still retain all their original natural charms, I can testify to the efficacy of the system. Botanists generally would do well to adopt this method, as specimens for the herbarium undoubtedly possess a far higher value when set naturally, and present at the same time a much better appearance, than they can when squeezed out of shape into shrivelled up, dead-looking things, which have lost all the specific characters of value.—*W. White.*

Æcidium Urticæ and Æ. Tragopogonis.—I am induced to furnish your readers with particulars of localities where I have met with the above. Mr. Charles F. W. T. Williams, in his interesting Paper No. II., in Science-Gossip of July, observes that he has never been able to meet with either of them. I can quite understand his difficulty, notwithstanding his great industry, for it was only after hunting for about a quarter of a century that I was successful. I first met with *Æ. Urticæ* on the high road leading from Milnthorp to Kendal. It was in quantity on the stalks of the nettles growing close to the footpath. I next, a year or two afterwards, found it in smaller quantity on the road from Ambleside to Keswick, near Grasmere, and I have no doubt it might then have been met with all around the district. I afterwards met with it on the high land looking over Corwen, and on one occasion I found the *Urticæ* on the borders of a lake in Sherwood Forest. I have twice found it in Derbyshire, once about three miles from Hathersage and once, but a single specimen, in a wood on the roadside opposite to Haddon Hall. I have not been equally fortunate in *Æ. Tragopogonis*, but I have found it very plentiful in two localities not far from Southport. One was near Crossins, on a raised bank which runs from north to south, bordering some fields about two miles north of the Hesketh Public Park. I have met with it in large quantity on the bank of a river which is crossed by a railway bridge leading in the direction of Preston—the line is not yet complete. The distance from Southport is about six miles. The infested plant (goatsbeard) is on the south side of the north bank of the river, about a third of a mile from the railway bridge.—*Thomas Brittain.*

New Habitats for Plants.—It will be interesting, I think, to note the discovery of three plants in a locality which is at any rate not noticed in Sowerby's "Botany." In the neighbourhood of Battle, Sussex, I found, a few days ago, *Viola lutea*, var. *amœna*; *Genista tinctoria*, var. *humifusa*; and *Sedum album*, var. *teretifolium*. On *Viola lutea* Sowerby says, "Not south of Derby and Notts." Kynance Cove is always given as the station for var. *humifusa* of *G. tinctoria*, the hairiness of midribs, of leaves, of bracts, calyces and stem forced me to decide for this variety, the plant in its usual form being wholly glabrous. On *Sedum album* Sowerby writes, "Rather rare; west of England, Gloucester and Somerset." The three specimens have been declared genuine by an able field botanist.—*C. Stickland.*

NOTES AND QUERIES.

Clausilia dubia et alia.—Will any conchologist afford information on the following points? In Tate's Manual, *C. dubia* is figured with one tooth high up on the columella lip, and both Tate and Turton agree that the shell is larger and more ventricose than *C. rugosa*. *C. rugosa* is figured by Tate with two tooth-like folds, high up on the columella, and one more to the front of the aperture. Is *C. dubia* generally found with only the one tooth? Any information will be welcome. I have lately taken several white pellucid specimens of *H. cellarius*. Is this a recognised variety? Can *Helix concinna* be rightly regarded as a distinct species? If so, on what grounds? Should it not rank with *H. depilata* as a variety of *H. hispida*? Is not the variety *costata* of *Helix pulchella* obsolete, it having been found that the shells not costated were merely older and worn shells?—*Baker Hudson.*

Ranunculus Ficaria.—Does not Mr. J. R. Neve make a mistake when he calls the *Ranunculus Ficaria*, p. 130, the common celandine? The ranunculus is among the Ranunculaceæ. The celandine, or chelidonium, is among the Papaveraceæ, the calyx is two-leaved; the ranunculus, five-leaved; chelidonium has a siliqua. In the ranunculus, the seeds are naked, and there are various other distinctions. The *Ranunculus Ficaria* is usually called the pilewort.—*E. T. Scott.*

Curious Phenomenon.—The phenomenon alluded to by your correspondent, A. H. D., was plainly visible here on date, and at time mentioned by him, and so accurately has he described it, that I can add nothing more. I am only surprised at having seen no notice taken of it in the papers, or an explanation from those competent to afford it.—*Windsor Hambrough, Farnham.*

Peculiar Site of a Water-Hen's Nest.—On May 18th, I was out egg-hunting, and while going up to what I supposed to be a ring-dove's nest, was surprised to see a black-coloured bird fly off. My curiosity was at once aroused, as I could not imagine what the bird was, and upon looking into the nest found five water-hen's eggs. It was situated about half-way up a fir-tree, some twenty feet from the ground, in a small plantation. The nest was made of sticks, and had evidently been a ring-dove's, and was lined with a few pieces of sedge. A friend of mine, W. Wells Bladen, of Stone, has also noticed a similar location; the nest he found was built on the top of an old blackbird's in a large thorn bush, some ten feet above a pool of water. I should be interested to know if any of the readers of SCIENCE-GOSSIP have noticed similar locations for water-hen's nests.—*W. T. Hart, London Road, Lynn.*

THE STAR OF BETHLEHEM.—There is a point in your correspondent's very interesting communication on this subject that I experience a difficulty in understanding. I refer to the allegation of St. Chrysostom that this was a miraculous appearance in the form of a star, the words in "the likeness of" not being employed as elsewhere in the context of the narrative.—*A. H. Swinton, Guildford.*

BECAFICOS.—Perhaps the following quotation from "Our Old Country Towns," by A. Rimmer, pp. 181–2, may interest your readers:—"I heard that the Becaficos" (he is writing about the Cinque Ports) "had commenced to pay their annual visits to Reculver, which yet contains some fig gardens. Of course there are not many persons in England who ever heard that such birds came here at all, and perhaps not a few never even knew there were such creatures; but shortly after the Conquest there was an influx of monks from Normandy and Brittany, who introduced many seeds and articles of value. Among others, the fig was a novelty, and the plains of Fécamp were renowned for this delicacy. English figs ripened rather later than on the Continent, and hence the flocks of Becaficos, that had probably travelled from Spain and Italy, found their favourite food. They used also to be seen many years ago in Cheshire, near Combermere Abbey."—*A. H. B.*

THE EGYPTIAN GERBILLE.—I would advise H. C. Brooke to keep his animal from one of the opposite sex to prevent their introduction into this country, as if their habits should be the same here as in their native places, he would gain little credit from our farmers. They are very destructive to grain crops when living in cultivated districts, and at the same time are exceedingly prolific, the females producing large families several times in the year. They are confined to the east, south of Asia, as far as India, the African continent and the south-east of Europe. During the day they live in shallow burrows, and at night come forth to feed, their food consisting chiefly of grain and roots. They live both in dry deserts and in cultivated districts, and often assemble in large numbers, doing considerable damage to the crops when in the latter places. They store up large quantities of the ears of corn in their burrows, and in some districts the poor inhabitants procure a good supply of grain by digging up that which they have stored. The gerbilles belong to the family Muridæ, and are therefore a species of mouse.—*Dipton Burn.*

CAN A PIG SWIM?—One day last summer I was standing on the pier at Morecambe, watching the disembarkation of a number of cattle and pigs from the Londonderry boat moored alongside. A pig of moderate size, after making a successful ascent of the gangway, was pushed by its comrades over the edge of the pier, and dropped about 20 feet into the sea. On rising to the surface, the animal appeared to take things very coolly, and, instead of making for the pier wall, struck out for the opposite side of the harbour; and finally steered for the open sea, probably with the hazy idea of returning to the "ould country." This laudable intention was, however, frustrated by the Irish drover and another man pushing off in a small boat in pursuit of the porcine swimmer; and piggy was soon sitting at the bottom of the boat looking none the worse for the swim. With regard to very fat pigs, I believe they run a much greater risk of lacerating their throats with their own claws when swimming.—*E. A. Kirk, Leeds.*

COCOA OR COCO.—Cacao or Cocoa is equally correct when applied to the produce of the *Theobroma Cacao,* a small tree the seeds of whose fruits furnish the chocolate and cocoatina of commerce. I remember seeing some of the fruit many years ago, at the time that Schweitzer of Brighton was preparing his since-famed cocoatina. A friend of his brought me some, and a sample of the cocoatina as well; so I believe I was one of the first to taste this especial make before it had been introduced to the general public, and I have taken it ever since. This cacao-tree is largely cultivated. It grows about eighteen feet in height, and the name *Theobroma* is said to signify "food for the gods." "Ada P." will find that the words "cocoa" and "cacao" are both used, in the "Treasury of Botany," for the preparation made from the cacao fruit.—*Helen E. Watney.*

COCO AND COCOA.—In reply to a query in your May issue: The word Coco is, I believe, the Portuguese "Coco," signifying an ugly mask, or a monkey's face. It was applied to the fruit of the coco-nut palm because of the imagined resemblance to a face, which is formed by the three cavities at the base of the nut corresponding to the three original carpels. Cacao is said to be derived from the Central American word Cacauatl, the native name of the plant. It has been corrupted into cocoa, by a curious substitution and transposition of letters. It is needless to say the two words Coco and Cacao have no relation to each other. The coco-nut palm grows freely on the whole of the coast of the island of Ceylon. The Sinhalese vernacular word for coco-nut is Pol, which comes from the more reputable Sinhalese word Pala, a fruit (or the fruit of all the fruits, to the low country Sinhalese this is the most important) which is itself derived from the Sanskrit word Phala. The Sanskrit word for the coco-nut palm is Nārikéra, which comes from the roots Narika, a watery place, and Ir, to grow (literally the tree which grows by the water), and the old Sinhalese word derived from this Sanskrit root is Neli. Although the coco-nut is not a native of India, its introduction is of undoubted antiquity, as it is mentioned in many old Indian medicine works; for example, Charaka Samhitā, Susruta, Vāgbhata Tantra, and Raghuvansa, many of which date back long before the time of Buddha (nearly 2500 years ago). The Maldivian word for the coco-nut is Karhi, which is almost the Sanskrit word Kera. The cacao plant now flourishes in Ceylon, the failures of the coffee crop having induced planters to turn their attention to it along with other new products, and some very creditable sales of the produce have been made in the London market.—*W. Knight James, F.R.G.S., Colombo, Ceylon.*

CLIMBING POWER IN MICE.—I remember, some years ago, seeing a common mouse let himself down, in true sailor fashion, by a piece of twine about a yard long, which was hanging from a beam over the boiler of a large steam-engine.—*G. M. Doe, Great Torrington, N. Devon.*

WHITE CRANE'S-BILLS.—On Whit Monday I walked from Yarmouth to Lowestoft along the cliffs, which at Gunton had been washed away to such an extent by the high spring tides, that I had to make a detour round by the village. Here, on a bank, apparently of recent formation I found several plants of the crane's-bill tribe, and, so far as a cursory examination would allow me to judge, in all essential features similar to the dove's-foot crane's-bill (*Geranium molle*), except that the flowers were perfectly white. I have never before observed a crane's-bill with white flowers, nor do my botanical books mention such a deviation from the normal features of the Geraniaceæ.—*Walter Cordwell, Harleston.*

ALBINOS, ETC.—Referring to the note of Mr. E. J. Gibbins in your May number, I may mention that about two years ago I had brought to me a young but perfectly fledged specimen of the Indian crow (*Corvus splendens*) which was quite white, with pink eyes, and that I have frequently seen in Ceylon specimens of the same birds with white feathers in the wing, and occasionally with white heads; but I have had no means of knowing whether these were original feathers, or whether they had been replaced after injury to the first ones. The other day I had brought to me a perfect albino of the palm squirrel (*Sciurus tristriatus*, Waterhouse), the only one I have ever seen. A curious example of change from coloured to white plumage is to be found in the paradise fly-catcher (*Terpsiphone paradisi*, Sharpe), which is a partial immigrant to Ceylon. The young males are of a chestnut-red colour, with greyish breast and glossy black crest, and at a certain age, probably at the second year, the central feathers of the tail elongate, until they reach from nine to twelve inches below the rest. Sometimes previous to, and sometimes after this, the male commences to change from chestnut-red to white. The scapulars and primaries change first, then the tail feathers, and Captain Legge remarks that, of the body feathers, the upper tail coverts are first to fade. I have seen many specimens in the process of transition, and I have in my possession one with about half its feathers of each colour; two of the centre tail feathers are elongated, one of which is perfectly white and the other perfectly red. It is difficult, I think, on any theory of mimicry or natural selection to account for this change of plumage, which takes place only in adult male birds. I shall be glad to have the opinion of any of your readers.—*W. Knight James, F.R.G.S., Colombo, Ceylon.*

STARLING'S EGGS WHITE.—In reply to your correspondent who asks for information on this point, I may say that I have taken a good many eggs in my time, and have several times taken starlings' eggs white, though it is always a different white from the white of a hen's egg. My experience is that all eggs are liable to be found varying much in colour, more especially those with any shade of blue for the ground colour. The delicate colour of the starling's egg is, like that of the thrush, much affected by the process of incubation, so that as the eggs are longer sat upon they nearly always become considerably lighter in colour. While on the subject of eggs, I may mention that I have found a blackbird's egg which was white, but then it was evidently due to the fact of the egg having been laid rather too soon, as the shell was of a chalky consistency and would not allow of handling, but broke immediately. The eggs of the chaffinch often vary considerably, and have the ground-work almost entirely of blue, so that, except for the shape, some of them might almost be taken for those of a hedge-sparrow, especially as when this is the case, the markings are generally nearly absent. I have also found robins' eggs vary much in colour, from white to cream colour.—*J. T. Green.*

MARKINGS ON V. ATALANTA.—The following incident may perhaps interest some of your readers, as it contains a fact not known, I believe, to the generality of entomologists:—Two years ago, when "The world to an end should have come in 1881," I was informed by a superstitious old lady that she was certified of the truth of the above prophecy, because one of her grandchildren had caught a butterfly with the figures 1881 distinctly marked upon it. I ridiculed the idea at first, but on reaching my collection I found that underneath the under-wings of a butterfly (*Vanessa atalanta*) there was plainly enough this peculiar marking, 18 on one wing and 81 on the other.—*Montague S. W. Gunning.*

RANUNCULUS FICARIA.—J. R. Neve would have done well if, before writing notes on *Ranunculus ficaria*, he had looked at Professor Henslow's "Botany for Children." In the first and second pages of that book the organs of that particular plant are described with more detail than is given by Dr. Hooker, who did not write for children, but for readers whom he credited with more elementary knowledge than, it may be, some of them possess. If it be erroneous to describe as roots the tuberous knobs at the base of the stem, they are organs of a complex nature, an appropriate name for which has yet to be devised. In the meantime, they may be called roots in the same sense as carrots, radishes, and mangel-wurzel are so called. In the case of these plants, the real root is blended with the base of the stem below the cotyledons. The difference between them and the lesser celandine is, that the latter being perennial, new roots are annually formed in connection with subterranean buds from which next year's plants will grow. If these tuberous knobs were true tubers, the bud would be at the end furthest from the stem, at whose base they grow, which does not seem to be the case. The buds that are sometimes found in the axils of leaves are more like real tubers, except in not being subterranean. That such buds should bear resemblance to the roots is not more wonderful than that the sepals of a coloured calyx should resemble petals, and be therefore called petaloid. In a similar sense the roots of *Ranunculus ficaria* are called tuberous.—*John Gibbs.*

NOTES ON ASH.—Mr. J. A. Dymes, in your June number, seems to think it unusual for the ash to come out before the oak. To show him that this is not at all an unusual fact, and also that these trees come into leaf at very varying times relatively, it may be useful to quote an old saying that is very familiar to me—

> If the oak comes out before the ash,
> There will only be a splash;
> But if the ash comes out before the oak,
> Then there will be a soak.

This shows that country people have long noticed this fact, and have very sensibly attributed it to its right cause—the amount of dampness in the soil and atmosphere, the relative length of the roots of the two trees being affected in different degrees by the state of the surface of the ground.—*J. T. Green, Wallasey.*

"THE SPIDER AND THE FLY."—While taking a walking tour in Perthshire last spring, I kept a constant outlook for specimens of one kind or another, as in fact I generally do, to add to my small collection. On one occasion, when walking along a road, my attention was attracted by a curious mass moving across the path. Stopping to look at it, I found on examination that the object referred to was nothing less than an ichneumon fly dragging a large spider after it. The battle had been a tough one, but it had nevertheless resulted, contrary to the old nursery rhyme, in a complete victory for the fly. The spider had torn off every foot from the ichneumon, and in all cases except one it had dismembered several joints, as well as one of its antennæ. The victorious fly had also used its mandibles, and to greater advantage, as the spider's body was literally squashed out of all shape, So infuriated was the ichneumon, and so determined on keeping a firm hold of its enemy, that I actually lifted it up, put it in a chip-box, where it remained for a short time, and then after killing it, to my astonishment on again looking some time after, found the spider still held firmly in the jaws of its antagonist. When I reached home I set them just as I had found them, but unfortunately the drying up of the spider had loosened the hold of the ichneumon's mandibles, and the two came asunder. The pin, however, judiciously put through the spider's head, nearly restored them to their previous position.—*James Edward Cree.*

MISTAKEN IDENTITY.—The other day, while in my garden, I heard some young sparrows chirping in a beech hedge. Walking quietly up, and imitating an old one, I was more than surprised when one flew out and sat on my arm, where it remained chirping and fluttering its wings, evidently expecting to be fed, for fully a minute before finding out its mistake.—*James Edward Cree.*

THE SIDMOUTH COAST.—In answer to the question in SCIENCE-GOSSIP, I write to say the Sidmouth coast affords a rich field for marine collectors. The Chit rocks are close to the town, and of easy access; as are also the rocks in Ladrum Bay, 1¼ mile westward. We often have visitors here on the same errand as M. C. W.—*Florence Cottage, Sidmouth.*

HABITS OF GOAT-SUCKERS.—I am informed by a friend of mine, that one evening about this time last year, he was walking across Batcombe Down, in this county, when a bird swooped at him, and continued to do so for some distance along the road. I assume the bird was a goat-sucker, but although I have found the nest, I never noticed it act thus. Perhaps some of your readers will say if I am correct as to the bird, and if they have seen it behave so.—*Darell Stephens, F.L.S., Mapperton, Dorset.*

GREENFINCH NESTING.—On the evening of Friday, the 18th of May, I observed a greenfinch on her nest; she would not leave it until I had shaken the bush several times, and even then she sat on the bough within half a foot of her nest. I then commenced to climb the bush, and when half-way up, to my astonishment, the bird returned to her nest. I record these facts as a similar case has not come under my observation.—*Darell Stephens, F.L.S., Mapperton, Beaminster, Dorset.*

ECCENTRICITIES IN NEST-BUILDING.—I have never known a case precisely similar to that described by Mr. Rawson, of rooks usurping the function of jackdaws, by building in a turret; but I have seen jackdaws' nests in trees, in the heart of a rookery, and that quite close to a convenient church, with a tower inhabited by many jackdaws. I also knew a a pair of waterhens which for several years had their nest in the top of a hawthorn-tree, by the side of the river Boro. I have seen a sand-martin's nest not built in a hole, but placed against the bank, after the fashion of a blackbird's; a golden-crested wren's, which was not pendent, but supported by the twigs of a small shrub of box; and a skylark's not on the ground, but up in a hedge of furze-bushes, barely within reach of the human hand. Among less remarkable eccentricities, I knew a wood-pigeon's nest which was occupied for at least two successive seasons, built scarcely a foot above the ground, on some recumbent laurels in the churchyard; also a greenfinch's in the thatch of an outhouse, and a thrush's humbly placed beneath the sheltering foliage of a cabbage-plant.—*Charles B. Moffat.*

DYNAMITE.—It is stated that in the manufacture of this explosive, "Infusorial" or "Siliceous" earth is used, which formerly was procured from abroad, but which is now obtained from several parts of England. I should be very much obliged to any one who would send me small specimens of these earths, either foreign or British, stating their locality. I would gladly pay postal charges.—*J. Deans, Franthurst, Bascombe, Bournemouth, Hants.* [These earths are the ordinary Diatomaceous earths.—ED. S.-G.]

DISEASE OF PUSS LARVÆ.—Since writing to you on the above subject some time ago I have, as I think, discovered the reason of the disease in my larvæ. One gentleman in answer to my query, as to the cause of disease, gives it as his opinion that the food I gave them was *wet*, but it was not so. I always carefully dry the food before offering it to any larvæ. But this idea set me thinking, and having some larvæ of *C. fraxini* diseased in exactly the same way, I have come to the conclusion that *wet*, indirectly, was the cause of disease. These Fraxini, when first hatched from the egg, were fed on well-matured dry leaves of black poplar, and throve remarkably well; but as they grew larger the popular threw out new leaves, and thinking to give them a treat, I gave them the young new leaves, and ever since they have sickened and died. The puss larvæ were fed on young shoots or suckers of willow, growing directly out of the ground. Now, it is my firm belief that these young shoots were not good for them, as they contained a great amount of wet and sap, and I believe it acted on them just the same as if they had taken the wet from the exterior surface of the leaves. I shall be glad to hear the opinion of others on the subject.—*W. Finch, jun., Nottingham.*

TENACITY OF LIFE.—Having some larvæ of the large tortoiseshell butterfly (*V. polychloros*), which were turning to chrysalids, and wishing to preserve one for the cabinet, before they were all pupated, I put one in my cyanide bottle to kill it, on Saturday, June 30th, intending to preserve it on the following Monday, but I entirely forgot it until to-day—July 4th—when, on looking in my cyanide bottle, what was my surprise to see that the larva had pupated; and, on turning it out to throw away, I found it was alive, and it is alive now, apparently uninjured by its long sojourn in the poison bottle. The bottle is well charged with poison, and usually kills a larva in about half an hour. Can any of your readers explain this, and oblige—*W. Finch, jun., Nottingham.*

WHITE EGG OF STARLING.—It may interest Mr. Foster to know that I have in my collection a perfectly white egg of the starling. It was taken, with three eggs of the normal type, from a nest in a barn near here. I have also take perfectly white specimens of the linnet's, robin's, and thrush's eggs. The country people about here say that in many cases the last egg laid is white, because the bird's colouring matter is exhausted. This statement, though, must be taken *cum grano salis.*—"*Plutarch.*"

NATURAL HISTORY NOTES: LOCAL NAMES, &c.—In this part of Kent the moorhen is called the morning by the rustics; the swift, the screech owl; the common thrush is called the greybird; the tit tribe generally are called tomtits. In one district of the New Forest the harvest mouse is sometimes called the little mouse, and the campagnol or field vole, thickhead, while the common bat rejoices in the name of rattlebat. The mole is called sometimes munt, sometimes mouldie; the hedgehog is the furze pig or bristly pig; the shrew, the longsnout; and the slowworm is called indiscriminately snake, adder, or blindworm; while the common snake is generally the green or water snake. The wryneck is here called the snake bird; and my informant, an old man who shoots birds in a cherry orchard, speaks of a bird called the pigeon pilfrey, which he describes as being somewhat like a pigeon, only rather smaller. He says they are very handsome birds, and not often seen; when seen, it is in winter. I cannot form any idea of what bird this can be; if any correspondent knows, I should be glad to be enlightened on the subject. A scarlet hopper was taken here a few days ago; I believe this insect is rare. A wryneck here has laid thirty-three eggs, of which most have been taken; at the present date she has two young ones a week old, two hard-set eggs, and two fresh ones.—*H. C. Brooke, Sutton Valence.*

RARE INSECTS NEAR LONDON.—I should be obliged if readers of SCIENCE-GOSSIP who are annually taking rare species of any orders of insects (except the Lepidoptera) near London will kindly send me a short list of the same, authenticated by the signature of the sender, and accompanied by the names of the localities. As I am engaged upon a volume on the subject, such lists would be of use to me in checking and amending other lists already prepared.—*W. J. V. Vandenbergh, F.R.A.S., F.M.S., &c., Hornsey, Middlesex.*

DRYING PLANTS.—I should feel very much obliged if you or any of your readers would kindly inform me how flowering plants may be dried for the herbarium without the blossoms losing their delicate colour in the process, as is so often the case. Apologising for the trouble I give you, and thanking you in advance. —*U. Aetona.*

RARE BIRDS.—My son shot here, in the winter of 1879-80, more than a dozen of the curlew-billed sandpiper (*Tringa subarquata*); and at Burnham a few years ago a young gentleman killed out of a flock of sixteen a splendid black swan. The heathen actually plucked and ate it! Now these cannot have been escaped birds.—*A. H. Birkett, Burnham, Somerset.*

LUNDY ISLAND (p. 116).—Mr. H. E. Wilkinson will find an excellent account of Lundy in Mr. J. E. Chanter's monograph on the island (published by Cassell, Petter, and Galpin, 3*s.* 6*d.*), which includes lists of its interesting fauna and flora. Additional information may be obtained from the publications of the Devonshire Association. For instance, a complete catalogue of the Lepidopterous insects which have been found on the island is appended to the county list appearing in their Transactions for 1878, vol. x.—*William White.*

WOOD-PIGEONS AND OWL.—Your correspondent Mr. J. A. Wheldon, in SCIENCE-GOSSIP for last month, seems to doubt whether a white owl (*Strix flammea*) ever preys upon birds. About three years ago I had occasion to examine a hole in a tree inhabited by a white owl, and there I found a great number of birds' skulls, one of which was that of a blackbird. If then an owl will attack a blackbird, I see no reason (if it has the chance) why it should not devour young pigeons. Although the circumstance related by me, in SCIENCE-GOSSIP for last June, and the observations of naturalists hitherto tend to show that white owls will not attack pigeons. I am not aware that there has been any positive proof of it, and I am inclined to think that when an owl is hard pressed for food, it would not hesitate to do so. It may be that white owls dwelling in trees differ slightly in their habits from those dwelling in old buildings, etc.—*F. H. Parrott, Aylesbury.*

MIND AMONG THE LOWER ANIMALS.—I cannot help thinking that Dr. Keegan would have refrained from his remarks concerning the lack of reason in dogs if he had kept them himself. Experience would tell him he is quite wrong in his opinions, and I am glad to see the able papers written in defence of our favourites by gentlemen of such evident power in reply to Dr. Keegan's rather sweeping criticism on all keepers of dogs, as well as the dogs themselves. I do not exaggerate in the following example of canine sense: A toy terrier I had, early one morning visited my sister, who is housekeeper, going to the top of the house for this purpose, and against her will, at first pulling her by the dress towards the door. At last feeling curious as to what Tiny's anxiety was about, she followed him until he took her to the bottom of the house to the breakfast-room; a kettle of boiling water had rolled off the fire to the floor, and this he wished to show her. His barks of delight were his expressions of approval at being understood at last. Another dog we had, on one occasion, when he thought we had been searching too long for shells in a hedge, fetched from somewhere, I do not know where, a cluster of *Helix aspersa*, and threw into my lap—showing he knew what we were looking for. All people who have kept dogs could tell many stories which would prove the reasoning powers of dogs. I hope they will do so, and thus settle the question.—*Fanny M. Hele, Bristol.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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. E. C.—In reply to H. E. Milkman, I beg to say that the book below mentioned gives all particulars of the natural history of Lundy Island. "Land and Sea," by Philip Henry Gosse, F.R.S. London, James Nisbet & Co., 21 Berners Street, 1865.

D. WELLINGTON.—Taylor's "Geological Stories," price 4*s.*, published by W. H. Allen & Co., would form a good introduction to Geology.

M. D.—We are always glad to help students gratuitously, but the least you could do was to separate your questions from your exchanges. We have had to write each out separately.

R. Y. GREEN desires the name of the publishers of Groves' "Review of the British Characeæ." Perhaps some reader will reply.

L. M. BELL.—Accept our best thanks for the specimens of the rare *Dero obtusa* found near Leamington, which you were good enough to send us.

C. O. LOWE.—We shall be very pleased to have your sketch of a revolving table.

J. P. PAGE.—You would get either of the books you mention of Mr. W. Collins, scientific bookseller, 157 Great Portland Street, London, W.

R. F. Z.—The Religious Tract Society have just published a pleasant little book, called "Ants and their Ways."

T. J. WILKES.—No. 4 is the dogwood (*Cornus sanguineus*); No. 8, *Orchis maculata*; No. 10, fig-wort (*Scrophularia nodosa*); No. 16, the flowering rush (*Butomus umbellatus*); No. 18, *Polygonum amphibium*. The rest were rightly named.

T. S. T.—The recipe for a good cement for joining together rockwork, as given in Taylor's "Aquarium," is the best we know of. Marine glue also forms a good cement; gutta-percha is untrustworthy.

A. J. S. (Kentish Town).—It is a specimen of pear (*Pyrus torminalis*), but the fruit is not so pleasant as the jargonelle pear.

S. A. S. (Belfast).—You will find the species alluded to in Berkeley's "Cryptogamic Botany," as a puzzling one, in the fungi.

F. W. C. (Bedford).—It is the reindeer moss, so called, though it is a lichen.

J. S. (Bolton).—The firm you mention are still to be found in Paternoster Row. No. 1, *Tortula muralis*; 2, *Funaria hygrometica*; 3, *Bryum*, but not in fruit.

D. D. (Thornhill, N.B.).—No. 1, *Carex sylvatica*; 2, *C. riparia*. The Salices are such a puzzling species that, unless they are carefully dried with male and female catkins, it is unwise to name them. However, No. 4 is *S. cinerea*.

EXCHANGES.

WANTED, Bate & Westwood's "Sessile-eyed Crustacea," Yarrell's "Fishes," Huick's "Zoophytes," and other Natural History works in exchange for Bury's "Polycystius," Berkeley's "Cryptogamic Botany," Quekett "On the Microscope" (last edition), &c.—C. Grimes, Dover.

WANTED, a few good specimens of *Dytiscus marginalis*, *Gyrinus natator*, suitable for microscopic objects; must be fresh, and need not be set. Well-mounted micro objects in exchange.—M. J., 51 Great Prescot Street, London, E.

WANTED, authenticated specimen of type and varieties of *Anodonta cygnea*, *A. anatina*, *Unio pictorum*, *U. tumidus*, *Sphærium corneum*, and *S. lacustre*. Shells or mounted palates in exchange.

CEYLON lepidoptera, pinned on papers, for micro-slides or material—diatoms, foraminifera, &c., or other exotic insects.—Dr. W. G. Clements, 2 Galle Face, Colombo.

WILL exchange Nicholson's "Palæontology" for Sowerby's "Grasses of Great Britain."—"Tyne," 326 Essex Road, Islington, N.

WANTED, tree-frogs, lizards, salamanders, and other reptiles. Exchange larvæ Lacustris, Carpini, Ocellatus, Lonicera, or cash.—W. Finch, 158 Arkwright Street, Nottingham.

FOR some beautiful hairs of the sea-mouse, send a stamped directed envelope to W. H. Gomm, The Green, Somerton, Somerset.

SNAKES (splendid grass), common, smooth, and warty newts for exchange.—Edmund Lye, Stony Stratford, Bucks.

BEAUTIFUL fossil sand, from Sourcat's tertiary deposits, containing well-preserved foraminifera, shells, corals, spicules (any quantity); in exchange for good mounted slides.—E. Rodier, 61 Rue Mazarin, Bordeaux, France.

WANTED, living specimens of *Geomalacus maculosus* or *Testacella Mangei*. I should also be glad to receive (for studying variation and geographical distribution) consignments of the common slugs of any district whatever.—Wm. Denison Roebuck, Sunny Bank, Leeds.

A FINE collection of pleistocene and neolithic remains offered for a complete human skeleton.—Ernest L. Jones, Belmont, Sale, Manchester.

WANTED, good specimens of rhinoceros horn, hoof of bison, antelope, &c., pieces fit for cutting sections from. Good micro slides given in exchange.—M. J., 51 Great Prescot Street, Goodman's Fields, London, E.

CASSELL'S "Butterflies and Moths," Parts 35 to 60, mostly uncut; also "Knowledge," Nos. 37 to 66, perfectly clean. What offers in cash?—Fred. Calver, 10 Somerleyton Street, Unthanks Road, Norwich.

IRISH nests or eggs of dipper, goldcrest, sedge warbler, chiff-chaff, grey wagtail, rock pipit, buntings, goldfinch, lesser redpole, bullfinch, chough, teal; eggs of sea birds in clutches. Wanted, good British-taken eggs in clutches.—Send list to R. J. Ussher, Cappagh, Lismore.

WANTED to exchange shells with a resident in North America. British land and freshwater shells offered for American. Especially wanted, American Helicidæ and Limnacidæ.—F. M. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

WANTED to exchange vols. iii. to xxiv. of "Nature" in parts, clean—vols. iii. and ix. want one part each, viz., April in each—for vols. i., ii., iii., and iv., of "British Conchology," by Jeffreys, and some good work on the British oolite.

UNNAMED shells for British beetles; zoophytes, and marine algæ preferred.—M. DODS, 24 Ballater Road, Acre Lane, Brixton.

WANTED, the following eggs and nests: pied fly-catcher, ring ouzel, stonechat, lesser whitethroat, rock pipit, woodlark, goldfinch, linnet. Will give other eggs and rare British Lepidoptera.—Thos. H. Hedworth, Dunston, Gateshead.

SIXTY Australian birds' skins, prepared for stuffing; 150 microscopic slides; pair of buffalo horns, over 6 feet long. Exchange for good micro slides, a polariser or pair of prisms, Valentin's knife, or books on natural history or otherwise.—William Tylar, 35 Burbury Street, Hockley, Birmingham.

WANTED, SCIENCE-GOSSIP for 1869, 70, 71, 73, 74, 75, unbound, for Silurian and coal measure fossils, good cabinet specimens, cleaned and named.—C. Beale, Lime Tree House, Rowley Regis, Dudley.

SEVERAL comprehensive series of duplicates, Upper Silurian and coal measure fossils, good cabinet specimens, cleaned and named, to exchange for geological books or maps, or fossils from other formations, flint implements, or other objects.—C. Beale, Lime Tree House, Rowley Regis, Dudley.

FOR exchange for slides, viz.: fluid for preserving organic substances, Dean's compound, glycerine and gum, glass-cleaning solution, preserving fluid for animalcula, zinc oxide cements (red, white, blue, and yellow), fluid for infusoria, double stain for vegetable tissues (*vide* SCIENCE-GOSSIP, vol. xvi. p. 6), brown cement, concentrated solution of chloride of lime, asphalte varnish (not Brunswick black), and several others; write for list, post free.—S. H. Robinson, 20 Branston Road, Burton-on-Trent.

WANTED, parts of wings of exotic Lepidoptera, also wing-cases, and other parts of brilliant Coleoptera for mounting.—F. A. A. Skuse, 143 Stepney Green, London, E.

FOR exchange, a good reversible compressorium.—E. B. L. Brayley, 13 Burlington Road, Clifton, Bristol.

FOR foraminiferous sand, send stamped and directed envelope to F. A. A. Skuse, 143 Stepney Green, London, E.

WANTED, *Erebia Blandina*, *Arge Galathea*, *Pieris Napi*, *Polyommatus Arion*, *P. Corydon*, *P. Adonis*, *P. Ægon*, *Thecla Pruni*, *Thecla W. album*, *Argynnis Lathonia*, *Apona Cratægi*, *Colias Hyale*, *Colias Edusa*, *Apatura Iris*, *Limenitis Sibylla*, *Papilio Machaon*. All senders of those named should send box in order to have some others sent back in return for those received.—G. H. Skuse, 143 Stepney Green, London, E.

BOOKS, ETC., RECEIVED.

"Whence, What, Where?" By J. K. Nichols, M.D. London: Trübner & Co.

"The Standard Value of Gold." By W. L. Jordan. London: D. Bogue.

"Manual of Taxidermy." By C. J. Maynard. Boston: S. E. Cassino & Co.

"British Marine and Freshwater Fishes." By W. Saville Kent. London: W. Clowes & Sons, Limited.

"Sunspottery." By J. A. Westwood Oliver. London: Simpkin & Co.

"Hardy Perennials." By J. Wood. London: L. Upcott Gill.

"Land and Water."

"Midland Naturalist."

"Journal of Conchology."

"Natural History Notes."

"Practical Naturalist."

"Young Naturalist."

"Ben Brierley's Journal."

"American Naturalist."

"Science."

"American Monthly Microscopical Journal."

"The Botanical Gazette."

"The Popular Science News."

"Canadian Entomologist."

"Cosmos: les Mondes."

"Le Monde de la Science."

"Feuille des Jeunes Naturalistes."

"Bulletin de la Société Belge de Microscopie."

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 12TH ULT. FROM:—J. J. O.—J. G.—G. M.—J. T. G.—A. S. W.—E. R.—R. Y. G.—T. S. T.—D. S.—E. L. J.—M. I.—E. T.—J. W. T.—M. C. W.—L. M. B.—H. F. H.—L. C. M.—H. & E. J. D.—J. E. C.—A. H. B.—W. D. R.—M. K.—W. H. T.—P. T.—J. W.—W. B.—W. C. H.—W. K. J.—J. E. A.—J. S.—F. B.—R. M. C.—M. I.—Dr. W. G. C.—W. H. H.—G. H. R., Jun.—F. M. H.—C. S.—C. B. M.—F. W. S.—J. T. G.—M. S. W. G.—T. C. M.—C. A. G.—C. S.—W. H. D.—J. D. J. B. B.—W. F., Jun.—I. F.—W. I. V. V.—T. H. H.—H. W. S. W.—B.—W. W.—W. B.—D. W.—Rev. E. G.—R. I. U.—F. C.—I. S.—F. M. H.—H. C. B.—A. H. B.—F. H. P.—F. A. A. S.—W. T.—S. H. R.—C. A. L.—A. D.—G. H. S.—P. Q. K.—C. B.—H. P.—E. L.—W. G. W.—R. M.—W. S. K.—E. B. L. B.—T. H.—J. W. W.—R. T. V. S. W.—A. E. C. S.—G. H. S., &c.

ON DRAWING MICROSCOPIC OBJECTS.

By BERNARD HOBSON.

I PLANNED the apparatus about to be described without previously knowing of similar inventions, such as that of Mr. C. W. Cooke, mentioned in Beale's book, page 28, or that of Mr. Morrison, mentioned in the American Monthly Microscopical Journal for 1882, page 59.

Drawing by this "micrographic camera" is the simplest, cheapest, most convenient, and at the same time, not at all a bad, although, perhaps, not the best, method of delineating objects. The camera consists of a Huntley & Palmer's large square-shaped tin biscuit canister, measuring $9\frac{1}{8} \times 8\frac{1}{2} \times 9\frac{1}{2}$ in. deep. In the centre of the lid I have had a circular hole $5\frac{1}{4}$ in. diameter cut, and a similar hole $2\frac{1}{8}$ in. at the bottom of the canister. In the hole at the bottom a conical tube, $2\frac{1}{4}$ in. long $\times$ 2 in. greatest $\times$ $1\frac{1}{2}$ in. least diameter, is soldered. The paper being stripped off the canister and the whole being japanned black, it presents a neat appearance. Inside the canister a piece of plate-glass, $8\frac{15}{16} \times 8\frac{3}{8}$ in. fits underneath the lid, but rests on the top edges of the canister, and is held firmly in position by the lid, when the canister is shut. A piece about $5\frac{1}{2}$ in. square of the thinnest, whitest tracing paper obtainable is inserted between the lid and the plate glass, which hold it in position opposite the large central hole. The whole of the camera is painted dead-black inside, with lamp-black and turpentine. Cost as follows:

	s.	d.
Canister	1	0
Japanning, cutting holes, soldering tube on, cutting circular plate mentioned below	2	0
Plate glass	0	4
Total	3	4

I intended to use the above-mentioned apparatus with eye-piece of the microscope, arranging the tracing-paper to be at ten inches, the fixed distance of distinct vision, from the eye-piece, but found that when the light brought to focus at a point was diffused over a circle of $5\frac{1}{4}$ in. diameter the loss of definition was too great. By taking off the eye-piece far better results are obtained. The conical tube of the camera is then slipped over the microscope tube, after having first focussed the object with the eye-piece. If the illumination be strong enough, and all light be excluded from the top of the camera, where the tracing-paper is, an image of the object will be thrown on the tracing-paper. To bring it to focus, the coarse-adjustment milled-head must be turned; then, by moving the object and the light, the image may be made to occupy the centre of the field, and the centre of the circle of light projected on the tracing-paper. For convenience in drawing it is better to incline the microscope at the usual angle, and support the camera above it at the same angle. I make use of a small wooden camp-stool, with a flat wooden top, and insert books or two oblong iron seven-pound weights under the camera to prop it up at the right inclination. If any light enters between the tube of the camera, and that of the microscope, it may be completely excluded by using an india-rubber cone (used by plumbers for connecting wash-basin pipes), price 8*d.*, made like a funnel, and open at both ends. This serves to make a light tight connection between the two tubes. It is convenient to have a circular plate of tin japanned on the outside, and blackened on the inside surface to fit into the large circular hole in the camera. In this plate a much smaller round hole is cut. This enables one to vary the size of the field of view, and centre the image if required.

I saw in a book called the "Minor Arts," by

C. G. Leland, page 62, the following recipe for making tracing-paper, which can be reconverted into ordinary opaque drawing-paper after drawing upon it:—

If one volume of castor-oil be dissolved in two or three (I prefer three) volumes of spirit of wine, the mixture will render paper immersed in it transparent, and the spirit rapidly evaporating, the paper will become fit for use in a very few minutes. (I find two or three hours necessary to dry it.) If the paper be afterwards placed in spirits of wine, the oil is dissolved out, and the paper presents its original appearance.

I find the recipe to be quite correct, and think that many readers of this paper will find it useful.

The illumination I make use of is that of Swan's Special Microscopical Incandescent Electric Light, of which more in last month's number. The full power of the battery should be put on, so as to give a dazzling light if the object be viewed with the microscope eye-piece, otherwise a clear image will not be cast on the paper. As, however, most readers of SCIENCE-GOSSIP have not the electric light, perhaps a few words as to the use of daylight would be useful. The dazzling light reflected directly from the sun, gives the most distinct image. Should the heat of the rays be feared, it might be cut off by interposing a cell containing a solution of ammonio-sulphate of copper between the light and the mirror, although, not having tried this, I am afraid the light would be much diminished. The tracing-paper must be externally in darkness. This may be secured by closing the shutters and drawing blinds and curtains so as to exclude all light but that on the mirror, or by covering one's head with a dark-cloth like a photographer. Probably the most convenient plan would be to cut a hole large enough to admit the tube of the microscope, including the adjustment milled-head in a dark tent. If this were done the camera-box might be dispensed with, and the image might be thrown on to tracing-paper stretched over a framed plate of glass placed at any convenient distance.

A dark tent, which would be easy to make, is described by Mr. J. C. Leake in Cassell's "Popular Recreator," vol. ii. page 227. The following is an extract from his remarks:—

"The first thing required will be a shallow box or tray of wood which will form the bottom of the tent. This should be made of dry pine about half or three-quarters of an inch in thickness. For a nine-by-seven (photographic) plate the base should be about two feet by eighteen inches. To the outer edges of this board should be screwed a wooden rim, about two inches deep (and one inch thick). This will form a capital operating table of convenient size. The top will consist of a light board, say half an inch in thickness, and of exactly the same size as the base; round this must be screwed a fillet of wood, so placed as to fit into the tray which forms the base of the tent.

"The next thing will be the covering, which should consist of two thicknesses of black "twill" (also yellow calico if used for photography). This covering should be secured at the edges by small tacks to the inner side of the bottom tray, and the inner side of the top fillet, taking care to nail it very closely, so as to exclude light, and make it very secure. The covering material should be made to extend along the back of the tent, over the two ends, and for six inches each way along the front. (The length way of the boards forms front and back, the ends form sides.) Each thickness of covering material will therefore require to be two yards in length and the edges in front of the tent will require to be neatly stitched, so as to unite the thicknesses. In order to ensure the tent standing square when erected the lining should be fixed both at the top and bottom, quite parallel with the base and cover.

"In order to stretch the lining and erect the tent, two stout rods will be required, which should be rather longer than the height of the tent, when the top is raised to the extent allowed by the lining. If these rods are inserted at the ends of the tent, and pushed firmly up, so as to stretch the covering out tightly, a box will be formed; which, if the work has been well done, will be almost as firm and rigid as if made of wood.

"The next thing will be to provide a curtain which may cover the opening left in the front of the tent. For this purpose the same black material may be employed, and it should be large enough to reach some little distance round the edge to the ends of the tent and to fall quite loosely.

"This curtain should now be secured to the top by strings of tape inserted in small eyes placed upon the cover of the tent, and to the sides by strings of the same material, fastened both upon the curtain and the sides of the tent. The curtain (being intended to wrap round the operator and exclude light) should be made very full, and long enough to fall at least two feet below the bottom of the tent. The whole tent, when folded up, will be enclosed in a flat box about three inches in thickness."

For use with the microscope probably the best plan would be to make the base board six inches wider, say two feet by two feet. Then the tent might be made of the size above described, and a ledge two feet long and six inches wide would be left outside at the back, at the opposite side of the tent to the operator. Two holes might be made in the twill at the back, one of them provided with a tape to draw it up tightly round the lower end of the microscope limb, the other having a circular brass curtain-ring stitched into it to admit the light from the mirror. If thought desirable, a broader ledge to hold a lamp might be left. Such a tent would be convenient for ordinary work with the microscope, as I have seen somewhere pointed out.

If the eye-piece be removed from the microscope as previously recommended, the image thrown on the tracing-paper at about 20 inches distance from the object will not be as highly magnified as if seen with the eye-piece down the microscope tube. A 1-in. objective will magnify about 30 diameters instead of 50 diameters.

Among the advantages of this camera apparatus is that of enabling one to obtain intermediate magnifying powers, in fact it is in itself a microscope stand. By using only the objective of the microscope fitted on to the end of the conical tin tube by means of the india-rubber cone, a magnified image of any object may be cast upon the tracing-paper. With the 1-in. objective used in this way the magnifying power will be about 15 diameters. If the box were made so that the distance of the paper could be varied, any amplification might be obtained although with loss of light and definition at long distances. If such a camera were desired it would no doubt be better to buy a photographer's bellows-camera, which could be used for drawing objects by substituting a sheet of plate-glass and one of tracing-paper for the ground-glass used for focussing on. A photographer's tripod stand would also be convenient for inclining the camera at any angle.

In order to support slides in front of the camera, when the microscope stand is not used, I have made a simple holder as follows :—

Two slips of wood, about 4 in. high, have a slit 2 in. long, and broad enough to admit the slide edgewise, cut in them with a fret saw. These uprights are joined by a cross piece at the bottom, and stand 2 in. apart. The cross piece is fastened by a hinge in the middle to a flat oblong board $6\frac{1}{2} \times 3$ in. so that the uprights stand equidistant from each end, and can be inclined at any angle. Near the end of the board, behind the uprights, two small oblong holes are made, into which two small pieces of wood are fastened by pins driven from the edge of the board. These "struts" serve to support the uprights as they turn on the pins, and their upper ends are cut off at angle of about 45 degrees, so as to make them fit into notches in the back of the uprights. This holder might be placed on a book, but if four brass shutter-screws turning in brass pieces let into the board were added, it could be raised or lowered as desired. By using two boards, the upper sliding on the lower, and a shutter-screw or rack and pinion in a horizontal position, probably it would be easier to focus.

Another plan of holding an object which I find to answer beautifully, is to use the microscope stand as a holder merely. If the limb be placed in a horizontal position, the body racked back out of the way, the mirror, and, if possible, the pivoted limb holding it turned aside, the slide may be held in the ordinary clip. The upper side of the slide should be turned downwards, and the tube of the camera brought to coincide with the centre hole of the stage. By bringing the electric or any other available light between the body and the stage or "above the stage," the magnified image will be thrown on the paper-screen of the camera. A diagram of this arrangement is given in my article last month, page 172.

The ease with which the magnifying power can be ascertained by the actual measurement by this apparatus is obvious.

Another and very great advantage of it is this, that in a dark room an object may be exhibited to several persons at once. It would be very convenient for class demonstrations.

I have no doubt that, for drawing objects in the way I have described, the Oxyhydrogen Lantern Microscope, mentioned on page 229 of Davis's "Practical Microscopy," and sold by Mr. Browning, complete with objectives, but without lantern, for £5 10*s*., would be very useful, and certainly better for class demonstration. Mr. Davis says that for exhibition neither oil nor the best paraffin-lamps yield enough light. The electric light would do if a larger lamp were used, and possibly for drawing merely, less powerful lights.

I have only just seen the series of articles on "Drawings, &c., from the Microscope" in SCIENCE-GOSSIP for 1882, pages 1, 39, 49, 74, 90, 97, 230. Mr. Draper remarks on page 1 : "The effect of a microscopical painting is greatly enhanced by its being drawn within a circle, surrounded by a black margin forming a square." I think it would be much the best plan to buy paper with the black square and white circle in centre, ready lithographed, from Messrs. Watson & Sons, High Holborn, who execute the plates for Cole's "Studies in Microscopical Science."

In Februrary 1882, page 39, Mr. Holmes remarks : "E. T. D. omitted to notice that outlines produced by camera-lucida are reversed." In reply to this remark, Mr. Draper, in April, page 74, says : "The neutral tint reflector . . . has the great disadvantage that everything is reversed; consequently, when removed, any further drawing from the microscope is extremely difficult, not to say impossible." He says further : "I am persuaded this neutral glass reflector has often been a snare and delusion to many a young draftsman, and should at once be abandoned by those who are ambitious to do prolonged after work." This is a good instance of the danger of hastily condemning appliances which happen to differ from those of which one habitually makes use. It is perfectly obvious that nothing further is required than a semi-rotation of the stage, to place the object the other way up, and enable one to fill in details. Of course the light and shade require attention, but the larger structural detail could be filled in.

In March, on page 49, Mr. Suffolk says : "I dispense entirely with camera-lucida, and substitute a grating ruled in squares . . . on a double convex lens. The drawing is made on ruled paper." In May Mr. Draper, page 97, comments on this, that "for a highly finished painting . . . such a method of fixing positions cannot be employed, the pencilled 'squares' on the paper are difficult to erase, and you can never permit any 'rubbing out' on paper designed for tender drawing and delicate colouring." No doubt true; but neither Mr. Suffolk nor Mr. Draper seem to be acquainted with the "Sectional Papers" of Messrs. Letts, Limited, London Bridge. These papers are ready ruled in very faint squares of $\frac{1}{20}$, $\frac{1}{16}$, $\frac{1}{12}$, $\frac{1}{10}$, $\frac{1}{5}$, $\frac{3}{8}$, $\frac{1}{3}$, $\frac{1}{8}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{1}{6}$, $\frac{5}{8}$, $\frac{3}{4}$, $\frac{7}{8}$, and one inch, and although for "fine art" drawings, the lines might be objectionable, for scientific purposes they would be advantageous, if each square were arranged to represent $\frac{1}{100}$ or $\frac{1}{1000}$ of an inch. Tracing-paper ruled in the same way may be had, and by placing it over a finished drawing, the latter can be copied on sectional paper, without disfiguring the original. In May, on page 98, Mr. Draper says: "Favourite subjects are the various parts of insects. How best to see them? Certainly not distorted between flattened glasses." There is an article on this subject (entitled "Unpressed Mounting for the Microscope") in the Journal of the Postal Microscopical Society, for September 1882. (1s.; W. P. Collins, pub.) In April 1882, page 89, T. R. J. makes an astounding assertion: "An object drawn by means of a camera or tinted reflector at ten inches from the eye-piece, would be twice as large as if drawn at five inches, but both pictures would represent the same magnifying power." I do not see how this can be true in any sense of the words "magnifying power," evidently not in the sense of mere amplification, and certainly not as regards the amount of detail observable.

The object as seen at ten inches will be as truly magnified as if it had been examined with an objective of higher power at five inches, although the light may not be so good.

T. R. J. is quite right in saying that, as usually understood among microscopists, a drawing of an object said to be magnified 500 diameters, should represent the details of structure visible under the microscope to the draftsman. If one of the statues of the apostles, which I have seen at St. Peter's, at Rome, and which is 16 feet in height, shows no details of structure that would not be visible in a man 5 feet 4 inches high, no microscopist, in his senses, would maintain that it was a correct representation of a man, magnified 3 diameters. Magnified representations of objects would be of very little use if they meant absolutely nothing more than an enlarged diagram of what was visible to the naked eye. I am sure that if Mr. E. Holmes (see page 114) had a drawing of a flea said to be magnified 500 diameters, in which nothing was delineated except what was visible to the naked eye, he would consider that Dr. Carpenter, or whoever the author of the book might be, was misleading him.

Tapton Elms, Sheffield.

NOTES ON FASCIATED STEMS.

By H. W. Kidd.

As not a few of these curious malformed stems have come under my notice from time to time, I think some remarks thereon may not be unacceptable to your readers. Through the kindness of my friend Mr A. H. Swinton, I am enabled to forward you sketches of some examples. With regard to the term "fasciated," I think there is no doubt that this term was originally and correctly applied to these stems in its radical sense, of a long narrow strip of cloth or bandage, and that Dr. M. C. Cooke correctly defines them as stems flattened out. From the Latin noun fascia, we get fasciatum 'in bundles,' that is, bound by a fascia. It unfortunately happens that these stems have at first sight very much the appearance of being formed by the union of several shoots. In Ogilvie's Comprehensive Dictionary, "fasciated" is said to be in botany applied to certain flattened stems of trees which appear to be formed by the union of several. The word "appear" must be taken for what it is worth. Even if these stems were formed by the confluence of shoots, "bundle" would not be a happy designation; one would scarcely describe a Pandean pipe as a bundle of reeds, seeing all the reeds are on the same plane. That these stems are one stem flattened is perfectly clear, there being only one pith which is always pressed nearly flat; this has been pointed out by Herr Professor Makowsky, in a paper published in Germany, of which a friend has kindly furnished me with a translation.* Only a few months since I found a dandelion with a flattened stem, crowned by two distinct flower-heads, but the stem was a single flattened tube, and not two connate stems, as I at first supposed. Moreover I have before me a drawing of a daisy, brought me by a friend in April 1866 which has four confluent disks and a flattened stem, but whether this stem was four stems united I cannot tell. Judging from the dandelion, I should rather think it was not; I do not know of a single case of two or more shoots being produced in confluence, although there seems no possible reason why this might not happen, seeing that what are commonly called "double fruits" are by no means rare. Of course woody stems sometimes become confluent, simply because there is not room for their annual increase; this may be often seen in the common ivy. When smaller flattened shoots are produced from the coxcomb end of these fasciated stems, I believe they are always on the same plane as Herr Makowsky observes, as in the holly, in fig. 119, *a*; at least I believe this to be the case, although the stems have somewhat twisted in drying. I have a sketch of a flattened holly stem, made in 1866, which seems to be the first stage of fig. 119 *a*; the blade being

* Verhandlungen des naturforschenden Vereines in Brünn, III. Band 1864, S. 19.

crowned by a confused crest of leaves, in the axils of which buds were probably forming for ramification of the flattened stem. A fasciated stem of vegetable marrow has been brought to me rather more than six feet long, and from an inch to an inch and a quarter in width. Towards the top it has divided into two branches, both of which are flat, and are decidedly on the same plane. On the other hand, it must be borne in mind that where round branches are produced from these flattened stems, they arise from any part, the edge not excepted. A glance at the ash, fig. 119, *a*, will show at once that phyllotaxis, or leaf arrangement, is quite obliterated in these flattened stems, as buds of the ash are normally in pairs. What the cause of these deformed stems may be, is rather hard to say; but I am disposed to think they are caused by a super-abundance of sap, as, upon the whole, rank growing species and individuals, seem more liable to it than plants which are of a less vigorous habit, and that cultivated plants are more liable to it than wild ones. Sir J. D. Hooker, in a letter to the writer respecting the fasciated stem of asparagus, remarks that the fasciated asparagus is extremely common, due no doubt to the rich soil given to a plant which in its wild state is but poorly fed. I possess sketches of two fasciated stems of daphne, very similar to the ash, fig. 119, *d*, as also one of a Canterbury bell. In the case of the cock's-comb (*Celosia cristata*), Herr Makowsky states that by dint of propagation and artificial selection, the fasciated form has become permanent, and is now so much better known than the round stem that it not unfrequently passes for the normal condition of the plant. In conclusion, it may be as well to give a summary of all the plants which are known to produce fasciated stems. Holly (*Ilex Aquifolium*), ash (*Fraxinus excelsior*), daphne, dandelion (*Leontodon Taraxacum*), daisy (*Bellis perennis*), *Asparagus officinalis*, a species of Campanula, and the vegetable marrow (*Cucurbita ovifera*), have been already mentioned, and I am told they are to be found on willow, elm, and chestnut. There were exhibited in

Fig. 119.—Malformation of the Holly and Ash. *a*, fasciated branch of holly (*Ilex aquifolium*), reduced; *b c*, fasciated branch of ash (*Fraxinus excelsior*), reduced; *d*, fasciated branch of ash, natural size.

Kew Gardens Museum Number 2, a few months since, and are probably still to be seen, a fasciated stem of Scotch fir (*Pinus sylvestris*), and fasciations in the stems of certain British plants, as the *Convolvulus arvensis*, dandelion, primrose (*Primula vulgaris*) in a species of Campanula, and in the common wall-flower (*Cheiranthus Cheiri*), also a fasciated flower stem of *Lepidium campestre;* and what is yet more singular, a twisted stem of the Fuller's teasel (*Dipsacus fullonum*), a plant not naturally a climber. Herr Professor Makowsky mentions larch (*Larix*), oak (*Quercus*), and also, though more rarely, an Ailanthus and Rhus (*Sumach*), and likewise upon *Farsetia*,* *Cirsium* (thistle), *Matricaria* (Mayweed), and *Bupleurum* (Hare's-ear), and probably fasciations occur on many other trees and plants.

* One of the Cruciferæ.

SEPTEMBER AT THE ENGLISH LAKES.

OUR stay being limited to three weeks, I devoted myself chiefly to botany, and worked up the flora the more carefully, as I was dissatisfied with the information on botany given in the guide books. Though our visit was at the end of September, I found about fifty species of plants, some of them being of the less common kinds.

We left Cambridge on the 12th of September, and after breaking our journey at Northallerton, started early next day for Penrith, then taking the coach to Pooley Bridge. On our way we passed King Arthur's Round Table, a circular plateau surrounded by a trench, the use of which is still unknown, as far as I can make out. On arriving at the lake, we embarked in the little steam yacht and made for Patterdale, where we had determined to make our head-quarters.

A few walks sufficed to make us tolerably well acquainted with the general appearance and flora of the neighbourhood. The rocks "are the result of a chaotic intermixture of Green Slates and Porphyrites," the limestone being left near Penrith. The commonest plant (perhaps, excepting the bracken) is the parsley fern (*Cryptogramme crispa*), which grows like a weed all over the rocks, accompanied on some of the slopes by the lovely little *Alchemilla alpina*. Of the club-mosses, *Lycopodium clavatum*, *alpinum*, and *selago* grow all over the hills, whilst the closely allied *Selaginella selaginoides* occurs frequently in moist places. Large tufts of sphagnum form a wet spongy carpeting wherever water trickling down the slopes supplies them with moisture; this is tenanted by *Drosera rotundifolia*, *Eriophorum vaginatum*, *Narthecium ossifragum*, *Parnassia palustris*, *Pedicularis sylvatica*, *Pinguicula vulgaris*, though most of these occur frequently where there is no sphagnum. In many places a species of sphagnum, of a beautiful red tint, covers the ground. By the streamlets on the slopes of Place Fell, *Anagallis tenella*, *Saxifraga aizoides* and *stellaris*, the two last named also on Helvellyn, and *Cochlearia cordata*. In woods, *Polypodium dryopteris* and *phegopteris*, *Lastrea oreopteris* and *dilatata*, *Polystichum filix-mas*, *Athyrium filix-fœmina*; among the phanerogams, *Solidago virga-aurea*. The oak fern is commoner than the beech, but the above plants all grow in woods about Stybarrow Crag. In open meadows, *Alchemilla vulgaris*, *Geranium sylvaticum* (occasionally), *Sanguisorba officinalis*. In Patterdale, *Circæa lutetiana*, *Geranium lucidum*, *Jasione montana;* up Dovedale, *Gnaphalium sylvaticum*, *Gentiana campestris*. On walls, *Polypodium vulgare*. Less frequent are *Polygonum viviparum*, *Meconopsis Cambrica*.

One of our first walks was over the Grisdale Pass to Grasmere. It was a lovely sunny morning as we ascended the valley, and the bogs full of *Parnassia*, *Drosera*, and other plants had put on a very bright appearance. Some little way up the valley we came upon a small plant or two of *Sedum Anglicum*, and some of the *Saxifraga stellaris* and *aizoides* were still in flower. After crossing the stream and making a steep ascent, the view down the valley with the steep rocks of Helvellyn on one side, and of St. Sunday Crag on the other, and the bracken-covered slopes of Place Fell at the bottom of the valley was splendid. We passed several little cascades, and in one stream I found *Chrysosplenium oppositifolium* in leaf. At last we arrived at the little Grisdale Tarn sparkling in the sun, and then at the summit of the pass. In places the ground is said to be carpeted with *Silene acaulis* in the season.

We had to hurry down to Grasmere to meet friends. After a rest we walked on past Rydal Water, finding *Sedum Telephium*, *Gentiana campestris*, *Meconopsis Cambrica*, as well as *Parnassia palustris*, and old spikes of *Narthecium ossifragum*, visited Rydal Falls and went on to Ambleside, a reputed locality for the Hymenophyllum, which grows or grew in one or two places in the neighbourhood. Next morning we took a trip down Windermere Lake, but it being cloudy, we did not see the largest but not most beautiful lake to advantage.

In the afternoon we walked back to Patterdale over the Kirkstone Pass. The summit was enveloped in a thick Scotch mist, but we managed to see the indistinct form of the Kirk Stone, which certainly does not look much the shape of a "kirk." Lower down Brothers Water shone at our feet, and was afterwards passed. Near here were a few poor plants of *Achillæa Ptarmica*. *Menyanthes trifoliata* grows at the end of the lake. From this point a three miles' walk took us back.

Of course we took the first fine day for going up Helvellyn. And here, in the event of any of my readers following my steps, let me give one piece of advice, which is not given in any of the guide books. If you are at all nervous or giddy, don't go up Helvellyn by Swirrel Edge. I am aware that this advice is given with respect to one of the other ways tourists go up Helvellyn—Striding Edge—in most of the guide books. But none mention this way as being at all dangerous, bad, or uncomfortable; indeed, I read in Baddeley's Guide Book that as the way up by Striding Edge is dangerous and very narrow, "giddily inclined people will feel more comfortable in going up Swirrel Edge."

Soon after leaving Patterdale, we found some *Galium saxatile*. The way up was excellent, till, after crossing the end of the Red Tarn, we got out into the ridge between Helvellyn and Catchedecam. And even then, till we came to the last climb, it was not bad. But then the climb up was as bad as going along the Mauvais Pas at Chamounix, and worse, while all along the latter there is a railing to hold on to and here none. Large rocks had to be clambered over as best one could, while the precipice on one side did not add to our feelings of "comfort." One of our party felt so uncomfortable as to stop behind while we reached the top. We found a good many people up there that had tried coming down the Swirrel Edge, but turned back. But we were well rewarded for our trouble; for, from the top, we could not have had a better view. From the Scotch hills on our north, to Morecambe Bay on our south, and the Yorkshire hills in the far east, every outline was perfectly clear; in the foreground Scawfell and Bowfell were particularly prominent. The top consists of loose stones, very similar to pumice stone, and in many places beautiful quartz crystals are to be found. We came down a much better way by Dollywaggen Pike and the Grisdale Tarn, and were glad we did so, as the views of the part by Windermere and Coniston were better than from the top. The following plants, though not to be seen so late in the season, are said to grow on Helvellyn: *Cerastium alpinum*, *Chrysosplenium oppositifolium*, *Hieracium alpinum*, *Juncus triglumis*, *Oxyria reniformis*, *Rhodiola rosea*, *Salix herbacea*, *Saxifraga hirculus*, *hypnoides*, *oppositifolia*, *nivalis*, *Thalictrum alpinum*, *Woodsia ilvensis*. Of *Vaccinium Vitis-Idæa* we found the leaves near the top.

We had many beautiful walks about Patterdale. The Greenside Lead mills were very interesting, and we saw how the material as it comes from the mines is crushed, sifted, and washed to separate the lead, which sinks by its own weight. Afterwards the ore is smelted, to separate the silver with which it is largely mixed. Above the mines, near a reservoir, grow *Erica tetralix* and *Empetrum nigrum*. The Aira Force made another walk. The falls, 80 feet high, are in a lovely little glen, the rocks on either side carpeted with ferns and mosses bathed by the spray. On the road, about half a mile before the turning to the falls, *Narthecium ossifragum* and *Hydrocotyle vulgaris* grew plentifully in a bog. Another lovely walk was along the lake side in the direction of Howtown. The slopes of Place Fell are here covered with *Juniperus communis*, while *Blechnum spicant*, *Calluna vulgaris*, and *Erica cinerea* grow in one or two places. In their full beauty are *Lycopodium clavatum*, *alpinum*, *selago*, *Alchemilla alpina*, *Cryptogramme crispa*. Farther on, near a little cascade, *Corydalis claviculata* covers some of the bushes. We returned by the Boredale glen, and found in a bridge near Sandwick, *Asplenium Ruta-muraria*, which, with *A. trichomanes* grow in bridges or other places where there is mortar, but not elsewhere, and hence, occur but sparingly. *Cystopteris fragilis* grows up the glen in one or two places. But all the valleys and glens have their own beauty. Deepdale is interesting from the numerous glacier moraines at its extremity; Glencoin as being divided into two parts by a ridge, while Dovedale has been mentioned as a locality for one or two plants.

We spent a couple of days at Keswick, and did that most frequented coach drive the "Buttermere excursion." At first the road runs along at some distance from the lake, and is separated from it by woods, in one of which we saw a notice that "The ferns are strictly preserved." Having seen numerous advertisements about of "all the choice British and local ferns for sale" we understood the necessity of preserving ferns if one wanted to save them from extermination. Lodore Falls were perhaps improved by recent rains. *Hymenophyllum* and *Thalictrum majus* are supposed to grow here, but no traces of them were to be seen. *Sedum Telephium* was growing on a wall. At Grange, a rock close to the bridge is scratched and polished by glacier action.

A tradition reports that the inhabitants of Borrowdale once built up a wall to try and keep in the cuckoo, believing that if they did they would have everlasting spring, but they found the wall too low for the purpose.

The rocky sides of the valley are richly wooded, and a clear torrent runs along the bottom. Here is the Bowder Stone, a huge boulder standing on edge, on such a narrow base that two people on opposite sides can shake hands through a hole at the bottom. Then on to Seatoller, where a steep climb brought us to the top of the Hornster Pass. Many of the Patterdale flora, *Drosera rotundifolia*, *Alchemilla alpina*, the Lycopodiums and *Saxifraga aizoides* grow here freely. This is an extremely wild situation. The towering crags on either side are scarred with slate quarries from which the best building slate is procured. Formerly the quarrymen ran down some hundred feet of loose screes with the slates on their heads, but rails are now laid to the place where the slates are found. From this point till near Buttermere Water, the road is dreadful. At Buttermere we rested, and walked down to Crummock Water, which is well stocked with trout and char. In our drive back by the Vale of Newlands, nothing occurred worth mentioning, except that a quantity of white *Geranium robertianum* grew by the road, and *Narthecium* was plentiful in a bog near Keswick, the gone over spikes being very noticeable.

At Keswick we visited the pencil works. Almost all the lead now used for pencils is brought from Mexico, and is prepared by grinding down to a paste and baking. Genuine Borrowdale lead or "wad" is now worth from two to three shillings per ounce, and is used only for the best drawing pencils, the mines having been some time closed. It was merely cut to the right size and put into the pencil.

Besides this, raised maps or models of the Lake district are shown at Keswick. One on the scale of three inches to the mile was made some sixty years ago by Mr. Flintoft, from measurements made entirely by himself, and is exhibited with a small but interesting local museum containing collections of the fauna of the district, granites, porphyrites, "wad" from Borrowdale, quartzes, rock borings, ores, and antiquities, also a rock harmonicon, a musical instrument formed of slabs of hornblende slate from Skiddaw. A newer model on the six inch scale is also among the sights of Keswick; this was made after the Ordnance Survey.

It is very hard to decide which is the loveliest; Derwentwater or Ullswater. Many prefer the richly-wooded sides and broad expanse of the former to the wilder hills which encompass the latter. About Keswick, however, there are rows of boat landings, which seriously mar the beauty of the lake. And when Ullswater again burst on our view, we at once decided in its favour. As we skirted the shores, the full moon rose over the lake, and it was truly glorious.

Only a few days, and then—we took the same walk, but the other way, and with feelings of sorrow at its being our last walk; and often did we look back at Patterdale where we had had so pleasant a three weeks' stay. Where we greeted the lake with pleasure a short while before, we now parted from it with regret, and soon were brought back into every-day life.

I have examined the list of Local Floras published in SCIENCE GOSSIP a year or two ago to find whether any flora of Cumberland or Westmoreland is published, but, to my great surprise, considering the richness of this district, I find none named. Unless there is one published of whose existence I am unaware—and if so your readers will, I trust, kindly inform me on this point—there is great need of a "Flora of the Lakes," as the botanical information in guide books is very fragmentary and incomplete. Thus, "Jenkinson" gives only two localities—Barrow and Castlerigg—for the parsley fern, and one, Causey Pike, for *Lycopodium clavatum*, *alpinum* and *selago*—how abundantly we found them at Patterdale I have mentioned above. While in an old "Murray" we had with us many of the botanical names are misspelt, and one is at first puzzled as to what are the *Cystopleris fragilis*, *Sedura rhodiola*, *Armenia maistima* or *Dnosera rodundiflora*.

G. H. BRYAN.

OBSERVATIONS ON CLEAVAGE.

No. II.

PROFESSOR GEIKIE remarks that, "among curved rocks, the cleavage planes may be seen traversing the contortions without sensible deflection from their normal direction, parallelism, and high angle," and he further affirms, on the authority of Jukes, that the trend of the cleavage over the whole of the south of Ireland seldom departs 10° from the normal direction E. 25° N., no matter what may be the differences in character and age of the rocks which it crosses.* We have shown in a former paper that, in one portion of the Central Wales district at least, there is often very sensible deflection in the dip of the cleavage, and that this is due to the varying hardness (or resistance to fracture) of the beds crossed by the cleavage in the dip. Now, assuming that the strike of cleavage is constant, this non-variability of direction may be accounted for from the fact that cleavage-planes seldom cut across the planes of bedding along the line of strike. It is well-known that the strike of beds, and that of cleavage traver-

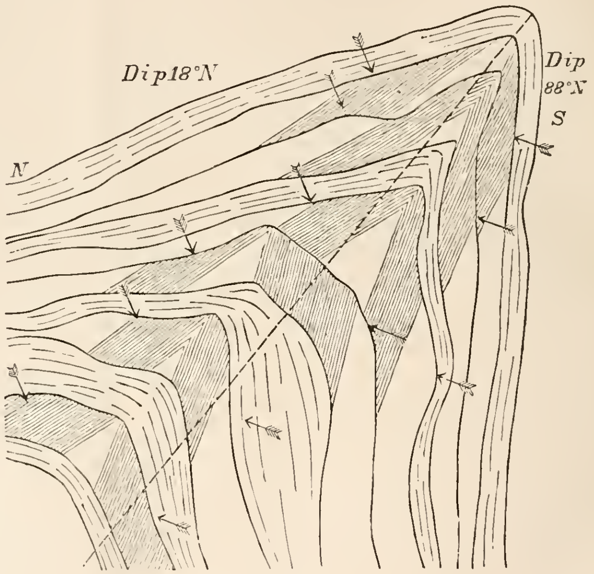

Fig. 120.

* Encycl. Brit. vol. x. 9th ed., p. 307.

sing them, as a general rule correspond very nearly. Examine plate ix. of the late Mr. Ward's excellent memoir.* It shows the direction of the anticlinals, and synclinals in the true dip, and cleavage dip—they are parallel, or form very acute angles with each other. The cleavage of the Skiddaw slates, (Lower Silurian), which are often much contorted and crumpled, is constant in direction (N.E.), in dip (S.E.), and amount of dip (between 55° and 60°). In the volcanic series the cleavage dips as high as 70°. There are exceptions to the above rules. Many years ago, De la Beche gave one example occurring at Sharkham Point, near Brixham, Devon. Here the direction of cleavage makes somewhat large angles with the planes of bedding.† When cleavage

strata. Action and reaction being equal and opposite, our observations are evidences just as much of variation in the direction of resistance to pressure. The major plication of strata, are usually termed anticlinal and synclinal curves, but just as each mighty

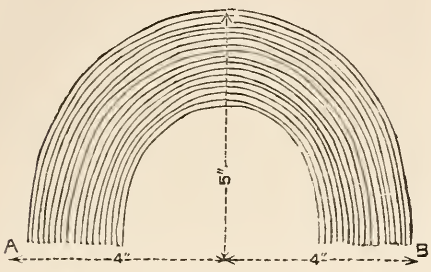

Fig. 121.

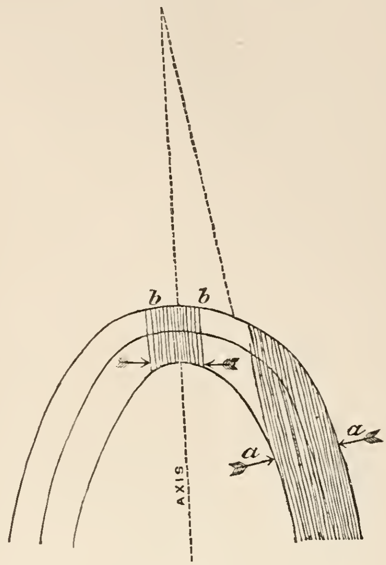

Fig. 123.

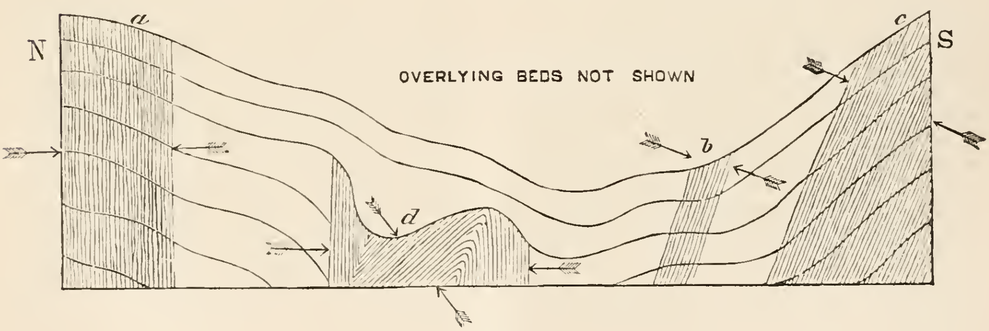

Fig. 122.

planes run parallel with planes of bedding, no refraction or bending of the planes is likely to take place; when the angles formed by the two planes are very small, the refraction, if any, will be very slight, so slight as frequently to be overlooked, but when the angles are larger, no doubt the cleavage-planes are bent when passing obliquely from a hard to a soft bed, or *vice versa*.

We have now to consider what appear to be evidences of variation in the direction of the pressure-forces which have contorted and cleaved certain

* Geology of the Northern Part of the English Lake District, 1876.

† Report on the Geology of Cornwall and Devon, fig. 3, p. 45.

swell of the ocean is made up of a number of lesser waves, so each great rock-curve is usually composed of a number of smaller folds. The latter are termed troughs and saddles—words which explain themselves. The smaller folds of rocks may be distinct and regular, or greatly broken and confused. Fig. 120 is a rough diagram of a saddle existing on the top of the hill marked Pen-y-Bannau on the geological survey map (quarter-sheet 57. N.E.). A little north of the Roman camp the beds are marked contorted. The saddle occurs about one hundred yards to the south of the camp. There is no distinct axis or saddle-joint, but here and there are very palpable evidences of fracture, and the dotted line shows that the ruptures have not taken place in the same plane. The fissure or saddle-joint is directed N. E. *b* E. (mag.) or very nearly that of the lodes of the district. The cleavage-planes on one side of the axis are clearly not parallel to those on the other side of it ; the two sets in fact form very acute angles with each other, but angles much less than those formed by the sides or "wings" of the saddle. The arrows show the probable direction of the fissure which produced this local contortion. They may be said to represent the resultant of the forces which folded the beds of clay-slate into such sharp curves. Indistinct lines of bedding are traceable in the hard beds, and in these beds no cleavage planes are visible, so that the phenomenon of refraction is not represented. The cleavage-planes near the crown or "buckle," form acute angles with the laminæ, but, lower down, the two sets of planes are almost identical in dip. The outcrop of the saddle—owing to denudation—is, of course, irregular, but it can be traced about 24 feet in vertical height. In one spot the beds appear to have been folded in a very regular manner. Fig. 121 shows a very hard bed made up of a number of thin laminæ, and apparently uncleaved. From A to B is only 8 inches, and, notwithstanding this sharp bending, the crown of the arch is unbroken. When a lamina is broken off and examined, it is seen to be by no means uniformly curved. The top of the curve is a wave whose crest and sinus form acute angles with the plane of the saddle-joint. Hence it would appear that oblique compression had produced these contortions. Is not this small unbroken curve an evidence that the rock was rendered somewhat plastic by the intense pressure brought to bear on it? M. Tresca has shown that a powerful compressing force will produce an internal motion among the particles of solid metals closely analogous to that of fluids, and some geologists are ready to admit that locally the same thing may have occurred in rocks, when they were subjected to great lateral pressure.*

Variation in the dip of cleavage-planes is still more marked in our next example. Fig. 122 is sketched from a series of beds occurring in the Lower Llandovery (b^4), rocks of Tregaron (Q.S. 57 S.E.) About half a mile N.E. of the town, there is the word "Castell" on the map; the beds are here marked contorted. I counted five saddles and four troughs in a horizontal length of only eight yards. A few feet above these greatly contorted beds, the clay-slate is moderately regular, and made up of smaller curves or rock-ripples. Within a distance of a few feet, the dip of the cleavage varies as much as 26°. At *a*, it is absolutely vertical (dip of beds 22° S.) ; at *b*, it is 72° N. (dip of beds 20° N.) ; at *c*, it is 64° N. (dip of beds 36° N.). Close by the beds dip 53° N.W. and the cleavage dips 79° N.W. At *d*, I have endeavoured to represent one of the sharper curves made up of a trough and a saddle, and the appearance of the cleavage dip at this point. Where there is a trough, the cleavage on each side of the trough-joint forms what may be termed a cleavage-trough, which is much more acute than the rock or bed-trough. On the other hand where there is a saddle, the cleavage abuts on each side of the saddle-joint so as to form a cleavage-saddle, also much more acute than the rock-saddle. Assuming that the cleavage-planes are perpendicular to the pressure which has produced them, the arrows show how the direction of the pressure, or the resistance to pressure, has varied over the small area. Viewed generally, the cleavage-planes passing through a saddle have the appearance shown ; but Fig. 123 is a true representation of the relation between the cleavage and the bedding. Close to the saddle-joint, the cleavage-planes are parallel with it, or exactly perpendicular to the crown of the bent beds ; lower down, the planes form acute angles with the bedding, and, still lower, both sets of planes are identical in dip. A prolongation of *a*, *a*, shows that they form very acute angles with *b*, *b*.

The cleavage can only be studied satisfactorily on or near the surface, because weathering action has there more or less separated the planes, and, owing to the unequal effects of denudation, some planes are left standing, and the lower or higher ones have been carried away, rendering the measurement of the dip an easy task. In sections of rock 300 feet below the surface, and possibly at much greater depths than this, the cleavage appears in section as a number of somewhat indefinite parallel lines, giving the rock the appearance of a ribbon-like structure. These lines are seen to traverse certain portions of the lead lodes uninterruptedly. Where this occurs the lodes consist of several parallel veins, and the cleavage-planes are visible only in the rock or "country" dividing the veins. This fact must have a bearing on the origin and history of the Cardiganshire lodes.

The general conclusion to be drawn from the above observations, is that where rocks have been sharply folded, the cleavage sometimes varies pretty considerably in dip, even within a distance of a few feet, and that such variation is evidence that the folding has not been of such simple nature as in certain experiments, e.g. those of Sir James Hall. Rocks are of very variable thickness, hardness, chemical composition, &c. ; and our experiments, as yet, only bear a faint resemblance to what has taken place in Nature's great laboratory. But if they do not teach us the whole truth, they show us the direction in which the truth lies ; and better experiments and keener observations will, no doubt, in time help to clear up this still mysterious and fascinating subject.

E. HALSE, A.R.S.M.

* Prof. Geikie, art. Geol., *op. cit.*

A NEW HISTORY OF THE SPARROW.

By George Roberts.

ARCHITECTURE AND BREEDING HABITS.

THE sparrow (*Passer domesticus*) well illustrates the theory of the survival of the fittest. Its attachment to man and his products gives it advantages over all other birds. Its manner of breeding enables it to bring up its young with greater ease and certainty than almost any other bird. In early spring it constructs a nest in holes in walls, and under tiles and slates in dwelling houses. These places are warm and secure from storms, and also from prowling enemies. The nests of other birds in the early spring are subject to frost, rain, and wind. A little later (the sparrow knows the time) it begins to build a nest in trees, and this nest is a pattern of stability, convenience, and comfort. The female is the architect; the male works to orders. As soon as the site is fixed upon, both begin to bring slender twigs, dry fibrous roots, and dry grass stalks, and these materials are worked and woven into a round, or rather oblong hollow structure, sometimes large enough to fill a peck measure. The male works tolerably hard till the nest is nearly finished; he then becomes negligent, and often takes a jaunt with other idlers into the fields and gardens to see how the crops are coming on, leaving the female to collect all the soft feathers and bits of warm flannel and wool to line the inside of the cradle. When the eggs are laid the male takes his turn at sitting, but he dislikes being cooped up in a dark prison. He prefers mounting guard on a branch about a yard off the nest, where he can look about him; he there sits and chirps at the top of his voice, proclaiming to the neighbouring community that all is going on prosperously. From this place he is also ready to join other small birds at a moment's notice in the task of mobbing any passing hawk or wandering cuckoo.

This masterly nest gains for the sparrow at least three advantages over most of the other small birds. First, by being thatched it prevents the eggs from being seen by the rook, crow, or magpie, or any other egg-eating bird; it also secures the young against that arch-enemy of nestling birds, the cat. Secondly, it preserves the eggs and young against the chilling effects of rain, snow, and wind. Whilst other young birds are starving and suffering in their roofless nests from the piercing blasts of early spring, the young of the sparrow, even when the mother is absent, are snugly enjoying a feather bed. Thirdly, the construction of the nest ensures greater and more uniform warmth, and thus brings the young on to maturity in less time, and with greater certainty. The position of the nest is another consideration. It is very often placed in a high tree out of the reach of ordinary enemies. It is often in some tall, ivy-covered tree, doubly shielded by its own roof, and by the pendent ivy leaves; or in some thick scraggy thorn bush, which no cat or other nest-hunter can climb on account of the thorns, which present a thousand defensive dagger-points on every side. The nest is frequently pitched, it is said, under the nest of rooks; the latter, in that case, will ward off the snow and rain and violent winds. The sparrow never places its nest on the ground, where it would be subject to damp, and to the depredations of snakes, weasels, hedgehogs, rats, mice, and cats; and, lastly, to mischievous boys. Though the sparrow is very overbearing and tyrannical when among other birds, it is said that he is exceedingly polite and humble when among the rooks, seeming to consider it a great privilege to be allowed to take up his residence in the rook-city. He never attempts to usurp the nest of the rook, unless it be a deserted one, and then, like a skilful architect, he seizes it and adapts it to his own wants to save labour, but in all other things he behaves himself in the most submissive and condescending manner. Thus the two species—the most eminent of British birds for sociality—live together in amity.

The nests which are in holes of walls are equally inaccessible with those that are in trees. In these cases the builder accommodates itself to circumstances, and practises economy of labour. Knowing that there is already a roof, the dome of the nest is omitted, or at least only partially constructed of a few arching straws, though the nest sometimes is of considerable size.

Trees are the normal nesting sites of the sparrow, and before there were any artificial walls it would be confined to trees or to rocks. But the bird has partially turned away from its normal nesting-places and attached itself to man's dwellings, which are convenient and much warmer than the trees, hence it is enabled to raise two or three broods, whereas formerly it might have raised but one. This is a clear gain to the sparrow as a species. It adapts its nest to the cavities in the wall; that, in itself, must entail some modification of architecture. The modification is favourable to the bird, for it enables it to build its nest with less labour, a smaller nest being required, hence there is a saving of time. In addition, greater warmth is secured, as it often happens that the nest is placed close to some flue or chimney. The fecundity of the species is also increased by this semi-domesticity. The sparrow thus improves its condition, from these causes alone, so much so that it has gained a perceptible ascendency over other species. But leaving aside its domestic habits and its predilection for warm walls, its domed nest gives it an immense advantage over birds that build an ordinary, hemispherical, exposed nest. There is as much difference in comfort between the house-sparrow's warm, bulky nest and that of the hedge-sparrow, as there is between a good dwelling-house and a gipsy-tent. Perfect, however, as the sparrow's nest may be, yet it might be more perfect. There is another bird (not

British) which is ahead of the sparrow; it constructs a domed nest with two chambers, one for the eggs, and one for the male to roost in. If our sparrow could be informed of this it would probably take the hint. A little parlour would be very useful for the male to sleep in during the cold nights, or to take shelter in during a thunderstorm.

Some philosophers maintain that there is no improvement in the habits of birds, man alone being progressive. It must, however, be admitted that there can be alteration, and if the alteration is for the benefit of the species it must be an improvement. The so-called accidental variations which have often been observed in the architecture of birds—many showing a tendency to improved construction—would, if properly investigated, be found not to be accidental at all, but the result of a fixed law, of which we know nothing. The probable fact is that birds progress and decline like the various races of man, but the steps are so slight and the process of progression so slow, and the data by which we might judge so limited, that we have not yet been able to take adequate notice of any progression or improvement.

(*To be continued.*)

THE TREE TOAD AND WOOD FROG (*HYLA VERSICOLOR* AND *RANA SYLVATICA*).

By Dr. C. C. Abbott.

A PRETTY batrachian, with which Americans are more or less familiar, unless their whole lives have been spent in a large city, is the tree-toad. Unlike the common toad, which is terrestrial, or the frogs that are aquatic, this animal leads an arboreal life. In anatomical structure, therefore, it differs from both the others, so far as this is necessary to its peculiar mode of life; the most prominent variation being found in the fingers and toes, which are more or less dilated into disks at their tips.

Fig. 124.—The Tree Toad (*Hyla versicolor*).

This little tree-toad soon attracted the attention of the early colonists of New Jersey, and I find mention made of it as early as 1698. Gabriel Thomas refers to a "sort of Frog that crawls up to the tops of trees, there seeming to imitate the Notes of several birds." The idea of the resemblance of its note to that of "several birds," or of any one kind of bird, is rather amusing.

Like all of our batrachians, the tree-toads make their way to the water, as the proper place for depositing their eggs. These eggs are "attached singly and in small groups, along the grasses resting on the water's surface." Eggs deposited on May 10th are recorded by Miss Hinckley, in the Proceedings of the Boston Natural History Society for 1880, to have hatched on the 12th, and passed through the tadpole state by July 4th, when the tadpoles were found "at the water's edge, with the tail reduced to a mere stump."

My own knowledge of these little creatures covers only their arboreal life. I have never seen them except in their high and dry quarters; not always dry, either, for they love damp hollows, in the angles of the branches, where a little rain lodges.

The old apple-trees in the lane are sure to be tenanted by several tree-toads, every year; and the little that I have learned of them, has been by watching those that frequented one locality. This is not recommended as a safe way of studying the habits of animals, as there would be nothing improbable, from what we know of other animals, in tree-toads acting quite differently in different trees. Suppose them, for instance, to be hiding in a cedar or in a weeping-willow, and it is evident that trees so widely different would make it necessary that their movements, when in pursuit of insects, should be quite different. I have not been able to learn how far these animals vary in the choice of their haunts, as I know them only as frequenting the apple-trees.

As is well known, the tree-toad is nocturnal and crepuscular in its habits. By day, it sits very still in some quiet nook. By sitting still, it must not be supposed that it makes no noise. Far from it. Let a patch of cloud as big as a barn-door cast a shadow over it, and the fretful fellow at once begins to croak. This croak is so very generally regarded as a sign of rain, that it almost invariably calls forth the remark, "It is going to rain," from some one who has happened to hear it. Even the Indians looked upon it in this light, and so did the Swedes in South Jersey. I am sorry, however, to have to say that the toads in the apple-trees have undermined my faith in the "sign," as they have not shown themselves superior in prophetic ability to the man who gravely informs us what the weather will be, when the indications are so plain that even a blind man might detect them. The croaks and the coming rain, so far as my apple-tree toad is concerned, are mere coincidences—nothing more—as the following observations will show. In 1880, the tree-toads croaked every day from May 9th to July 12th, inclusive, and there were but half-a-dozen wet days, during the sixty-five. The following summer (1881) gave the same results; and during the summer of last year, I obtained similar results from daily observations extending over four months. Throughout the warm weather of 1882, they croaked more or less, every day, hot or cool, sunshine or clouds, and far more at noon-time than either in the early morning or at evening. The supposition that they are particularly noisy at night is wholly inapplicable to my apple-tree toads. Had I never heard anything about these animals, I should have reported them as croaking, not because it was likely to rain, but because it was so dry, that they were suffering for want of moisture. After an unusually hot day, during the early summer, I have noticed that they croak a great deal, when, after sunset, the air becomes damper, seemingly out

Fig. 125.—The Wood Frog (*Rana sylvatica*).

of pure satisfaction at the desirable change; whilst during our annual summer drought, they croak much at mid-day; and this, I have thought was a cry of impatience, uttered in anticipation of the refreshing bath of dew that only comes with night-fall. When we do have a fairly wet season, these tree-toads are less full of croak than during a dry one; and never have I been able to detect the slightest connection between the cries of the apple-tree toads in the lane, and either a passing shower or a coming storm.

It may be asked of the tree-toad, as of many of our other fauna, are they as abundant as formerly? In answer to this question, Captain Jonathan Carver, in the concluding chapter of his "Travels in North America" (1667–69) says, "These creatures . . . infest the woods in such numbers, that their responsive notes at these times make the air resound." The rest of the notice is a mixture of truth and absurdity and is omitted, but the portion quoted would indicate that either tree-toads were formerly more abundant than at present, or that the author has confounded the animal with some one of the tree-frogs; possibly the wood-frog, which is a noisy fellow, and one that croaks more like the tree-toad than do any of the aquatic species. The great difference between them, however, can readily be seen by comparing the illustrations of the two animals given on pages 204, 205.

The tree-toads, or Hylæ, while always at home during the day, are as active as a hop-toad during the night, and wander about the home-tree in search of food. Unless disturbed, however, they do not, I think, go far away, certainly not so far that they cannot find their way back. I have long thought that they made one tree their home, and I know, from observations extending over several summers, that the same tree-toad will spend the day, the summer through, in the one spot on the tree from April and October, without a miss, except when making the journey to the nearest water to lay eggs. I have known a tree-toad, day after day, to stick to one and the same spot, wherever it might travel through the night. Of course such regularity of habit must be coincident with an abundant food supply. Let this once become uncertain, and, like sensible toads, they would quickly change their quarters; but any change of locality is from necessity, not choice.

I have never been able to find out whether this batrachian had any enemies. The snakes that climb trees do doubtless sometimes make a dinner upon them; but these snakes are few, and hence the inference that they have less to fear than either the frogs or the toads, though they are by no means so numerous.

A word further, in conclusion, with reference to the wood-frog, already mentioned. In the retired portions of our upland woods, far away from the muddy ponds and stagnant puddles, and close to the leafy haunts of squirrels and chipmunks, if it be even a little damp, we may chance upon a pretty frog which in colour, habits and disposition is unlike all the others. It is literally, quick as a flash, and for some reason has a great dread of mankind; at least, it takes wonderful leaps and plenty of them, whenever any one happens to come too near. I know of no harder task than to chase a wood-frog over uneven ground.

Except in April, when they congregate at some neighbouring pond and lay their eggs, these frogs frequent the woods the year through; feeding on flies and such small fry, until frost comes, when they burrow some two feet deep in damp earth, and there they remain until the weather has become fairly spring-like.

By many people, even now, these wood-frogs are confounded with the tree-toads. Why two creatures so unlike should be mistaken for one another passeth comprehension, yet in spite of all the zoological literature, and thousands of school teachers, such is the fact. Worse than this, I know of a lad with a correct knowledge of our batrachians, who dared to correct his teacher on this matter, while on a Saturday fishing frolic, and who was, in turn, "corrected" by the teacher on the following Monday.

Prospect Hill, Trenton, N.J., U.S.A.

SEA-SIDE HOLIDAYS.

No. I.—The Mollusca of Margate and the Vicinity.

THE following is a list of the mollusca that I have met with in the neighbourhood of Margate. I have taken as my limits Sandwich on the one side and the Reculvers on the other. Near Sandwich there is a beach called Shellness, composed almost entirely of shells, and on this beach I have come across many rarities, including a few that I have found nowhere else round this coast. The nomenclature throughout is that of Dr. Gwyn Jeffreys.

Conchifera.

Anomia ephippium; small specimens only on the roots of Laminaria, all round the coast from Margate to Pegwell Bay. *Pecten pusio*; single valves, pretty common at Margate and Shellness, but perfect shells are rare. *P. varius*; common everywhere. *P. opercularis*; small specimens every now and then. *Mytilus edulis*; everywhere in clusters where there are rocks or wooden piles to cling to. *Mytilus barbatus*; occasionally all round the coast. *M. Adriaticus*; now and then at Shellness. *Modiolaria discors*; Margate, but very seldom. *Nucula nucleus*; small specimens at Margate, but fine and fresh at Shellness. At Shellness also I have met with the var. *radiata*. *Leda caudata*, var. *brevirostris*; one specimen at

Shellness. *Pectunculus glycimeris ;* single valves at Shellness. *Arca lactea ;* single valves all round the coast, but I have never met with a perfect specimen. *Loripes lacteus ;* occasionally at Margate. *Cardium echinatum ;* single valves at Shellness. *C. exiguum ;* very seldom at Margate. *C. fasciatum ;* now and then at Margate during the winter months. *C. edule ;* on muddy shores in great profusion, such as off the Reculvers and at Pegwell Bay. The var. *rusticum* occurs in the marshes at St. Nicholas. *C. Norvegicum ;* single valves at Shellness. *Venus ovata;* Margate and Shellness, but this species is by no means common. *Tapes pullastra ;* extremely common all round the coast. The var. *perforans* is not rare. *Tellina crassa ;* two single valves at Shellness. *T. Balthica ;* all round the coast, but in great profusion at Pegwell Bay and Shellness. *T. tenuis ;* Shellness and Birchington, but only now and then. *T. fabula ;* very abundant at Shellness and as the other species. *Corbula gibba ;* single valves all round the coast. Two perfect specimens at Shellness. *Mya arenaria ;* alive at the Reculvers. One small specimen at Pegwell Bay. *M. truncata ;* common all round the coast. I have found it alive in the holes made by *Pholas dactylus* at Margate. *M. Binghami ;* occasionally at Margate. *Saxicava rugosa ;* common all round the coast, wherever there are rocks. *Pholas dactylus ;* with *Saxicava rugosa*, but usually nearer low-water mark. *P. candidus ;* Reculvers, Margate, and Shellness, in abundance.

SOLENOCONCHIA.

Dentalium Tarentinum ; very common at Shellness, but not elsewhere.

GASTEROPODA.

Chiton fascicularis ; on the rocks at Margate and

Fig. 126.

also now and then at Margate and Birchington. *Psammobia vespertina ;* a single valve at Shellness. *Donax vittatus ;* extremely common at Shellness, and at Margate very seldom. *Mactra solida ;* single valves at Shellness. The var. *elliptica* is much more frequent, and good specimens are no exception at Shellness. *Mactra stultorum ;* very common at Shellness, and now and then at Margate. The var. *cinerea* occurs at Shellness. *Lutraria elliptica ;* a single valve at Shellness. *Scrobicularia prismatica ;* one good specimen at Margate. *S. alba ;* often in abundance at Shellness, and now and then all round the coast. *S. tenuis ;* often abundant at Pegwell Bay. *S. piperata ;* Pegwell Bay, but all the shells, or nearly all, that I have found, seem to be post-tertiary. *Solen ensis ;* all round the coast. *S. siliqua ;* Shellness. I have found this species in abundance between Ramsgate and Pegwell Bay. *S. vagina ;* by no means rare at Shellness, but elsewhere not so common Ramsgate. *Chiton cinereus ;* with the last, but more abundant. *Chiton lævis ;* occasionally at Margate. *Patella vulgata ;* everywhere in rocky places. The var. *elevata* also occurs. *Helcion pellucidum ;* Margate, Ramsgate, and Shellness, often very large and fine. The var. *lævis* occurs now and then at Margate. *Tectura virginea ;* common, especially in the winter months, all round the coast. *Emarginula fissura ;* one large specimen at Margate. Shellness now and then. *Emarginula rosea ;* Shellness only, and never in any quantity. *Fissurella Græca ;* common at Shellness. Often large and fine. Also at Broadstairs. *Trochus tumidus ;* common at Pegwell Bay and Shellness. *T. cinerarius ;* very abundant all round the coast. *T. striatus ;* worn specimens at Shellness. *T. zizyphinus ;* all round the coast. At Shellness I found three perfectly white specimens.

At Shellness a very conical form of *T. cinerarius* occurs, while at Margate they are often very depressed. *Phasianella pulla*; very common. But none of the specimens that I have found are large. *Lacuna crassior*; at Shellness this species is not rare, and I found a number between Ramsgate and Pegwell Bay. *L. pallidula*, var. *neritoidea*; common at Margate, but only during the spring and winter months. *Littorina obtusata*; extremely common on the rock all round the coast. *L. rudis*; all round the coast, but rather local. *L. litorea*; everywhere. *Rissoa parva*, var. *interrupta*; very abundant in shell-sand all the year round. *R. membranacea*; rare. Margate and Shellness. *R. striata*; with *R. parva*, but less common. *Hydobia ulvæ*; can be picked up by handfuls at Pegwell Bay, and is also abundant in the salt marshes at St. Nicholas. *Scalaria communis*; now and then at Shellness, but usually worn and chipped. *S. clathratula*; all round the coast, but larger at Shellness than elsewhere. *Odestomia lactea*; common in shell-sand at Margate and Shellness. *Natica catena*; abundant at Shellness, and very occasionally at Margate. *N. nitida*; this species seems commonest between Broadstairs and Ramsgate. *Adeorbaris subcarinatus*; two specimens in shell-sand at Margate. *Lamellaria perspicua*; Margate and Shellness, but this species seems very rare. *Velutina lævigata*; Pegwell Bay and Shellness. Pegwell Bay, however, seems the more favoured locality. *Cerithium reticulatum*; Margate and Shellness in shell-sand, but generally worn and broken. *C. reversum*; this uncommon species occurs with the last, and I have found a fine specimen at Shellness. *Buccinum undatum*; all round the coast. *Murex erinaceus*; all round the coast. *Fusus antiquus*; with *B. undatum*, but not nearly so common. It often reaches a considerable size. *Purpura lapillus*; wherever the coast is rocky. At Shellness I found some worn specimens of the var. *major*. *Nassa reticulata*; not very common, but occasionally all round the coast. *N. incrassata*; abundant everywhere. *Defrancia linearis*; Margate and Shellness, occasionally in shell-sand. *Pleurotoma septangularis*; two specimens only at Margate. *P. rufa*; plentiful, especially at Shellness. *P. turricula*; this species, though not nearly so common as the last, is by no means rare. *Cypræa Europæa*; very plentiful everywhere, as is also the spotted variety. *Utriculus obtusus*; Margate and Pegwell Bay. At the latter place I have met with large specimens. *Actæon tornatilis*; an immature specimen from Margate. *Philine aperta*; one specimen only from Shellness. *Melampus myosotis*; this species occurs in the rejectamenta of the Stour at Shellness and Reculvers.

FRESHWATER SPECIES.

I have found *Sphærium corneum*, *Pisidium amnicum*, *Bithynia tentaculata*, *B. Leachii*, *Valvata piscinalis*, *V. cristata*, *Planorbis corneus*, *P. complanatus*, *P. contortus*, *P. carinatus*, *P. vortex*, *P. nautileus*, *P. albus*, *Limnæa stagnalis*, and *L. peregra*, in the rejectamenta of the Stour. *Sphærium lacustre* occurs at Minster and St. Nicholas. *Anodonta anatina* at Minster. *Bithynia Leachii* at Minster, St. Nicholas, and Ebbsfleet. *Planorbis lineatus*, *P. spirorbis*, *P. nitidus*, and *P. complanatus* at Minster. *P. corneus* and the scarce var. *albus* at Minster and St. Nicholas. *Limnæa glutinosa* *L. peregra*, *L. stagnalis*, and *L. palustris* at Minster and St. Nicholas, and the var. *alba* of *L. palustris* at Minster and Sandwich.

TERRESTRIAL SPECIES.

Succinea putris and *S. elegans* attain a large size at Minster. *Zonites nitidus* is more or less common wherever there is water, such as at Minster. *Helix nemoralis*, *H. Cantiana*, *H. rufescens*, and *H. hispida*, are common at Minster. *Helix virgata* is general. *H. ericetorum* occurs at Margate with *H. pulchella*, and *H. Cartusiana* is abundant on the sand-hills near Sandwich, with a small var. of *H. caperata*. In shell-sand on the shore I found *Vertigo minutissima* and *Carychium minimum*; and *Pupa marginata* is general, with its var. *edentula*. (Journ. Conch., April.)

SYDNEY C. COCKERELL.

Glen Druid, Chislehurst.

MICROSCOPY.

MOUNTING INSECT ORGANS.—The stings must be soaked in strong solution of potassic hydrate, or even boiled in it, which renders them transparent in a very short time. When transparent enough they must be mounted in Canada balsam, after being washed first with hot water to remove the potash, and afterwards, when dry, with turpentine. If W. B. wants to know how to mount them in Canada balsam he had better read Martin's "Manual of Microscopic Mounting" or, if he wants a smaller book, "Half-hours with the Microscope" by Tuffen West, as it is a very long business to explain.—*R. A. R. Bennett.*

A GOOD CEMENT REQUIRED.—Gold size made into a thick paste with lamp-black makes an excellent cement for securing slides; gold size alone answers very well, but is so liquid that it is liable to run into the balsam, as M. D. observes.—*R. A. R. Bennett.*

MICROSCOPICAL QUERY.—I should be much obliged for information on the following points. The best method of illumination of viewing of, e.g. Stephanoceros with high powers to bring out detail; a horn to retain in a position (extended) for drawing with camera lucida—*E. F. B.*

A SUBSTITUTE FOR A REVOLVING TABLE.—Nothing is more wearisome when one is entertaining one's friends with the microscope, and without the aid of a revolving table, than the constant moving to and fro, in order to set and change the objects one is exhibiting. It was this untold nuisance that led me to devise the apparatus as described below, which will be found a great boon to microscopists not possessing a revolving table. It consists of a board, A, set on rollers, and carrying the microscope and lamp round a house table by revolving on the centre, B, through the medium of the arm on stalk, C. The board, A, should be about 15 inches long, 9 inches wide, and ½ inch thick; the top side must be covered with thick cloth, and to the bottom side is attached by screws, the stalk, C, which should be of thin wood T section, to prevent vibration. The stalk must be of sufficient length to obtain radii varying from 18 to 24 inches to suit house tables of different diameters. At DD are shewn

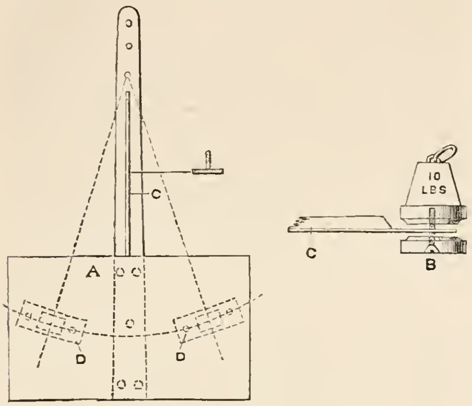

Fig. 127.—Scale, 1 inch to 1 foot.

two pieces of wood, each 4 inches × 1½ × ¾ thick, having a shutter roller ⅝ inch diameter let in. These pieces of wood must be set to radiate as shown by dotted lines on sketch, and fastened to the bottom of the board, A, by means of screws. As a screw put into a mahogany table would be objectionable, make a centre as follows:—Get a piece of wood 14 inches diameter, ¾ inch thick, through the centre of this pass a stout wood-screw 2 inches long, then cover the bottom with thick cloth to prevent it scratching the table. On to this projecting screw place the stalk, C, the free end of which must be bored for that purpose; now screw on a second disc of wood, 4 inches diameter, 1 inch thick, leaving sufficient space between the upper and lower discs for the stalk to revolve freely. Place a ten-pound weight on the uppermost disc to prevent the centre from slipping about the table and the apparatus is complete. If the foregoing description and sketch is not sufficiently clear, I shall be happy to furnish further details.—*C. A. Lowe, King's Hill, Wednesbury.*

Cyclosis.—The power usually employed for observing this phenomenon is a quarter inch, but as I have been able to detect it with a two-inch objective of Browning's (advertised aperture of 16°) I make a note of the fact. Selecting a good horizontally-cut section of Vallisneria, I screwed an inch objective into the sub-stage, fitting as a condenser, and very carefully adjusted the mirror, arming my microscope with a B-ocular, and only an inch objective as a finder. This enabled me to ascertain the portion of the section most suitable for observation. When I removed the inch and replaced it with Browning's two-inch, I was still able to see the chlorophyll granules in motion. Of course I could only just see them: the power was not suitable for any scientific observation of the phenomenon. To study it comfortably and profitably a quarter inch is indispensable. But while so much attention is paid to high powers that beginners' hearts fail for want of them, it is desirable to point out what can be done with a little careful manipulation, and an effort to see into an object with good low-power objectives. The rotation of cell-sap can be seen with a wide angle two inch; and better still with a good working one inch or half inch, although the quarter inch is the glass for it.—*W. J. S., Calcutta.*

Micro-Slides for Science Classes.—Mr. B. Piffard has just sent out some of his slides illustrative of the five orders of Coniferæ. They are exquisitely mounted, and comprise *Taxineæ* (Salisburya); *Abietineæ* (Spruce-fir); *Araucariæ* (Araucaria); *Taxodiæ* (Wellingtonia); *Cupressineæ* (Juniper).

Studies in Microscopical Science, edited by A. C. Cole. The second volume of this very useful and highly practical work is now well on its way, and, supported as we have no doubt it is, and, as it undoubtedly ought to be, by numbers of new friends. "The Morphology of the Cell" is continued through three numbers. Amongst the slides which Messrs. Cole have sent out are specimens of the Globigerina ooze, Polycystina, from Springfield earth, Barbadoes, and an exquisite specimen of Hebridean gneiss from the Flannan island.

Suggestions for an Exchange Club.—It has occurred to the undersigned that much mutual good might be effected if a small circle of really ardent workers could be formed for promoting the study of microscopy, amongst whom slides would circulate and general ideas become common property, something after the style of the postal microscopical society, but with less routine, which might be put briefly thus:—No fees, no secretary, no journal, no annual meeting; if at any time any subject were thought sufficiently good to bring before the public, the same to be done through the medium of your publication. We do not desire to have a large and cumbersome circle, and we do not propose to dignify it with the name of club, but what we desire is, a small body of really earnest workers. It should consist, at first, of at least two members, each of whom make the following subjects their study—entomology, biology, botany, geology, mineralogy, or chemistry; subsequently special branches might be added if collectively thought advisable. If the above idea commends itself to you, would you kindly aid us in forming such a circle by a short note in SCIENCE-GOSSIP, allowing these few remarks to be the leading feature? Mr. Crowther or myself would be glad to receive the names and addresses of such as would like to assist, and if they would mention the special department they are interested in, it would aid in establishing the circle which is intended solely for mutual good.—*W. H. Harris*, 44, *Partridge Row, Cardiff; Henry Crowther, Beeston Hill, Leeds.*

WESTERN MICROSCOPICAL CLUB.—This society, which holds its meetings at the houses of its chief members, is now assuming a very important position. The meetings are of a highly practical character, and, from the reports which have been forwarded to us, we gather that some very valuable objects have been exhibited, and the comments made upon them must have been of an important character, when we remember that amongst the members present were Dr. Spencer Cobbold, Dr. M. C. Cooke, Dr. Lowne, Professor Boulger, Messrs. F. Pascoe, H. V. Tebbs, and others. The honorary secretary is Mr. A. W. Stokes, F.C.S., Vestry Hall, Paddington, W.

THE BELGIAN MICROSCOPICAL SOCIETY.—The *Annales* of this well-known society for the year 1881 have just been published, containing papers by Dr. Jabez Hogg on "The Movements of Diatoms," and another by G. H. Delogne on "The Cryptogamic Flora of Belgium," which extends over considerable space and is very artistically illustrated. The volume also contains the Bulletin des Séances from October 1880, to the end of 1881, in which we find a large number of valuable matters discussed relating to practical microscopy.

THE QUEKETT MISCROSCOPICAL CLUB.—Nos. 4 and 5 of the first volume of Series ii., for April and July respectively, have just appeared. Dr. M. C. Cooke contributes a short but interesting paper, "On the Estimation of the Numbers of Foraminifera in Chalk." From one ounce of chalk Dr. Cooke prepared no less than 190 slides, each containing upwards of 1000 perfect shells; another ounce, more carefully prepared, produced nearly half-a-million entire shells, without counting those which must have been washed away in the process. Hence the author concludes that in estimating half-a-million of foraminifera to each ounce of chalk, he is falling very far short of the maximum. These calculations agree very closely with and greatly strengthen Professor Ehrenberg's computation that between one million and a quarter, and one million and a third, of foraminiferous shells are contained in each cubic inch of Kentish chalk. Other papers are those on "The Fibro-vascular Bundles in Ferns," by Mr. J. W. Morris; "The Statoblasts of the Freshwater Sponges," by Mr. B. W. Priest; "Fluid Cavities in Meteorites," by A. de S. Guimaraens; and some further notes on the same subject by Mr. H. Hensoldt; "Notes on Vaucheria," by Dr. M. C. Cooke; and on "A Newly-discovered British Sponge," by Mr. J. G. Waller. Several of the above-named papers are illustrated by good plates.

ZOOLOGY.

CONJUGATION (?) OF AMŒBÆ.—In the dark green slime which I scraped away from under a waterpipe this morning, I secured an Amœba which I put under power of 300 diameters. In the course of my observation I detected a second and quite independent amœba a little distance from the first, and rather smaller than it. Their course as regards each other may be indicated by the arrows which follow: 1st ↗ ↓ 2nd. Suddenly the pseudopodia of the first approached the second, and were soon in contact with it. Having frequently observed the conduct of this rhizopod when it gets itself involved with a diatom, or a desmid, or small filament of conferva, I was curious to learn how two amœbæ would act towards each other under similar circumstances. The two masses of sarcode quickly blended with each other, and became stationary, assuming a globular form without any indications of pseudopodia, the action of the granular particles, &c., in the substance of the animal being for a few instants quite suspended. In about two minutes, however, fresh pseudopodia were protruded, and the animalcula became as active as ever. While I write the strangely united two-in-one are happily pursuing the irregular tenor of their way across the field of my old Smith and Beck. The granular particles are more numerous, and the nuclei rather fainter than before. There are two large vacuoles and a small one, and two reddish-brown spots in the body of the animal. The amœba first under observation had certainly only one of these spots. I have had this singular couple under observation off and on during two hours, and there is no doubt as to its identity, but beyond the usual ceaseless changes of form undergone by it, there is nothing to record; and business engagements will now oblige me to place it in my aquarium. What will its future history be?—*W. J. Simmons*, *Calcutta.*

HELIX POMATIA IN BUCKS.—I have a list of thirty-nine species of land and freshwater shells, all of which, with one exception, I collected myself, while residing at High Wycombe. The exception is *Helix pomatia*, which was not rare in a park at Great Marlow. My friend Mr. Lucas found it alive there and gave me two specimens of the shells. I send this note because of the remark on page 173 of the August number concerning this species. I intend sending the list to Mr. Taylor at Leeds.—*Henry Ullyett, Folkestone.*

COLOURS OF BIRDS' FEATHERS.—Miss Lewis has recently read communications before the Philadelphia Academy of Natural Sciences showing that the lustrous parts of the feathers of birds are composed of angular cells, whilst the duller feathers are formed of globular cells. She thinks the cell characters might be utilised in the classification of birds.

"HALF HOLIDAY HANDBOOKS." (London: T. Fisher Unwin.)—This is a new little volume of the series which the publisher has so well placed before the world. It deals with the district of Wimbledon, Putney, and Barnes, and is accompanied by a map and bicycle route. It is a pleasant chat about the topography, history, &c., of the district, but it concerns the naturalist most in giving abundant details concerning the botany, entomology, and general zoology of the various localities. The illustrations are of a high character, and the book is cheaply published at ninepence.

THE BRITISH ASSOCIATION MEETING AT SOUTHPORT.—This year's meeting, which commences on the 19th of September next, promises to be of an unusually interesting character. The Southport people are using every effort to make the gathering successful. The President is Professor Cayley, of Cambridge, and the Presidents of the various sections are as follows: *Mathematical and Physical Science*, Professor Henrici; *Chemistry*, Dr. J. H. Gladstone; *Geology*, Professor W. C. Williamson: *Biology*, Professor E. Ray Lankester; *Anthropology*, Mr. W. Pengelly; *Geography*, Colonel Godwin Austen; *Economic Science*, Mr. R. H. Inglis Palgrave; *Mechanical Science*, Mr. J. H. Brunlees. The two evening discourses will be as follows: on Sept. 21st, "Recent Researches on the distance of the Sun," by Professor Ball, Astronomer-Royal for Ireland; and on Sept. 24th, on "Galvani, and Animal Electricity," by Professor McKendrick of Glasgow. Sir F. W. Bramwell will also give a discourse to working men. The conversazioni are expected to be of an unusually attractive character, and will be held in the celebrated Winter Gardens. Numerous excursions have been arranged, many of them to view the great manufactories of the neighbouring district, such as that of Messrs Platt Bros. & Co. at Oldham, the Coal and Iron Company's pits at Wigan, &c. A geological excursion will be made to Clitheroe and the Victoria caves (where the remains of early man have been met with). Others will visit Furness Abbey and the Lake District. The Honorary Local Secretaries are Messrs. J. H. Ellis, H. H. Vernon, and T. W. Willis.

PROVINCIAL SOCIETIES.—Part iv. of Vol. iii. of the "Transactions of the Norfolk and Norwich Naturalists' Society" for 1882–83 contains the address of the President (Mr. H. D. Geldart); a most instructive paper on "The Scenery of Norfolk," by Mr. H. B. Woodward; others on "The Dusky Petrel," by Mr. H. Stevenson; "Seals and the Seal Fishery," "The Herring Fishery of 1882," &c., by Mr. Thomas Southwell; "Ornithological Notes," by Mr. J. H. Gurney, jun., and Mr. H. Stevenson; "The Bearded Tit," by Mr. J. Young: "The Springs and Spas of Norfolk," by Mr. H. B. Woodward; and part x. of "Fauna and Flora of Norfolk: Marine Algæ," by Mr. H. D. Geldart. Some miscellaneous notes, &c., form the conclusion of an unusually good number.

THE LIVERPOOL NATURALISTS' FIELD CLUB has also issued its Proceedings for the year 1882–83, containing, besides digests of papers, excursions, &c., an interesting address by the President, entitled, "Notes on Grangeover Sands, by an invalid Field Naturalist," illustrated by a faithful representation of Humphrey Head in North Lancashire. An important list of the most interesting of the plants collected during the excursions is given at the end.

THE BRISTOL NATURALISTS' SOCIETY has issued Part i. of its Annual Report and Proceedings for 1882–83. The latter contains papers on "The Density of Rocks with regard to Water Supply," by E. Wethered, F.G.S.; "Rainfall at Clifton," by Dr. G. F. Burder; "Temperature Observations taken at Clifton," by H. B. Jupp, M.A.; "The First Telephone," by Professor Silvanus Thompson. Part vi. of the "Fungi of the Bristol District" (illustrated), by Cedric Bucknall; besides notes on some new electrical apparatus by Mr. Worthington, and on a local colony of alien plants by Mr. White. We find also included part iii. of "Flora of the Bristol Coal-field," edited by Mr. James W. White.

"THE BUTTERFLIES OF EUROPE." By Dr. H. C. Lang. (London: L. Reeve & Co.) Part xiv. of this beautifully illustrated work is just out, containing descriptions of the genera Argynnis, Limenitis, Neptis, Vanessa, Thaleropis, Melibœa, &c. The illustrations are of the usual exquisite character, and are devoted chiefly to the caterpillars and chrysalids as well as the food plants on which the larvæ feed.

ABNORMAL GROWTH OF LIMB OF CANCER PAGURUS.—I have recently received a curious abnormal development of the right, fifth walking foot or ambulatory appendage of the common edible crab, *Cancer pagurus*. The terminal joint in this remarkable specimen consists of three perfect joints, soldered together at the base and therefore working on one "hinge," like the rest of the terminal claws of the animal. It would be interesting to know if this form obtained at the time of its change from the zooid stage or during one of its "moults," and if the latter, from what cause. The breadth of carapace of the specimen is seven inches.—*Edward Lovett, Croydon.*

"PARROTS IN CAPTIVITY." By Dr. W. T. Greene. (London: George Bell & Sons.) Dr. Greene has now obtained a creditable reputation as an authority on caged and acclimatised birds, and many of our readers will be glad to avail themselves of this work now appearing in shilling parts. It is attractively got up, each part being illustrated with three full-page coloured plates of the various birds described.

LAND SHELLS NEAR CROYDON.—The following is a list of land shells found between Croydon and Warlingham station, July 22, 1883: *Arion ater*, var. (animal light yellowish-white, shield rather darker, margins of foot orange yellow, head grey). *Arion hortensis*, *Limax agrestis*, *Vitrina pellucida*, *Zonites cellarius*, *Z. nitidulus*, *Z. crystallinus* (?) (I found a broken shell which resembled this species); *Helix aculeata* (two specimens); *Helix pomatia*, *Helix aspersa*, *H. aspersa* var. *exalbida* (common, with the type, at one place; but most of the shells had lost part of their epidermis); *Helix nemoralis*, *H. hortensis*, *H. hortensis*, var. *incarnata*, *roseo-labiata*, and *lutea* (for descriptions of these vars., see "Journal of Conchology," * April 1883, p. 34). *H. Cantiana*, *H. rufescens*, *H. hispida*, *H. virgata* (and bandless var.), *H. ericetorum*, *H. rotundata*, *H. apicida*, *Bulimus obscurus*, *Clausilia rugosa*, *C. laminata*, *Cochlicopa lubrica*, *Cyclostoma elegans.* This list is, of course, a very imperfect one, as it was only the result of one day's search; but, nevertheless, it shows how good a locality the Croydon neighbourhood is for land shells. I only found one fresh-water species, *Limnea peregra*, which lived in a small pond on the hills near Croydon. On the same day I caught, near Warlingham, a curious variety of *Satyrus hyperanthus* (the ringlet butterfly), which had the three ocelli well developed on the under side of the right upper wing, but on the under side of the left upper wing the lower of the three ocelli was missing, but the upper two were as well marked as on the other wing. I should be glad to hear whether this is a common occurrence.—*S. D. A. Cockerell.*

"THE SCOTTISH NATURALIST."— This well-known magazine devoted to Scottish natural history has now been in existence for twelve years, under the able editorship of Dr. F. Buchanan White; who, we much regret to see, is now retiring from the editorial chair. Although his place will be taken by a well-known zoologist, Professor T. W. Trail; the high position which the "Scottish Naturalist" has deservedly taken amongst scientific serials is doubtless owing to the energy and *bonhomie* of Dr. Buchanan White. The quarterly issue for July last forms No. 1 of a new series, in which Dr. Buchanan White takes editorial leave of his readers and Professor Trail very genially introduces himself.

* Mr. J. W. Taylor, on "Some New Varieties of British Land and Freshwater Shells."

BOTANY.

"TARAXACUM OFFICINALE."—I am glad Mr. Swinton takes my criticism in the spirit I wrote it. His reply is, however, wide of the mark. There are verily, "sorts" of dandelions, varying according to soil, &c. I entirely agree with that remark. My object was to set readers right as to the four varieties. Their names and characters (by which we identify them) are of primary importance, and do not in any way involve "synonymy." It is simply a question of right or wrong nomenclature. I would urge Mr. Swinton to use terms with a little more accuracy and closeness. The indiscriminate use of such words as "sorts," "races," and so on, is puzzling and misleading; whereas the consistent use of "genus," "species," "variety," can only be a help and benefit to learners. No name need be "trivial" if wisely selected. The nettle seen near Waverley Abbey, was probably *Urtica pilulifera*, the Roman nettle. "Laciniated" is scarcely the term for the leaves of dandelion. It is applied to finely-cut organs, such as fringed involucres or stipules. The term I used, "lobed," is the best for some, and "runcinate" for others.—*H. W. L. Worsley-Benison.*

THE FERTILISATION OF ASCLEPIAS.—I have just made some very interesting observations on the flowers of *Asclepias purpurascens*, kindly supplied me by Mr. W. Thompson, the well-known horticultural botanist of Ipswich. The structure of the flowers of this plant is very curious and intricate. The pollen is produced in masses, like the pollinia of the orchids, and adheres to gelatinous processes developed on the sides of the stigmas. I had frequently been told that these flowers "caught flies," but as there are no indications of any carnivorous habit on their part, I concluded that the so-called fly-catching habit might be connected with fertilisation, and accordingly requested that the next time a fly was caught the flower might be brought to me; and the other day one was brought, in which the legs of the common green-bottle fly (*Musca chloris*) were entangled. The insect struggled a great deal, and on examining it under a half-inch power I found its feet were imbedded in the gelatinous processes above-mentioned. After a time the feet were withdrawn, and the fly got away clear, but as I had imprisoned it under a wine-glass, I was enabled to examine the feet, when I found two of the pollen masses adhering to them, exactly in the same way as the pollinia of orchids are seen attached to the heads of butterflies. It struck me that this might be the method in which *Asclepias* is fertilized by insects in its native habitats, and I would suggest to North American botanists the advisability of examining the insects which may be "caught" in the various species of Asclepias peculiar to their part of the world, to ascertain if pollen masses are usually adhering to them.—*J. E. Taylor.*

The Botanical Record Club.—The report for the years 1881–82 of the Phanerogamic section of this club has just been issued. The new county records show no falling off in the number of floral novelties catalogued, the general locality list being very full and covering a very large space. Besides these, some additions are made to special county catalogues, the whole bringing to completion the second quinquennial volume that the club has published.

Œcidium Urticæ.—My experience differs from that of Messrs. Williams and Thos. Brittain with regard to the scarcity of this cluster-cup. On the contrary, I have always regarded it as one of the commonest species. In Norfolk and Suffolk I never have had any difficulty in finding it growing upon the nettle in May and June, but only when the nettles grew near water, as, for instance, by some dyke side. I found it growing thus abundantly this season.—*J. E. Taylor.*

Œcidium urticæ and Œ. tragopogonis, &c.—*Œcidium urticæ* was found by me in this district for the first time on the 23rd May last year, on the river bank between Goole and Swinfleet; later in the year it became very common and conspicuous, being present in almost every place where nettles were growing, but most abundant on the banks of the Ouse and of ditches running into it. This year I have only seen one specimen gathered on the Yorkshire Wolds above Drewton Vale, whilst in places where it was so abundant last year, not a single specimen is to be found. *Œ. tragopogonis* I have never met with during the five or six years that I have collected fungi, although in each year I have made a careful search for it. The Œcidia most common here are *Œ. tussilaginis*, on coltsfoot, and *Œ. rubellum* on dock, both these are plentiful; *Œ. ranunculacearum*, on *Ranunculus ficaria*; *R. repens* and *R. acris;* and *Œ. violæ* on *Viola odorata* and *V. sylvatica*, are more sparingly distributed; whilst *Œ. geranii* on *Geranium dissectum*, and *Œ. thalictri* on *Thalictrum flavum*, are amongst the new local records for this year. The word "common" referring in the "handbook" &c., to the distribution, seems to be of very doubtful value, many species to which it is affixed being anything but "common," according to the experience of most students. When shall we have a "London Catalogue of British Fungi" on the same lines as the second edition of the "L. C. of British Mosses"?—*Thomas Birks, jun., Goole.*

"The British Moss Flora," by Dr. R. Braithwaite. Part vii. of this highly important work has recently been issued, dealing with the Dicranaceæ, and describing the genera and species grouped under this family. The illustrations occupy six full-page pages of details of various species of mosses, and are all of the usual high artistic character. Twenty-seven species of the Dicranaceæ are thus illustratively detailed.

"The Fruits of all Countries," by F. T. Mott. This is a preliminary catalogue by a well-known and capable botanist of all the so-called fruits at present known, the word being used in its popular sense. Mr. Mott has bestowed a great amount of pains upon his work, which we regard as a valuable contribution to economic botany. We should have been better pleased, however, if the work had been issued in a less ungainly shape.

GEOLOGY.

The Earthquake in Ischia.—The whole scientific world, in sympathy with the larger world outside, has been occupied with the subject of the terrible earthquake at Ischia. It is surprising how small a knowledge of the science of earthquakes exists in the minds of numbers of so-called educated people, especially when we remember the excellent books on the subject, and that a few hours' reading will put a person in possession of all the laws which are known to govern their phenomena. I was in Switzerland when I first heard the disastrous news, and at the table d'hôte nothing else was discussed for a day or two. As the intelligence grew older, some of the bolder spirits ventured upon an explanation of earthquake action. It was then evident how thoroughly ignorant everybody really was on the modern scientific aspect of the question. I need not say that scientists, and especially those who approach earthquakes from the geological side, are deeply interested in the origin of the present catastrophe. It is only two years and a half since an earthquake occurred in the same place. The loss of life attendant upon that of July 29th last, is now known to be much greater than was at first anticipated. The shock of the earthquake was felt as far away as Wiesbaden. There is a volcanic mountain on the island of Ischia called Epomeo, whose last recorded eruption took place in the year 1302. Earthquake action usually originates in the same centres as volcanic activity, and nearly always precedes the latter. It may be, therefore, that these rapidly recurring Ischian earthquakes are the precursors of a not distant volcanic eruption. Nothing is better known in physical geography than that volcanic mountains have periods of infancy, mature development, and old age, when their activity dies completely out. All volcanic mountains are in one stage or another of this development. Those on the Mediterranean coast are without exception young volcanoes, in all the fiery activity of their youth; and if their action is intermittent, their earthquakes and eruptions are of a terribly active character, as witness the outburst of Vesuvius in 79, when Pompeii and Herculaneum were overwhelmed, and buried for 1500 years. Science is as yet but trying its wings for extensive flights, but it has already obtained a knowledge of many of the laws relating to matter. Those governing the planets are already calculable, as is also the action of molecular and chemical forces. The laws of biology have been comprehended and formulated by such men as Darwin. Those relating to the weather (or meteorology) are slowly but surely being understood. Shall we ever be able to prognosticate earthquake shocks and volcanic eruptions? Professor Judd, the author of the most philosophical and yet the most popular treatise on volcanoes in our language (one of the chief volumes in the well-known "International Scientific Library Series"), thinks the day will come when even the laws relating to these now mysterious forces will be so comprehended as to enable us to anticipate, and prognosticate with more or less accuracy, their action. With regard to the earthquake at Ischia, it has already been observed that the seismic waves usually run in the direction of the fissures in the district. Houses built transversely to these were shaken down like so many heaps of loose bricks, whilst those which had been placed diagonally to the direction of the earthquake waves withstood the shock just as the prow of a ship withstands the actions of the waves it encounters. From all of which we learn that a study of the directions usually taken by earthquake waves in districts affected by these terrible phenomena is imperative upon architects.—*J. E. Taylor.*

"A Sketch of the Geology of Norfolk." By John Gunn, M.A., F.G.S. (Sheffield: Wm. White.) This *brochure* is reprinted from the fourth edition of White's "History and Directory of the County of Norfolk." As most of our readers are aware, few counties in Great Britain are so geologically rich as that of Norfolk, and to its geology Mr. John Gunn has devoted the whole of a long and enthusiastically laborious life. He published this sketch thirteen years ago, and in the edition before us has included all the new discoveries which have been made since that time. The formations described include the Oolite, the various members of the Cretaceous (the upper chalk being especially interesting), the Eocene, and more particularly the Newer Pliocene, or Norwich Crag. To this latter, as might be expected, Mr. Gunn devotes a great deal of space, giving a list of the shells found in that most interesting deposit. Another important Norfolk formation is the Cromer Forest Bed, at whose fossil contents Mr. Gunn worked for over forty years, the result being the magnificent collection of elephantine and other remains, now in the Norwich Museum, and which was so generously presented to the Institution by the collector. The author devotes as much space to the Forest Bed and its associated strata as lay at his disposal. The glacial series of Lower Boulder Clay, inter-glacial beds, Upper Boulder Clay, and more recent deposits, are finely developed in various parts of Norfolk, and are here briefly described. Mr. Gunn has just written enough to make everybody wish for more.

NOTES AND QUERIES.

Mind among the Lower Animals.—I will answer, as briefly as possible, the various criticisms which appeared in last month's issue. Mr. Dixon mentions a series of interesting experiments on the conduct of his dogs. At the words "mouse, cats, sugar," these dogs appeared to act in such a manner as if they actually understood the meaning of the terms. But the question is, are they capable of understanding these words considered as signs of abstract or generalised thought: i.e. would the mind of these animals call up, under any circumstances whatever, the general or abstract notions indicated by these sounds? If it could do so, then the effect of this act of higher intelligence would (as I have laboured to show in my article) be clearly manifested in the habitual conduct of the creature. I fancy, however, that I have succeeded in demonstrating that no animal below man ever did really act under the guidance of an abstract or a general notion. May I ask, once for all, is it not invariably in the same room, or under very nearly similar circumstances perpetually repeated, that the dog exhibits any peculiar comprehension of the signification of certain common names? Suppose the word "sugar" was uttered to a dog on the king's highway, or on the stairs at night, would he manifest any peculiarly noteworthy excitement as if he expected a certain luxury, &c. No doubt the mere sound of "sugar," may perform the function of expressing a concrete notion as efficiently as the sound "Dash," or any other popular canine name; but in this case is there not always some sort of restriction of the meaning of this general term to a determinate single thing? Is there not always some particular object present that is embraced by this common name, or is not its pronunciation marked by emphasis or accompanied by some strikingly significant gesture? Is not the human general term always intimately associated in the animal mind with some individual impression or individual object? The very basis of all language, strictly so denominated—its primitive material—consists in roots, and what are these but symbols of the prominent attributes of whole classes entirely dissociated from the concrete? Mr. Hudson's instance of equine sagacity is a very fair illustration of an animal's actions being guided by the force of habit: i.e. by a sort of organic association of ideas which it would be difficult to sever. We may ask, was it the having to make an unusual or extra journey, or was it the want of corn that induced the refractoriness on the occasion alluded to? Mr. Edwin Holmes's retriever dog could tell a lie, it seems: i.e. he barked in a manner which his master "perfectly understood to mean denial," and the said master considers this feat to be "an unquestionable proof of reasoning power." Well, the probability is that the dog intended merely to convey that he would have no objection to a second dinner. Did he deny the fact in itself, or merely the master's assertion thereabout? When the creature was actually refused his first dinner, in what manner did he then bark?—*P. Quin Keegan, LL.D.*

MIND IN THE LOWER ANIMALS.—In an article on this subject in your June number, Dr. Keegan questions the fact of certain sounds conveying a real definite idea to dogs and cats; e.g., he asks whether a cat or dog will go towards the kitchen when it hears the word meat, or whether it will not rather simply become excited because it sees its master is more or less so. Now, from my limited experience of dogs, I certainly answer "yes." I have a Skye terrier, about two years old, who will certainly not only get excited at certain sounds, but will also apparently fully enter into their meaning, since even when he is lying to all appearances fast asleep, and there has been no notice taken of him for some time, should I simply say quietly in my usual tone of voice, "Is there a cat there?" he will jump up, wide awake, look round with a little bark, run to the window, look out, and if he sees nothing there, will often ask to go out; as soon as the door is open, he will look up on to the garden wall, and in all the places where he has been in the habit of seeing cats, and will not come back and lie down again till he has satisfied himself that there is not one about. Then, again, if I ask him, while in the drawing-room, if he would like a biscuit, he will run into the dining-room, and stand at the sideboard door, wagging his tail, till I go and give him one, and he will not do this for any other kind of food which I may mention. Then, again, my servant assures me that when I am out he will go to whichever room she tells him to do when she wants him out of her way in the kitchen, though this of course only applies to the dining-room and drawing-room, as he does not go upstairs. The same dog has a most sensitive ear in the matter of music, as he will lie quietly enough on the rug while my wife is singing, unless she comes to one or two of her songs, notably one entitled "Children of the City"; but as soon as she begins this song he will immediately wake up and come and sit beside, looking all attention and most pathetic. This fact is possibly accounted for by the fact that this song is of a plaintive character, and so may give him the idea that she is in pain and make him want to comfort her; though, in that case, why does he not do the same with all similar songs? Again, he will never try to come with us if we tell him we are going to church, although he is most anxious to come if he sees any signs of our going out. This might be easily set down to general associations of the day, if it were only the case on a Sunday; but it is invariably the case whenever we say it to him, no matter what the day or time of day may be, though on week-days he always looks surprised at our making such a statement, as he evidently thinks we ought to confine our church-going to Sundays. I could mention other facts of a like nature, but must not trespass further on your space.—*J. T. Green, Liscard.*

CURIOUS INSTANCE OF PROTECTIVE SAGACITY IN SOME SWANS.—The following facts were given me a few days ago by some labourers at Washington, near Lincoln. A pair of swans had completed their nest on the bank of a dyke preparatory to the laying of eggs, but, on Wednesday the 4th of this month (July, 1883), they set to work to raise the structure and piled it up two feet higher, as though conscious of the great storm that was approaching. On Thursday the rain fell in torrents (accompanied by thunder and lightning) all the land was flooded, and their nest would inevitably have been swept away but for this precaution. The eggs were saved, and the nest left high and dry after the subsidence of the waters. —*Mrs. V.*

WATER HENS' NESTS.—In reply to a note in last month's SCIENCE-GOSSIP, on the "Peculiar Site for a Water-Hen's Nest," I beg to inform Mr. Hart that it is no unusual thing for a water-hen to build in a tree and at a height from the water. Two years ago I found a water-hen's nest containing five eggs, in a thick bush about three feet from the ground, near a running stream. In our Arboretum here—Nottingham—there are a number of water-hens on the lake, and they invariably build their nests in the willow-trees which grow out of the water. On one occasion I remember quite well—about three years ago—one of these birds built her nest in the very top of one of these willows, about twenty feet above the water. I watched the bird several days building its nest. Every stick the nest was composed of was carried up the tree from the water. I was fortunate enough to see this bird bring her young ones from the nest; she came down the slender branches with the greatest quickness and ease, directing the movements of her young ones, who seemed quite as much at home in the tree as their mother. I believe there are two old nests now in these willows. I have often seen the nests of these birds in similar situations.—*W. Finch, jun., Nottingham.*

ERRATUM: p. 169, line 39, for Holland, read Lolland. (Laaland, a Danish island.)

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

R. Y. GEEEN can obtain "Grove on the Characeæ" from West, Newman & Co., 54 Hatton Garden. The papers are reprinted from the "Journal of Botany," 1880, with four plates.—E. C. J.

D. M. W.—The chrysalides you forwarded us are those of the leaf-cutter bee (*Megachile centuncularis*), the insect which cuts out the circular pieces you see missing from the leaves of rose-trees, lilac-trees, &c.

DICK (Wellington).—Get Edgeworth's book on "Pollen" for details. It contains a great number of illustrations.

G. W.—Your ant is the worker of *Formica flava*.

Y.—It is difficult to identify your fern from the outline sketch sent us, but it looks like a young specimen of *Cystopteris fragilis*. You cannot do better than get Miss Ridley's "Pocket Guide to British Ferns," published by Messrs. W. H. Allen & Co., at 2*s*. 6*d*.

J. E. A.—The fungus you describe is *Polyporus sulphureus*, not of very common occurrence.

C. T. BINGHAM.—You may obtain much very valuable information about the archæology near London, pre-historic and otherwise, in the "Half Holiday Handbooks" now being published by T. Fisher Unwin, price 9*d.* each. There are, we believe, both English and French Aerostatic Societies, but we do not know their addresses. Perhaps some reader can supply them.

F. C. KING AND OTHERS.—The "London Catalogue of British Plants" is now, we believe, published by Messrs. W. H. Allen & Co., 13 Waterloo Place, London.

M. MORTON.—Mr. James English's work on preserving fungi is published at 2*s.* 6*d.*, and may be had of the author at Epping, Essex.

E. DICKSON.—Most of the dealers in microscopic material supply geological slides. Write to T. D. Russell, 48 Essex Street, Strand, or to E. Wheeler, 48B Tollington Road, Holloway, London, N.

W. BRADFORD.—Your sketch of *Aspidium filix-mas* as showing bifurcation of frond, is very interesting. The phenomenon is not uncommon.

MAITLAND DODS.—Your specimens are, No. 1, *Sertularia*, No. 2, *Sertularia argentea*, No. 3, *Antennularia antennina.*

W. H. GOMM.—The eggs are those of *Natica.*

K. F.—The plant is *Marchantia polymorpha*, one of the liverworts.

EXCHANGES.

BRITISH, land, freshwater, and marine shells, including *Limnæa glutinosa*, *Unio tumidus*, *Achatina acicula*, *Bithynia Leachii*, *Nucula nucleus*, *Tellina fabula*, and many others, in exchange for British or foreign land and freshwater or British marine.—Sydney C. Cockerell, Glen Druid, Chislehurst, Kent.

WANTED, a few specimens of *Dytiscus marginalis* and *Gyrinus natator*, &c., for mounting for the microscope: must be fresh.—A. Laban, 27 Trinity Road, West Bromwich.

WANTED, fossils of any kind.—M. Norton, Ridgemount, Basset, Southampton, Hampshire.

OFFERED, British shells in exchange for good Paris basin fossils—specially wanted Volutes.—Miss F. Hele, Fairlight, Elmgrove Road, Cotham, Bristol.

WILL exchange micro-sections of coal measure fish remains for Professor A. Geikie's "Advanced Book on Geology."—Joseph Taylor, Shire Moor, *viâ* Easdon, Newcastle-on-Tyne.

I WISH to correspond with naturalists in all parts of the world: object, to exchange birds' eggs.—Charles Stackhouse, No. 1001, 6th Avenue, Altoona, Pa., U.S.A.

FOR exchange, about 50 metallic minerals (named) for 25 good microscopical slides of general interest. List sent in return for list of slide objects.—"H.," 5 Rough Down, Boxmoor, Herts.

WANTED, valentine knife, machine for sections, microscopic specimens, with turntable. Offer G. J. Wilkowski's movable atlas and books, "Brain, Eye, Tongue, and Throat," "Ear and Teeth," "Neck and Trunk."—Oswald Simpson, 7 Fishergate Hill, Preston.

EGGS to exchange for others not in collection: Indian swift, sparrow, ring dove, turtle dove, river tern, weaver bird, scissor-bill, black-bellied tern, grey partridge, yellow-wattled plover, striated bush-babbler, drongo shrike, purple honey-sucker, red-wattled plover; American robin, kingbird, bluebird, flicker, phœbe bird, song sparrow, yellow-headed blackbird, and many others, English and foreign.—Geo. Widdas, Woodsley View, Leeds.

WANTED "Science-Gossip" for 1876, bound or unbound. Exchange good slides.—W. H. Harris, 44 Partridge Road, Cardiff.

SPECIMENS of *Smilacina bifolia* and *Lloydia serotina*, both from Switzerland, for other plants rare to the British Isles. Send lists.—Mr. H. Morland, Cranford, near Hounslow.

EGGS of sea and shore birds wanted, either in sets or single eggs; must be blown with one side-hole. Many rare duplicates to offer.—T. Dealy, Grey Street, Derby.

WILL send one dozen of Vallisneria young plants for a half-dozen mounted objects.—John Simm, West Cramlington, Northumberland.

WATT'S "Dictionary of Chemistry" wanted in exchange for full-set (seven vols. and two atlases) of 40th Parallel U.S. Geological exploration.—H. Poole, Buffalo, N.Y., U.S.A.

FOR exchange, three varieties of *H. aspersa*, viz., *conoidea*, *albi-fasciata*, and *ex-albida*, also other shells. Also many rare British wild plants. Send lists of duplicates and desiderata.—C. A. O., Lyndhurst Cottage, Lyndhurst Road, Worthing.

DUDLEY limestone and coal measure fossils, good and choice examples, named and localised, offered in exchange for other specimens. Correspondence invited.—F., 106 Finch Road, Handsworth, Birmingham.

WANTED, SCIENCE GOSSIP for 1871 and 1872, bound, or in Nos. Other books in exchange.—F.R.G.S.I., 9 Royal Terrace West, Kingstown, co. Dublin.

RYMER JONES'S "Animal Kingdom" (last edition), Quekett "On the Microscope," Burmeister's "Entomology," Lewis's "Sea-Side Studies," Landsborough's "Sea Weeds," &c., offered in exchange for Yarrell's "Fishes," Bate & Westwood's "Crustacea," Moggeridge's "Harvesting Ants," and other natural history works.—C. A. Grimes, Dover.

EXOTIC Lepidoptera—Duplicates: *Orn. Minos*, ♂ and ♀; *Papilio protesilaus*, *autosilaus*, *Sinon*, *Dolicaon Turnus*, *Hector*, ♂ and ♀; *Antiphus*, *Philoxenus* (fine), *Polymnestor*, ♂ and ♀; *Chaon*, *Polydorus*, *Protenor*, ♂ and ♀; *Rhetenor*, ♂ and ♀; *Nox*, *Polyctos*, *Perianthus* (fair), *Sarpedon*, *dissimilis*, *Ægeus*, ♂ and ♀; *Xalmoxis*, *Hesperus*, *Leonidas* (fine), *Hippocoon* (fair), *Policenes*, *Heb. Glaucippe*, *C. Menippe*, *Amauris damocles* (fine), *Niavius* (fine), *Minetra Gambrisius* (fine), *Diadema anthedon* (fine), *Dirrarchæ Hen.* (fine), *Cethosia cyane*, *Limen. procris*, *Cat. cynosura* (fine), *Harma theobene*, ♂ and ♀ (fine); *Cœnis*, ♂ and ♀ (fine); also many species of *Romalæosoma*, *Heliconia*, and others.—J. C. Hudson, Railway Terrace, Cross Lane, Manchester.

ROCK sections of unsurpassed excellence in exchange for interesting rock material—igneous preferred.—H. Hensoldt, 7 Machell Road, Nunhead, S.E.

WANTED, *Puccinia buxi*, *P. straminis*, *P. apii*, *P. conii* *P. angelicæ*, *P. æthusæ*, *P. bulbocastani*, *P. pimpinellæ*, *P. straminis* and *Æcidium asperifolii.* Must be fresh specimens. Will give other species in exchange.—H. T. Soppett, Saltaire, Yorkshire.

THE rare leaf-fungus, *Xenodochus carbonarius*, sent to any one interested, on receipt of a stamped envelope, or other fungus in exchange.—W. B. Grove, 269 St. Vincent Street, Birmingham.

WEST Indian Sand, used for Microscopes, for any six of the following butterflies: *Thanass Tages*, *Steropes Paniscus*, *Apatura Iris*, *Papilio Machaon*, *Colias Hyale*, *C. Edusa*, *Pieris Napi*, *Arge Galathea*, *Thecla Pruni*, *T. W. album.*—George Herbert Skuse, 143 Stepney Green, London E.

WHAT offers for the shells extracted from foraminiferous sand?—Herbert Skuse, 143 Stepney Green, London, E.

EXOTIC LEPIDOPTERA. Duplicates. Will exchange 50 kinds of Indian butterflies and moths, including *Atlacus Atlas*, ♂ and ♀; *Kallima inachis*, *Cyrestis thyodamas*, *Junonia œnone*, ♂ and ♀; *Papilio polyctor*, *P. sarpedon*, *Hypolemnas misippus*, *Vanessa asterie*, *V. charonia*, *Apatora dichron*, *Ornithoptera Pompeius*, ♂ and ♀, and others; for either (1) Seebohm's "Birds," Parts I. and II., new; or (2) Bell's "Quadrupeds and Stalk-eyed Crustacea," new.—Charles Donovan, jun., Myross Wood, Leap, co. Cork, Ireland.

NAVICULA HUMEROSA, De Brébisson. Slides of a pure gathering in exchange for other diatomaceæ.—W. M. Paterson, Loftus.

V. antiopa (bred here from continental eggs) duplicates; desiderata, *C. album*, *Polychloros machaon*, *Sibylla*, &c.—G. Brabon, 48 Shakespere Road, South Hornsey, N.

BOOKS, ETC., RECEIVED.

"The British Moss-Flora," Part VII. By R. Braithwaite, M.D., F.L.S.

"Parrots in Captivity," Part I. By W. T. Greene, M.D., &c. London: G. Bell & Sons.

"The Butterflies of Europe," Part XIV. By H. C. Lang, M.D., &c. London: L. Reeve & Co.

"Journal of the Royal Microscopical Society," August 1883.

"Transactions of the Essex Field Club," vol. iii., Part VII.

"Land and Water."

"Midland Naturalist."

"Journal of Conchology."

"Natural History Notes."

"The Practical Naturalist."

"Ben Brierley's Journal."

"American Naturalist."

"Science."

"American Monthly Microscopical Journal."

"The Botanical Gazette."

"Canadian Entomologist."

"Cosmos: les Mondes."

"Le Monde de la Science."

"Feuille des Jeunes Naturalistes."

"The Popular Science News."

&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 11TH ULT. FROM:—A. W. S.—Mrs. V.—H. W. L. W. B.—W. B. G.—A. L.—H. E. W.—E. H.—O. S.—A. H. B.—H. B.—H. W. S. W.—B.—C. S.—W. J. S.—W. H. H.—F. H. A.—S. H.—T. W. W.—S. H. B.—J. C. T.—T. D. A. C.—B. H. B.—W. J. S.—W. W.—W. G.—W. H. H.—H. M.—J. W. W.—E. F. B.—B. M. O.—P. S. A.—Dick—J. T.—H. P.—C. H. J.—B. H.—J. S. (Oporto)—J. K. D.—G. A. W.—J. T.—J. W.—R. A. R. B.—E. F. B.—W. E. H.—M. N.—H. W. S. W. B.—J. R. E.—F. M. H.—D. M. W.—H. E. W.—J. A.—W. F.—C.—H. U.—G. W.—S. C. C.—C. A. L.—G. W.—A. L.—F. C. K.—E. C. J.—J. S.—C. S.—F. R. G. S. I.—C. A. G.—W. B. G.—H. S. T.—A. H. W.—R. L.—F. J. G.—W. B.—S. C. C.—W. T. L.—W. F.—A. O.—T. Mc.L.—H. C. B.—Miss B.—H. M.—H. H.—J. C. H.—J. A. W.—W. B.—H. T. S.—E. L.—U. A. S.—W. J. S.—J. D. B.—E. D.—A. H. B.—G. H. K.—F. A. A.—G. B.—C. D. Jr.—H. S. W.—A. E. B. S.—A. E. G.—W. M. P.—R. A. R. B.—A. D.—G. R.—&c.

A NEW HISTORY OF THE SPARROW.

By GEORGE ROBERTS.

[*Continued from page* 204.]

CHANGE OF TASTE.

If we turn to the feeding habits of the sparrow we shall see here again how happily he has fitted himself into circumstances. When hawks and other natural enemies were numerous, and when the face of the country consisted of woody, heathery, and grassy wastes, the sparrow, as a species, would be thinly distributed, and would feed for the most part on the seeds of grasses. Just before harvest he reverts for a short time to his ancient food, and when the ripe grass is being mown, flocks may be seen in company with whinchats and starlings feeding on the seeds. I have also found seeds of grasses at this time of the year in their stomachs. When oats and wheat and barley, all of which are improved and enlarged grasses, came into cultivation, the sparrow began to turn from his normal food to the seeds of cultivated grasses. No other bird did that in the same degree. No other bird seems to have had the same adaptability. The chaffinch, the bullfinch, and the goldfinch, all birds with strong bills, adhered as near as they could to their normal food, and the two last-mentioned, being less able to adapt themselves to changes, are now dwindling species. Now, this readiness to conform to a change of food placed this sparrow a step above other small birds: it induced a parasitic attachment to man, and it opened up a new source of subsistence. Gradually as the cultivation of cereals extended the sparrow would prosper and multiply, till now it has acquired an appetite for cultivated produce that is omnivorous. Other birds having less adaptability remained at a comparative standstill. When rice was introduced into America a bird called the cow-bunting turned from its natural food to rice, and now that bird is as much a pest in the ricefields in America as the sparrow is in the cornfields of Britain.

It is not necessary to go into a detailed account of the present habits of the sparrow, for it has been pointed out on previous occasions in the "Rural Notes" that it spends its time from January to January, with very slight exceptions, in one continual round of plunder and destruction. I must, however, take the opportunity to mention that I received from my friend Mr. A. Willis, of Sandal, an account of a series of examinations of the stomachs of sparrows, carried on in the summer of 1882, with a view to ascertain the nature of their food. He states that out of 87 careful examinations he found insects in eight cases; in 68 he found vegetable food; the stomachs of the others contained sand only, or were empty. In several instances he found in the gizzard sharp bits of glass, bits of iron, coal, cinder, and wood.

The manifold advantages which an omnivorous taste confers on the species, being apparent, need not to be referred to further than to note that its adaptive nature is thereby immensely widened.

COLOUR.

The dull plumage is another advantage that the sparrow possesses. The colour assimilates with the soil and with the bark of trees, thus it is more likely to elude observation. If half-a-dozen sparrows and half-a-dozen yellow or pied wag-tails were feeding in a fallow field and a hawk happened to be passing over, the hawk would pounce upon one of the wag-tails, those birds being more conspicuous, and the sparrow would escape. It may further be worthy of note that the speckled eggs of the sparrow assimilate in colour with the black and white feathers and wool of the lining of the nest; we cannot tell, in our present ignorance, how far this may have favoured the bird. It certainly would be a great advantage if the sparrow ever, at any time of its existence as a species, built a nest without a dome, as the eggs would lie half hidden among the feathers, and be almost invisible to any passing egg-hunting bird. There are some birds, a little more intelligent than others, that cover their eggs on leaving the nest. I cannot but think that this is an advanced step, slowly developed, towards the construction of a dome.

PARASITISM AND AGGRESSIVENESS.

By allowing the sparrow to feed on our crops, to breed about our houses, and to roost in our haystacks and cornstacks, we greatly facilitate its multiplication. Cultivated produce provides it with food all the year round, except in the severest storms. Its accommodating appetite enables it to turn from one source of food to another; hence it seldom suffers like other birds from want of provisions. Its habit of nesting and roosting about warm dwellings is a very great advantage. It monopolises the housetop, and often in winter several individuals may be seen basking on the sunny side of a chimney, with evident pleasure and satisfaction, whilst other half-famished birds are hopping about in the snow. Stacks, also, and warm, ivy-clad walls are taken possession of, to its own peculiar advantage, but frequently to the detriment of other birds, as from its pugnacity it can drive other birds out, and compel them to take up with less comfortable quarters. All these semi-domestic habits tend towards the preservation and increase of the species.

Its aggressions on other birds form another kind of parasitism. Its habit of taking possession of the nest of the house-martin is well known. This hinders the nidification of the other birds if it does not materially profit the aggressor. I do not think it ever rears a brood in the usurped nests of the martin. The sand-martins are also subject to similar assaults and hindrances. Sometimes it appropriates the nest of another bird as a foundation for its own nest. Its habit of building in shielded places among the rooks has been alluded to. These habits, slowly acquired, are now hereditary, yet mutable; they all tend towards the welfare and the spread of the species.

It has been stated that the martins take revenge on the impudent invaders of their nest, and occasionally build him up within, but this requires confirmation. I think the sparrow is too wide awake to be buried alive.

It is said that sparrows habitually roost in the nests of rooks in winter; that they roost in their own nest, and that they build a supernumerary nest like the wren. The latter assertion I can confirm, but the other two perhaps require investigation. All this, however, tends to prove that the sparrow has acquired habits which are very different from those of other birds, and that it stands as an advanced species, so to say, in bird civilisation.

LANGUAGE.

Constant association with man and with the domestic animals that surround him, together with its own sociability, has caused the sparrow to contract a language that is superior to that of most other birds. From the fact of being numerous it has many enemies, and the burden of its life is to avoid its enemies. Adversity sharpens its wits. When feeding in the open exposed fields it is always alert to receive or give a note of alarm. All the suspicious and adroit movements of its enemies are understood. Very often does the well-known note of the watchful sentinel enable a whole flock to save their lives. The copiousness of the sparrow's vocabulary is perhaps most noticeable in spring, during the breeding time. The various notes of alarm, fear, warning, menace, reproof, pleasure, or gratulation are then most demanded; then is the whole energy of its language displayed. The business of pairing, selecting a site for the nest, collecting proper materials, weaving them into shape, sitting in turns, feeding the young, and protecting them when fledged, could not be done without a constant interchange of ideas. Teaching the young how to procure food and how to avoid danger, and retrieving them from numberless little mishaps that befall inexperienced or weakly birds, are tasks which require a great amount of tact and intelligence. The cock sparrow takes considerable pains in training and guarding the young. When he thinks they have been rocked in their feathery hammocks long enough, he sits on a branch and calls them from the nest. For a day or two they occupy any little convenient perch that happens to be near the entrance to the nest, the old ones bringing them food constantly. Having acquired command of wing they are then escorted to the nearest feeding grounds, and trained to seek their own food, being guarded all the time with the greatest care. If at any time the young should be left alone and no old ones on the scene, and an enemy turn up, the old ones instantly appear, and by word and example endeavour to call them and attract them to some place of safety. Neither the young nor the old are guided entirely by instinct; they deport themselves according to circumstances. They often have to decide which is the best of two ways of escape or defence, in the twinkling of an eye. In these cases the old ones frequently display great boldness and sagacity, generally throwing themselves within the sphere of danger. Sparrows often assist other birds to save their young. When a cat is tracing a young bird a note of alarm is soon given, and a host of birds appear upon the scene and commence to fly round the enemy, giving vent to the most abusive language. Some chatter and frisk about in the trees, evincing the greatest possible agitation and concern. Swallows utter loud execrating notes, and swoop down so threateningly and so near that the cat actually raises its paw to strike in self-defence. During this extraordinary commotion the young bird contrives to make its escape. The old ones, perceiving this, then retire as suddenly as they appeared, leaving the cat standing motionless, with tail erect, wondering at the oddity of the thing.

The question how far young birds receive artificial instruction from their parents, and the whole subject of bird-language in its different branches, seem to be almost ignored in this country, but has received considerable attention in Germany.

DISSEMINATION AND HABITS IN AMERICA.

As proving the remarkable adaptability of the sparrow, the following brief account of its spread in North America may be adduced. It is from the "Zoologist" for 1881 :—"The house-sparrow was first introduced into North America at Portland, Maine, in 1858. It has overrun the entire eastern province from the Atlantic coast to the Missouri, and south, nearly or quite to the Gulf, but it is most abundant in the Northern States. It is equally abundant in the Missouri Valley and in the Atlantic States, but is of course more so in some localities than in others. Apparently not yet introduced into California or other parts of the West. In the vicinity of all the larger cities *Passer domesticus* far outnumbers all the native birds taken collectively. It is common also at Salt Lake City, Utah, and at St. Louis, Missouri. I have found it abundant in all the cities of the East, from Montreal, Canada, to Richmond, Virginia ; but it does not seem to spread much into the surrounding country.—PERCY E. FREKE."

It is worthy of note that no other European bird is so thoroughly naturalised on the new continent as the sparrow ; it seems to have the ability to conform to any circumstances or conditions under which white men can exist.

Concerning the habits of the sparrow and other birds in America, I have received a long communication from an American correspondent, Mr. Charles Mortimer, of Milwaukee, Wisconsin. The following is the substance :—"In answer to your question about the presence of English sparrows, I would say that they are here in Milwaukee in considerable numbers, and in many other cities and towns. They are by no means favourites, as the editorial article I sent you will show. Their habits here, so far as I know, are much the same as at home—the same noisy, pugnacious, chirruping race. In the city here they seem to find food enough in the streets among the horse-droppings and about our depôts, where much grain is handled and some wasted. They are industrious scavengers. Latterly, I see a few have begun to frequent the steep banks of the lake, but I think their living there must be more precarious, except, perhaps, in the autumn, when seeds of most plants are ripe, or ripening. Their nests are built exclusively in holes and crannies about the tops of our buildings, or in the little box houses that were put up originally for the convenience of our native blue bird or purple martin. Both of the last-mentioned birds are great favourites—the one for its cheery notes in breeding time, and the other for its sociability and its song ; but I am sorry to say that your English usurpers, the pugnacious sparrows, have almost driven them away. I have not seen a blue bird this season ; the first omission in the many years I have lived here. The sparrows are becoming more noticeably numerous here every year. I saw their young fledged and hopping about on bushes as early as the 8th of May (1882). They are now confined mostly to towns, but we are afraid they will soon spread into the country, and become a great pest.

"A farmer in the interior not long since procured some young ones and tried to settle them on his premises, thinking they would remind him by their chirrupings, of the pleasant old English home-associations of his early days, but one morning when he got up no sparrows were to be seen. They had all fled to a neighbouring farm.

"One of our finches here, the goldfinch, or yellow bird as it is more commonly called, or thistle bird, from its known fondness for the seed of that plant, has a very singular habit that has not been noticed by Audubon, Wilson, or other naturalists, I believe previous to the last decade. The female—or perhaps both assist in building a comfortable-looking nest in bushes—in willow bushes I have found them—and before it is used by the female to deposit her eggs, it is pulled to pieces and destroyed, and another built in another locality for the purpose of incubation, so that they are not among the early breeding birds. The fact has been noticed in the vicinity of Washington, and in the neighbourhood of Boston, Mass., and by myself in the neighbourhood of Milwaukee several years ago, so that appearances seem to indicate a general disposition to the same purpose in widely remote parts of the country." In regard to this latter subject it may be added in confirmation, that the chaffinch in this country often pulls the lining of its nest to pieces, and that the sparrow often deserts unfinished nests.

After reviewing all the above facts, and paying due regard to all the bright points in the character of the sparrow, to its artful conduct in the defence of its young, and to its various other ingenious and clever performances, it is almost a pity to have to come to the conclusion that it is a superabundant and injurious species, and that it is the bounden duty of man, in view of his own interests, to take all possible means to lessen its ever-increasing numbers.

Lofthouse.

A MIDSUMMER RAMBLE OVER THE SURREY DOWNS IN QUEST OF BUTTERFLIES.

By the Author of "Insect Variety."

It is the heyday of summer. The sun is again looking over the hill on the picturesquely Elizabethan town of Guildford. The old grey keep that reverberates with dreamy echoes and stares owl-like at the upspringing day, holds eternal watch over the shattered palace walls, where our Plantagenet monarchs caroused at Yule-tide, over the remnants of the boar, the deer and the swan.* Within the silence of its oratory; scribbled over with effigies of Christopher, the canny child bearer, and Charon, the importunate ferryman, crucifixions *à la mode*, crowns, shields, doves, and Catherine-wheels; the Morte Darthur suggests that the fair Elaine pined and died of love for Sir Launcelot, peerless in knighthood. Streaming over dewy flowers and pearly cobwebs, the slant sun-rays creep into the decrepit chapel of the Baptist, and flicker over faded masterpieces in Italian distemper, representing Gospel stories and instructive legends, where figures of Norman monarchs, Ethiopian slaves, monks and scribes, are the puppets of a galaxy of Egyptian gods and legendary spirits, Anubis, Horus and Michael. Where the sunlight glints over bald elms to sleep on the walls of the old moated mansions of Loseley, Tangley or Sutton; the stained glass casts the light of other days over oak panelling and carved chalk mantelpieces, while the air at the porch becomes fragrant with chamomile, tansy, and other aromatic herbs, that our ancestors put into their tea or cakes.† But a nightmare of antiquities is not my happiest vision of the morning. The sun now high in heaven reaches my window-pane, and its warm ray smiting on my forehead, causes my sleepy thoughts to wander away into Fairy-land, where some beautiful water-spirit, newly arisen from the crystal mirror of the Silent Pool, is bending over me with eyes glistening with emeralds and molten diamonds. Around me hang the creamy blossom of the sloe and emerald shade of the hawthorn, while a mingled essence of cowslips, violets and furze, seems to load the air. In my ear echoes a strange accent resembling the throbbing of the nightingale, confused with the delicious warbling of the throstle cock. My heart experiences the unrest of the dog-days, and that stinging brute *Stomoxys calcitrans* has joined himself to the house-flies who are sounding an attack. I start with a shudder. Pshaw, the cat! I then remember I have determined to give myself a holiday in order to find something fresh to communicate to Science-Gossip, so with perfect nonchalance I watch the dance of flies on the ceiling, and an arachnide endeavouring to fix a thread, until I grow weary. I then arise and dress, I breakfast and make for the foot track leading up the hill. As I pass along, I notice an old acquaintance setting flowers out in his garden. I greet him, but he tells me he has obtained all the species of butterfly in the country, so I simply move on. As I climb the slope, my attention is attracted to the foliage, and the singular Rembrandt effect conferred by the late cold wind. The trees are all seared with premature autumn. On its southern aspect the elm I am approaching is crisp and umber, and the quickset beside me is all of a sienna hue. The stunted oaks in the hedge appear to be hung with charred paper, as though there had been a feast of lanterns. The young sap has refused to flow to the emerald bud, and the cyclone mocked the south with its saline and icy breath, for it whirleth about continually. It was the same, the old chronicles suggest, in the year of our Lord 1247, when a terrible earthquake visited England and houses went to wreck. We have had this year an earthquake in Wales, and it has struck me that these fitful agues are upon us, when the more equatorial portions of the globe are enjoying immunity.

But see, my meteorological reverie has taken me up the Elm-tree hill, along the summit, and past the Chilworth sign-post. As I trudge over the old oblong trench, forty feet by eighty, I stoop and wrench from the sward an antique pair of metal-nippers, that makes me suspect that this excavation in the chalk was dug by ignorant miners searching for iron ore.* Now I reach the gnarly yew, silvery with the parasitic white-beam spray, and the solitudes of Newland's Corner, the best butterfly locality hereabouts, lie before me. Primeval silence encompasses me. Are there no mammoths stirring, no white harts and wild cats, no outlaws and nut-brown maids, nothing but my lord's partridges and small game? "Not quite a poacher yet, my man," I exclaim, as I plunge as of old into the sun and shade of the ferny glades, and an orange-winged fritillary (*Argynnis Euphrosyne*) that moment glides past me; the speckled yellow (*Venilia maculata*) too, is out in gay profusion. I track a path lavish with the turquoise of forget-me-nots, that conducts into the

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* Mr. Frank Lasham, of Guildford, has lately discovered in the rear of his premises in the High Street, the castle refuse-pit, filled with bones of the horse, ox, sheep, deer, wild boar, and other animals; associated with layers of charred wood, objects of iron, glass, pottery, and other convivial relics.

† The *Anthemis nobilis* grows in profusion by the moat at Loseley; the *Tanacetum vulgare* is conspicuous in the pleasure-grounds at Sutton.

* I deposited my treasure in the Guildford Institute, where it may be seen by the curious, and I dropped a note to a gentleman said to be fond of archæological research on my return.

dusk. The white wings of the little clouded silver (*Corycia punctata*) impress the pupils of my eyes, and I am arrived at a solitary recess open to the blue vault above. There are apparently no bee-flies this year, but in the quiet, a clear winged moth poises at a blossom. I miss my sweep with the net. Then a paradisiacal weariness seizes on me. The glare of the sunlight and perpetual *churr* of the fern owl becomes tedious, the sound of the wind grows irksome, the honeyed fragrance of the rich mould is over-satiating. Now then for a love poem in the manner of Petrarch, but it is surely the dinner hour: time forbids.

As I return over the short turf I catch the note of a grasshopper, a sound I have somewhat missed these eight years past. The little skipper butterfly (*Pamphila comma*), the catch of this district, which I suspect to be double brooded, is not to be seen darting up the slope. I regain the hedgerow, where I see a purple emperor on an oak spray, and catch three different kinds of white butterfly, one a green-vein (*Pieris Napi*), taken just in the act of ovipositing on a tuft of wild mignonette (*Reseda lutea*). Now I am back in my study—my manufactory, may I say? From the fritillary, *Euphrosyne*, and *Megæra*, the wall butterfly, I elicit quite a joyous fiddling by rubbing the two wings together, and I am led to perceive it arises from the anal vein of the fore wing being notched; I likewise prick a scent fan from the hind tibiæ of the male of the scorched carpet moth (*Ligdia adustata*). Surely insect physiology should consist in something more than a dry discussion of the organs of respiration; one would think that we field naturalists were all coming out as surgeons to Queen Titania.

But now, how about these very common white butterflies, *Pieris Brassicæ*, *Rapæ* and *Napi*? I must have a thought about their ancestry before I throw them away as useless. Is it not a little singular, that the large and small whites of the cabbage beds should be so much alike, and the rustic green-vein so radically different in appearance; when the fact is, in the caterpillar state the two smaller whites are the most alike? Indeed they are so much alike, that the only part of Professor Zeller's late discrimination of them in the "Stettin Zeitung" I can verify, is that the caterpillar of the green-vein wants the orange in its dorsal line, and it has no orange spots on and behind its spiracles, like the caterpillar of the small cabbage white. Even here, the rule (I think) is not without exception. As to variation in the perfect state, our white butterflies vary similarly and according to the season. We have white or buff spring forms (*a*, *b*), in which the black markings are small, and in the males sometimes absent (*a*), and we have dusky summer forms, with large black markings (*c*, *d*) that often run more or less into a marginal line. This lineament of summer, in the green-vein (*d*) we found ovipositing on the wild mignonette, cuts through the black rays and marks a row of obsolete hearts, such as are frequent in its kindred, the white butterflies of Hindustan. In seeking for the most permanent characters of a species, I should mention that size is a very inconstant one: (*a*) and (*b*) are, for example, dwarfs I manufactured by starving the caterpillars of last autumn, and I have many such starvation dwarfs, whites, peacocks, and tortoiseshells, in my boxes; besides brobdignagian tiger moths from a diet of spring lettuce. A strange food plant too dwarfs a species: my tiger moths (*Arctia caja*) bred on herb-robert (*Geranium Robertianum*) are little pallid creatures; and climate has the same

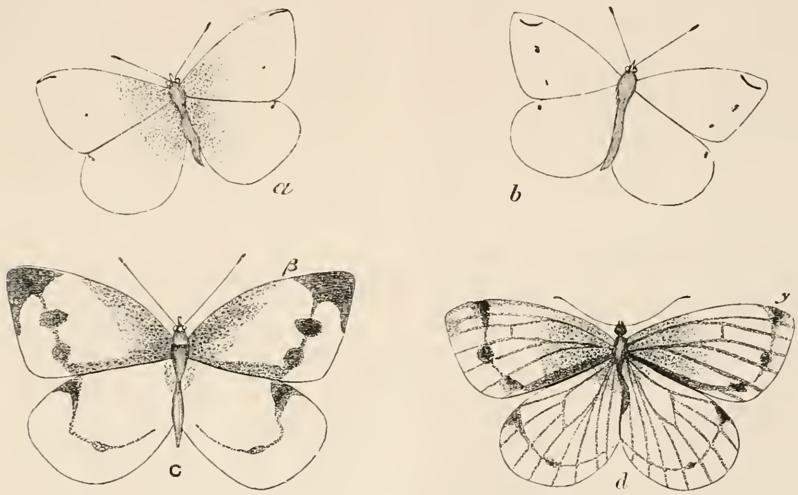


Fig. 128.—White Butterflies. Limits of seasonal variation:—*a*, *Pieris Rapæ* ♂, Spring form (dwarfed); *b*, *Pieris Rapæ* ♀, Spring form (dwarfed); *c*, *Pieris Rapæ* ♀, Summer form; *d*, *Pieris Napi* ♀, Summer form; β γ, spots running into lines.

effect, judging from a series of gipsy moths (*Hypogymna dispar*) I bred in this country from southern parents. Dwarf butterflies are often taken at large, and the process in no way impairs the faculties of the individual. Since caterpillars only feed in bright light, the reason why British butterflies and moths that have left colonies in Italy should invariably be giants of their kind and appear oftener in the year, is easily seen. Indeed the curious circumstance is that the cabbage plant should nourish two nearly related white butterflies that differ so much as to size. As regards the smaller whites, with all this seasonal dress in common and an identical variation on the under surface of the wings, from pale sulphur to canary yellow, we have, as I said before, a radical difference, namely in the appearance or absence of the black rays. Sometimes these dark markings only appear, in the green-vein, at the base of the under wing beneath, and then it resembles most its congeners. If we accept this as a primordial form of the whites, it remains to discover the conditions necessary to produce it ; it is not seemingly a vernal variation, since I take it in August.

But let us leave this topic, and take a stroll in the cool down to the mill beneath the castle, where an American pond weed (*Anacharis alsinastrum*) may be observed with a freshwater Asiatic mussel (*Mytilus polymorphus*) clinging to its tangles ; both of which, of late years, have largely propagated in the Wey. I should likewise like to visit the spot on the Hog's Back, where a gentleman picked last year an American weed, the *Claytonia perfoliata* ; or to mount to the bank where the spotted dead-nettle (*Lamium maculatum*) is growing wild ; we shall find near it a large shrubby spurge that has lately made itself at home on the building plots. Time forbids us to search for the grape hyacinth out at Merrow, or the Roman snail (*Helix pomatia*) in the chalk pits, or to look for that pink colony of the *Helix cantiana* a friend asks word of. Indeed this old place should likewise be quite a choice locality for garden sports. Was it not at Guildford that the Queen of Henry III. kept an herbarium, and from the neighbouring Waverley, fifty years after, that a prize carnation was sent yearly to the Abbot of Dinan in Normandy?

PUPA DIGGING.—There is no better way of collecting lepidoptera than hunting for their chrysalides. The implements required are simple ; a common garden-trowel, a short, strong, blunt knife, and a tin box. Thus equipped, take your way about the middle or end of October to the nearest wood, and with the aid of your trowel carefully peel away the turf from the bottom of the tree-trunks. Many chrysalides will be found just under the turf, others are a few inches deeper. It is of course unnecessary to warn you to dig carefully, lest you risk doing some rarity a mortal injury.—*Albert H. Waters, B.A.*

A CHAPTER ON BRITISH FOSSIL BIRDS.

By ARTHUR SMITH WOODWARD.

THE remains of all kinds of vertebrate animals have a very small chance of being preserved in a fossil state, owing to the very numerous ways in which they are liable to annihilation before entombment, and owing also to the fact that an exceedingly large number of the relics are those of air-breathers that do not come within reach of any transporting currents, by which they can be carried to some suitable spot and buried in sediment. But of all groups of the most highly organised division of the animal kingdom, the class of birds is the least likely to be well represented in the palæontological record. The skeletal structures of the feathered tribe are so extremely fragile that even if an individual after death does happen to find its way into water, which would eventually bring it to a place of entombment, it not only, like all other vertebrate remains, has all the risks of being devoured by some predaceous fish, but is also liable to annihilation from other causes, in consequence of its delicate organisation. Thus, our imperfect knowledge of the avi-fauna of any area, during any geological epoch, can easily be accounted for ; and when we look at all sides of the question, we really must wonder how fortunate we are in being able to know anything at all on the subject.

It is very rarely that the skeletons of any but the natatorial birds (*Aves aquaticæ*, of Nitzsch) can be entombed in marine deposits ; sometimes, remains of the *Aves terrestres*, and *aereæ*, may reach estuaries ; but usually those that do find their way into river waters are buried in the terraces and valley-gravels, which, from their limited extent, are seldom found of greater antiquity than the most recent (Pleistocene) geological times. Cavern deposits sometimes yield a number of bird-remains, but these accumulations, like river-terraces, are generally of such small dimensions, that they cannot often survive denuding agencies for any long geological period.

For these and many other reasons, it is no long task to summarise all that is known concerning the birds which have existed in the British area of the globe during past geological epochs. The remains of scarcely any examples have been noticed as occurring in the British Mesozoic deposits ; a few more have been detected, and with greater precision, in the Lower Tertiaries (London Clay of Sheppey, and Headon Series of Hordwell Cliff) ; some difficultly-determinable fragments of the avian skeleton have been found in the Pliocene Crags ; several species have been recorded from cavern deposits ; and, lastly, some exceedingly interesting facts concerning the ornithology of this part of the globe in the most recent times have been obtained by a study of numerous bones found in fluviatile accumulations and peat-bogs.

The great similarity between some of the bones of the Pterosauria, and the corresponding parts of the skeleton in certain orders of birds, constitutes perhaps the most important obstacle to the correct determination of the Avian fauna of the Mesozoic age. More than once, specimens have been described by the highest authorities as indicating the existence of birds at particular periods; while some time afterwards the same palæontologists have altered their opinion, in consequence of longer consideration and greater experience, and declared the puzzling fossils to be truly pterosaurian.* In fact, the Pterosauria seem to graduate so imperceptibly into the Aves, that it is hard to ascertain in many cases whether a skeletal fragment belongs to the former or the latter class, and, as palæontological research continues, many intermediate forms will probably be defined, to which a large proportion of the problematical bones may eventually be referred.

So long ago as 1835, Dr. Mantell announced the discovery, in the Wealden Strata of Tilgate Forest, of certain fossils which he regarded as belonging to the skeletons of true birds. The remains were very fragmentary, but still, in the opinion both of the discoverer, and of Professor Owen, they were considered quite sufficient to warrant the conclusions expressed in the transactions of the Geological Society of London for that year. At a later date, however, after more of the enveloping matrix had been removed from the specimens, Professor Owen studied them more closely, with the result that they were relegated to the Pterodactyles. Since then, no more discoveries of bird-remains in the Weald have been recorded, and, consequently, although the class may have been represented in British regions at the epoch when that estuarine formation accumulated, no satisfactory evidence of such being the case has hitherto been obtained.

The next Mesozoic deposit which has been stated to contain traces of birds is the Cambridge (or "Upper") Greensand. In 1858, Mr. Lucas Barrett discovered a few fossil bones, the avian affinities of which were soon recognised, the determination being confirmed by Professor Owen. Subsequently, more specimens were obtained, and the collection of the Woodwardian Museum at Cambridge, comprises a good series of vertebræ, and portions of cranium, femur, tibia, and metatarsus. According to Professor Seeley, who made a careful study of these fragmentary fossils, and published his final conclusions in 1876, there are probably indications of only one genus, but of this there are two well-marked species. Though the remains differ generically from the corresponding parts of the skeleton of any known living bird, the whole series betokens affinities with the existing divers, and in that respect the British Greensand specimens somewhat approach the interesting and peculiar forms discovered in the cretaceous formations of North America. No portions of mandibles have yet been discovered in the Cambridge deposit, but taking into consideration all the facts adduced by the fragments of the skeleton already found, it is not in the least improbable that these British cretaceous birds were characterised by the feature of possessing teeth in sockets in the jaw, like the more perfectly known species (of genera *Ichthyornis*, *Hesperornis*, &c.) in the New World. Some of the bones, and parts of the vertebral column in both the Cambridge Greensand species "shew evidence of remarkable persistence of cartilaginous conditions of the articulations, especially in the region of the dorsal vertebræ" (Seeley). Originally, *Pelagornis* was the generic name proposed to be applied to these interesting fossils, but, that having been pre-occupied by M. Lartet for a bird (*P. miocænus*) discovered in the marine Molasse of Armagnac, it was, in 1876, replaced by the new term, *Enaliornis;* the larger species is named *E. Barretti*, and the smaller, *E. Sedgwickii*.

While at the present time palæontologists are almost universally agreed that the existence of birds at the period of the deposition of the Cambridge Greensand is a well-established fact, such is not the case with regard to the evidence which the chalk has been supposed to afford of the presence in the British area at another period of the same class of creatures. Two imperfect fossil bones were found in 1839, in the chalk of Burham (Kent), which were believed to be of the avian type by Dr. Bowerbank and Professor Owen, and the latter eminent anatomist briefly described the specimens in the Trans. Geol. Soc. Lond. for 1840, indicating their affinities to the longipennate natatorial birds—particularly the albatross. Subsequently he proposed to refer the remains to a new genus, designated *Cimoliornis*, and from the remarkable resemblances of the species to the albatross, the specific name selected was *diomedeus*.

Some years afterwards, however, there were discovered in the chalk, also at Burham, a few comparatively perfect relics of a huge unknown species of Pterodactyl. These came under the notice of Dr. Bowerbank, and he gave the name of *Pterodactylus giganteus* to the interesting pterosaurian form that they indicated. Somewhat later, this palæontologist, together with Professor Owen, recognised that *Cimoliornis* could no longer be looked upon as an extinct bird, and that the imperfect remains upon which the genus had been founded really belonged to the remarkable new species of flying reptile just mentioned.

The Cambridge Greensand, therefore, is the only British Mesozoic formation which has, so far, yielded satisfactory specimens of the fossil remains of birds.

(*To be continued.*)

* For some years a considerable number of the Pterodactyl bones from the Stonesfield slate were looked upon as belonging to birds.

NOTES ON THE COMMON GARDEN SLUG.

Very few people who have cultivated a small garden plot have escaped the depredations committed on their plants by that pest, the garden slug (*Limax flavus*). By universal consent they are objects to be destroyed as soon as discovered, if we would preserve our plants from their ravages.

Comparatively few, however, of its exterminators, have any idea of the wonderful piece of mechanism employed by this creature for procuring its food, and the following brief description may not be altogether uninteresting to the general reader; while to those who take an interest in practical microscopy, and are possessed of ordinary manipulative ability, the procuring of the tongue is not such a very difficult affair, and the trouble expended will be amply repaid by the possession of an exquisitely fine object, the study of which cannot fail to impress upon the mind the wonderful adaptability of the organ for the performance of its function.

The apparatus consists of two distinct parts, viz. the tongue, or odontophore, and the jaw. The typical object from which these notes are made was taken from a slug measuring two inches in length, when fully extended. When first removed it bears some resemblance to a split tube bent into a V-shape form; the fold of one arm, however is reversed, so that the surface which is exterior in one arm becomes the interior one in the other. It consists of a moderately strong membrane, and, when unfolded and fully expanded, measures $\frac{5}{24}$ inch long by $\frac{2}{24}$ in breadth.

Arranged in parallel rows, transverse to the length, are the numerous teeth or denticles, with which it breaks down the tissues of the plant attacked; the denticles in the object before me amount to the enormous number of twenty-two thousand one hundred. At first glance it might be thought they were similar on all parts of the tongue, but a higher power reveals the fact that there is variety even here, those on and near the margin of the tongue being of a different character to those on the central portion; the former are long and narrow, as compared with the latter, and measure $\frac{2}{1000}$ long by $\frac{1}{3000}$ broad, while the latter measure $\frac{1}{700}$ long by $\frac{1}{1200}$ in breadth.

The anterior portion of the tongue shows unmistakably the friction it has been subject to, the membrane being fractured, and the denticles partly

Fig. 129.—Tongue of *Limax flavus.* × 28 diameters.

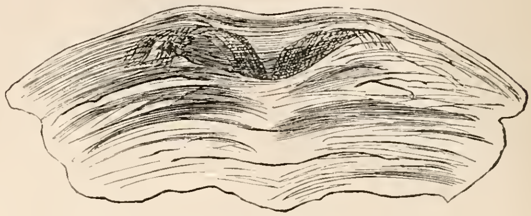


Fig. 130.—Jaw of *Limax flavus.* × 28 diams.

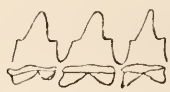


Fig. 131.—Top view of three denticles, middle portion of tongue. × 200 diams.

Fig. 132.—Side view of same.

Fig. 133. — Denticle near margin. × 200 diams.

detached. Can feeding under such conditions be free from pain? Judging from my own experience of a loose tooth I should say decidedly, No; but when we remember that the nettle forms the diet of some species of snails, we should feel disposed to modify our views of the question.

A strong muscular attachment connects the second portion of the buccal apparatus with the jaw; this consists of a crescentic shape chitinous plate striated where the laminæ show the thickening of the organ. Some are folded and thickened into bold transverse ridges, while others are nearly quite destitute. As Mr. Crowther, in his admirable paper in SCIENCE-GOSSIP for January, has entered fully into this part of the subject, I will merely say that what he has written about snails I have found to hold good about slugs. In the case of the latter, however, I have not found the immersion in hydrochloric or acetic acid to have any appreciable effect on the denticles.

I have found the following an easy method of obtaining these organisms. Remove by partial dissection the buccal mass, soak in caustic potash for some time, or boil, if greater expedition is required; partly fill the test-tube with water, and shake briskly; the tongue and jaw connected will separate from the surrounding mass, and can be readily discovered and removed for further treatment. I generally mount in Canada balsam, and since I became acquainted with the wet process, I have had no difficulty in making very creditable slides of animal substances. I therefore recommend a perusal of the article by Mr. Underhill, published in SCIENCE-GOSSIP in May and June 1879, to whom I am indebted for the process, and I shall be glad if you will allow me to thank him for the very useful information.

By this method I have been able to obtain the odontophore and jaw of that minute creature *Vertigo edentula*, which is a fairly good test of the process.

W. H. HARRIS.

Cardiff.

ON GROWTH IN THE EGGS OF INSECTS.

By DR. J. A. OSBORNE.

THE phenomenon of increase of bulk taking place in the ova of some insects, after they have been separated from the body of the parent, has excited a good deal of interest ever since its discovery. In the third volume of Kirby and Spence's "Entomology," p. 91 seq., we read,—"Another peculiarity . . . is the augmentation in bulk which takes place, after exclusion, in the eggs of the great tribe of sawflies, the gall-flies, the ants and the water-mites. Those of the two former, which are usually deposited in the parenchymous substance of the leaves, or of the young twigs of various plants, imbibe nutriment in some unknown manner, through their membranous skins, from the vegetable juices which surround them, and when they have attained their full size are nearly twice as large as when first laid. Except in the eggs of fishes, whose volume in like manner is said to augment previously to the extrusion of the young, there is nothing analogous to this singular fact in any other of the oviparous tribes of animals, the eggs of which have always attained their full size when they are laid. It is to M. P. Huber that we are indebted for the knowledge of the fact that the eggs of *ants* grow after being laid, a circumstance favoured probably by the moist situation in which the workers are always careful to keep them. By an accurate admeasurement he found that those nearly ready to be hatched were almost twice as big as those just laid . . . Dr. Derham seems to have observed, that the eggs of some Diptera, of the tribe of Tipulariæ, also increase in size before the larva is excluded. It seems to me likely enough, that in this and many of the above cases in which the egg is supposed to grow, it is rather an extension of the flexile membrane that forms their exterior proportioned to the growth of the included embryo from food it finds within the egg, than from any absorption from without." In the number of the "Entomologist's Monthly Magazine" for Sept. 1882 (pp. 77–78), Mr. W. Buckler, writing of the eggs of a moth, *Ennychia anguinalis*, states that "though they were very flat when first laid, as Mr. Jeffrey informed me, yet I found they had begun to swell and by the next day had filled out considerably." Again, "The egg of *anguinalis* is round and flattened, becoming more and more convex and plump above as the embryo develops." In rearing from the egg last year the larvæ of *Adimonia capreæ* (a beetle of the family *Galerucidæ*), I had frequent occasion to observe a similar filling-out of the eggs, which when laid were variously flattened and indented, but gradually became full, plump and spherical. It seemed to me also that they attained a size which must have involved some stretching of the chorion. In these two latter cases, the increase of bulk, though to a smaller extent, is not less real a phenomenon and equally demands an explanation, as in the more striking instances of the saw-fly and Cynips. What in the nature of this process? Are these eggs able to absorb and assimilate nutritive matter in the same way as the larva does? This seems to be the opinion hinted at by K. & S. Westwood repeats their words (Mod. Class ii. p. 96); and both are simply reiterating the hypothesis of Réaumur.* He says ("Mémoires," vol. v. 179): "Les œufs de certaines mouches ont besoin d'être humectés, et même nourris . . . par la sève que fournit la branche dans laquelle ils ont été logés.' But Réaumur was by no means sure of the matter. He could discover no incision in the leaf on

* Or perhaps of Vallisnieri, the first to observe and describe these things in the saw-fly.

which "La fausse chenille du groselier" (*Nematus ribesii*) laid its eggs; and in the case of the saw-fly of the osier he sometimes found one layer of eggs on the top of another, and both external to the plant. Vol. v. pp. 128–9. "La coque de l'œuf, son enveloppe, est-elle une espèce de placenta qui s'abreuve, qui s'imbibe du suc de la partie de la plante sur laquelle elle est posée, et d'un suc qui non seulement la fait croître, mais qui fournit à l'accroissement de l'embrion qu'elle renferme? Un œuf qui a été déposé dans la fente faite à une tige de rosier, y est-il greffé en quelque sorte? Doit-il s'approprier le suc de l'arbuste comme l'œilleton d'un arbre, logé dans la fente faite à l'écorce d'un autre arbre s'approprierait le suc de cet arbre? Il semble que cela soit ainsi." Then occurs to him the difficulty mentioned above about the saw-flies of the currant and osier. He adds: "J'ai fait une expérience qui prouve décisivement qu'il est essentiel à l'œuf que cette humidité lui soit fournie par la feuille." This was, in brief, allowing some leaves with eggs on them to dry up; when the eggs perished, whilst those on living leaves and on leaves kept fresh in water, developed. He says: "Des œufs de papillons qui auraient été laissés sur une feuille qui se serait desséchée n'en auraient pas moins donné pour cela des chenilles." That is, in ordinary circumstances, because the eggs of Lepidoptera are better able to retain their moisture. Finally, regarding the eggs on the osier laid in a double layer, "ce qui semble former une grande difficulté sur la manière dont se nourrissent les œufs de la seconde couche . . . On doit penser que l'humidité qui s'élève de la feuille, parvient à la seconde couche d'œufs, ou que les œufs de la première couche fournissent à ceux de la seconde ce qu'ils ont de trop d'humidité, et qui suffit à ceux-ci."

All this only demonstrates the necessity of moisture for the development of the egg. An experiment which I made last year shows in like manner that moisture alone is sufficient, and that no nutritive juice derived from the plant is indispensable to this development. I succeeded in hatching eggs of *Zaræa fasciata* and *Nematus ribesii* on pieces of glass, away from the leaf altogether, by simply keeping them always moistened with plain water, in a covered vessel. All that is necessary besides the interaction of the atmosphere is the imbibition of water. And yet these eggs grow to at least double their original bulk. The little mass of protoplasm has within itself all other material that is necessary to the building up of the embryo; and, sometimes at least, more than is necessary or than can be used up in the process. The matter which gives colour to the yellow yolk of the egg of *Gastrophysa raphani* does not enter into the composition of the larva. As the embryo grows, the yolk, finally enclosed in the alimentary canal, becomes deeper and deeper in colour, and the residuum is voided as an orange or reddish meconium immediately after hatching, in exceptional cases even in the shell itself.

When life, from being subaqueous, becomes subaerial, various contrivances come into requisition for the purpose of retaining within the organism, that amount of free water which is necessary to the carrying on of the processes of vitality. Since desiccation suspends or destroys these processes, can we wonder that an organism so minute and so passive, as an insect ovum, should require not only special structures in its shell, but special conditions of the environment to preserve it from a contingency so proximate and so fatal?* The shell must not be totally impervious, because the interaction of air and water is necessary. Leuckart's description of the microscopic structure of the shell shows how well it is adapted to regulate this interaction within a given range of hygrometric conditions. Many insects lay their eggs in water, and such eggs have an almost structureless chorion. For others the moist exhalations from the leaves of plants are sufficient. *Prasocuris marginella* cuts a hole in the hollow petiole of *Ranunculus ficaria*, and inserts her eggs in the tube where they are always bathed in sap. Exposed to the air these eggs would shrivel up in a day or two; but they can be easily hatched in a covered saucer, on a fresh leaf of any plant moistened with a few drops of water. We have seen how, in two hymenopterous families, the same object is attained by inserting the eggs in the tissues of plants. In the case of the third mentioned family of Hymenoptera, the ants, the due relation of the egg to the environment is the care of the workers; and such is also the plan adopted by the common earwig, according to the account of Mr. Rennie in the "Penny Magazine." He says: † "About the end of March I found an earwig brooding over her eggs in a small cell scooped out in a garden border; and in order to observe her proceedings I removed the eggs into my study, placing them upon fresh earth under a bell-glass. The careful mother soon scooped out a fresh cell, and collected the scattered eggs with great care to the little nest, placing herself over them—not so much, as it afterward appeared, to keep them warm, as to prevent the too rapid evaporation of their moisture. When the earth began to dry up, she dug the cell gradually deeper, till at length she got almost out of view; and whenever the interior became too dry, she withdrew the eggs from the cell altogether, and placed them round the rim of the glass, where some of the evaporated moisture had condensed. Upon observing this, I dropped some water into the abandoned cell, and the mother soon afterwards replaced her eggs there. When the water which had been dropped had

* Possibly the layer of albumen in the bird's egg may subserve a similar use.

† I quote from a little book entitled "The Life of an Insect," issued by the Society for Promoting Christian Knowledge.

nearly evaporated, I moistened the outside of the earth opposite the bottom of the cell, and the mother perceiving this, actually dug a gallery right through to the spot where she found the best supply of moisture. Having neglected to moisten the earth for some days, it again became dry, and there was none [*sic*, i.e. no moisture], even round the rim of the glass as before. Under those circumstances, the mother earwig found a little remaining moisture quite under the clod of earth; upon the board of the mantel-piece, and thither she forthwith carried her eggs. The subsequent proceedings were not less interesting; for though I carefully moistened the earth every day, she regularly changed the situation of the eggs morning and evening, placing them in the original cell at night, and on the board under the clod during the day, as if she understood the evaporation to be so great when the sun was up, that her eggs might be left dry before night. I regret to add that during my absence the glass had been removed and the mother escaped, having carried away all her eggs but one or two, which soon shrivelled up."

Milford, Letterkenny.

A GOSSIP ABOUT FUNGI.

By George Massee.

A DEFINITION of a fungus will probably, and not unreasonably, be expected on the first page; nevertheless, such definition is undoubtedly the most difficult part of the work we have undertaken to produce. The numerous orders and genera, whose definitions extend over a score or more octavo pages, and which are all derived from the variability, presence, or absence of some of the essential features that constitute a fungus, prove the impossibility of expressing clearly, within a reasonable space, the elasticity of fungal life. Certain characters, structural and physiological, are met with in the organisms constituting the vegetable kingdom, and it is the varied association of certain of these characters in different individuals that give us the divisions known as Orders, Families, Genera, &c. The great difficulty in attempting classification does not consist in arranging into groups all plants possessing so many features in common, but in determining at what stage a character is sufficiently developed or arrested, to entitle the organism exhibiting the change to occupy a place in a preconceived arrangement. "Natura non facit saltus." Structural changes which may be looked upon as the manifestation of physiological changes, themselves again dependent on the stability of surroundings, are introduced step by step, and disappear in a similar manner, may be compared to a spindle-shaped body; and every group of plants, nay, every species, is composed of more or less of these spindles, a few entire, or nearly so, constituting its so-called characteristics, and portions of others, the mass of which forms one of the characters of allied groups or species, allied, but not the same, because what is appearing or disappearing in the one, is yet a prominent feature in the other.

In fungi there is an entire absence of chlorophyll, hence they are unable to assimilate inorganic food, and require for their support organic substances; consequently they are either *saprophytes*, growing on decaying animal or vegetable matter, or *parasites*, when developed, on living plants or animals. The larger terrestrial fungi appear to offer an exception to the above statement, but a closer examination shows that they are attached to leaves, roots of plants, or the soil contains a large amount of organic matter.

Apart from furnishing food and shelter to myriads of beetles and allied insects, fungi may be looked upon as Nature's vegetable scavengers; so long as an animal or plant is vigorous, it more than compensates for food and space occupied, but the instant it begins to languish, Nature manifestly says the sooner it is out of the way the better; fungi innumerable, large and small, prey upon it, attain their full development at its expense, and then disappear as if by magic. Thus an enormous amount of material, which but for fungi would remain for a long time in a passive state, is speedily converted into suitable food for other plants.

Fungi are broken up into two primary groups, depending on the mode of origin of the germinating bodies.

I. Sporifera.—Spores naked, not during any period contained in special sacs or cells. In the higher fungi, as the edible mushroom, the spores originate from cells called *basidia*; each basidium is surmounted by four thin spicules or *sterigmata*, and each sterigma bears at its lip a spore. The term *spore* is restricted to such reproductive cells as originate in the above-mentioned manner. Spores produced on basidia are sometimes called *basidiospores*. (Fig. 134, *a. b.*)

II. Sporidiifera.—Germ cells produced in special cells or sacs, and called *sporidia*. There are two types: *a*, when the contents of a certain cell break up into an *indefinite* number of sporidia, the containing cells are usually more or less spherical, and are called *sporangia* (fig. 135). An example is to be found in the mould (*Mucor mucedo*), common on jam, &c., looking like little black or gold headed pins; *b*, when the sporidia are produced in *definite* number, generally eight in a lengthened cell called an *ascus* (fig. 136), or *theca*, such sporidia are sometimes spoken of as *thecaspores* or *ascospores*. The small cup or saucer shaped fungi, to be met with on rotten sticks and stumps, are examples.

The spores are invariably microscopic, yet the variety both in form and colour is endless; from a perfect sphere, there is every transition to the linear sporidium as long as the ascus. In some instances, appendages in the form of lengthened cilia originate from various parts of the surface, in others the wall is studded with warts, *verrucose*, or spines. The spore, or sporidium, may be *simple*, when it is one-celled; *compound* or *septate*, when the interior is divided into two or more compartments, owing to the growth of septa from the cell wall; the term *pseudo-septate* is used when the cell contents break up into two or more pieces, but true septa are absent; it is not unusual to find simple and pseudo-septate sporidia, with various transitional stages in the same receptacle —*muriform*, when the contents are broken into pieces by divisions crossing at right angles. *Nuclei*, or bright spots, usually precede the division of the cell contents, although not unfrequently nuclei are present in definite numbers in sporidia that never undergo any further change. Commencing with white

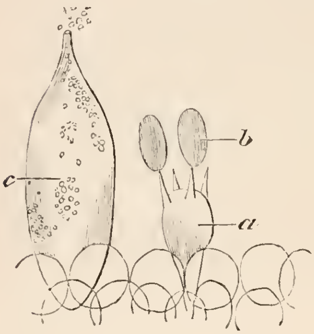


Fig. 134.

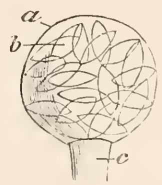


Fig. 135.

Fig. 136.

there is a transition through pale yellow, buff, pink, rich sienna or iron rust, dark brown, and violet, to black, as seen in the mass, and recently an agaric with green spores has been described. Other bodies connected with reproduction, but whose exact functions are imperfectly or entirely unknown, are *spermatia*, minute sporules frequently enveloped in mucilage and escaping in the form of a tendril from conceptacles called *spermogonia;* the name was given on account of their supposed male function, but the question yet requires to be worked out. *Stylospores*, also very minute, and generated on slender threads in receptacles called *pycnidia*, or on a naked compacted portion called a *stroma*.

Conidia or *Trichospores* produced frequently in bead-like or *moniliform* strings which break up at the joints, from the tips of threads not contained within a special receptacle. One or more of these often consistently precede or accompany other forms of fungi producing more highly developed reproductive germs; thus spermatia are frequently mixed with the group of microscopic fungi parasitic on living leaves, and conidia frequently appear on the same plant that eventually produces ascigerous fruit, as in the candle-snuff fungus (*Xylaria hypoxylon*), the white mealy-looking tips being due to their presence. *Oogonia* are conceptacles containing locomotive bodies called *zoospores*, the movements being due to the presence of exceedingly slender cilia; they may be obtained from a white fungus common on the leaves and seed vessels of the Shepherd's purse (*Capsella bursa-pastoris*).

This association of diverse forms of fruit or bodies presumably connected in some way with reproduction

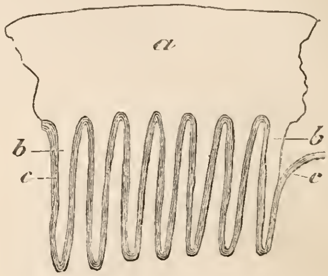


Fig. 137.

is expressed by the term *Polymorphism*, *Dualism*, or *Alternation of generations.*

Leaving out of question certain obscure unicellular organisms, whose association with the present group is not definitely settled, every fungus consists of two parts: a vegetative, whose functions tend towards the well-being of the individual, the most important being that of nutrition; and a reproductive, specially concerned with the production of spores, which, under favourable conditions, directly or indirectly develop into a plant similar to the one from which they originated. The vegetative part consists of the *mycelium*, or spawn, slender hyaline septate or continuous threads that enter into the substance upon which the plant is growing, for the double purpose of absorbing food and fixing the individual. In some of the lower forms, commonly called moulds, these threads remain isolated, and at their upper free tips are produced the spores; but in the more highly organised kinds, the threads are compacted into a solid tissue, which generally constitutes the greater part of the plant. Yet the structure is often fibrous and readily divisible into threads, proving it to be simply the result of a number of primitive threads more or less grown together; but in some groups the vegetative part consists of spherical or polygona cells, presenting the appearance of ordinary cellular tissue. The tissues of fungi are invariably cellular, but the cellulose is peculiar, inasmuch as it does not in general become blue on the addition of iodine and sulphuric acid, whereas other cellular tissue does so, although much more difficult to demonstrate than the blue reaction of iodine on starch. In some fungi the asci and spores become blue when iodine is added. Laticiferous vessels are abundant in some groups: the genus *Lactarius* is characterised by the milky gills, which, on being injured, give out a copious supply of latex, usually white at first, but often changes colour to yellow, lilac, green or blue on exposure to the air; the latex is sometimes insupportably hot and acrid, in other species sweet. When the spore-bearing surface is continuous over a considerable space, it is called the *hymenium* (fig. 137). The following examples illustrate the most marked types of structure:—

SPORIFERA.

This division includes four families. The first, *Hymenomycetes*, is characterised by the presence of a continuous hymenium, which, from the first, or very soon, is exposed, and spread over closely arranged plates, or gills, spines, lining the inside of closely packed hollow tubes or pores, or covering uniformly the whole surface of the plant. Mushrooms and "toadstools" stand at the head of this family, and will serve as a type. The stem and cap, or *pileus* together form the *hymenophore* (fig. 138, *f*, *e*), the under side of the pileus is broken up into gills, radiating from the stem to the margin (fig. 138, *g*). These collectively constitute the *trama*, over which the hymenium is spread. The structure of the trama is often different to that of the pileus, which in turn differs from the stem, the latter frequently being more fibrous and often hollow or loose in texture towards the centre. The hymenium presents under the microscope the following parts, a groundwork of cells, basidia with their four spicules, terminated by spores, and in fewer numbers, yet thicker and more elongated cells called *cystidia*, whose functions are not yet ascertained (fig. 134, *c*). All these may be well studied in *Agaricus tenacellus* or *Coprinus comatus*. The higher mushrooms—agarics—when quite young are enclosed in a continuous skin, which as the stem lengthens is ruptured, one part remaining as a sheath more or less grown to the base of the stem, and called the *volva*; the other part is carried up by the pileus, on the top of which it sometimes remains in the form of warts or irregular patches (fig. 138 *a*, *b*). Before the fungus has arrived at maturity, it will be observed that the gills are not visible, but the edge of the pileus is connected with the stem at some distance from the base by a membrane, the *veil* (fig. 138, *a*) which is ruptured as the cap increases in size, portions sometimes remaining attached to the margin; but the greater part forms a collar round the stem, and is called the *ring* or *annulus* (fig. 138, *c*). The covering in which the young plant is enclosed, and which on the growth of the fungus becomes the volva, and warts on the pileus, is also known as the *universal veil*, and the membrane extending from the margin of the pileus to the stem, the *partial veil*; one or both are absent from entire groups of agarics.

(*To be continued.*)

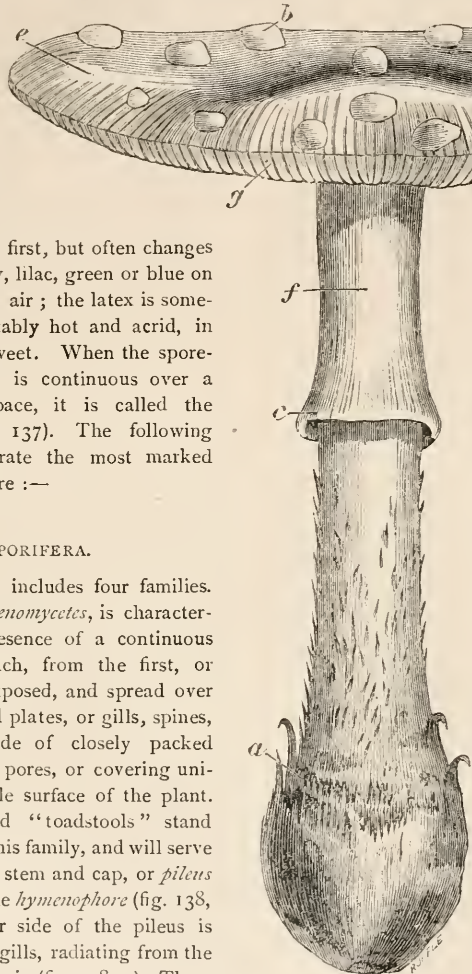


Fig. 138.

BOTANICAL RAMBLES FROM BRADFORD.

By WILLIAM WEST.

BRADFORD is a large town, and if we set out from its centre we have to go two miles in almost any direction before seeing anything but such plants as *Lolium perenne*, *Poa annua*, *Polygonum aviculare*, &c. If we take down the valley we shall find something worth noticing very near the town, for here, near the canals we have fields nearly covered with *Polygonum bistorta*, where I have seen the roots being taken away in sacks for the herbalists; a little farther on, *Sanguisorba officinalis* sends up its pretty leaves, then *Epilobium angustifolium* is seen, and we begin to notice things, for we have a canal, some ponds, a wood, a stream, a railway embankment, and some quarries not far off. In the ponds and canal, and on their banks, we find *Potamogeton densus*, *P. pusillus*, *P. natans*, *Alisma plantago*, *Cardamine amara*, *Glyceria aquatica*, *G. fluitans*, *Carex hirta*, *Scutellaria galericulata*, *Salix pentandra*, *Juncus supinus*, *Lycopus Europæus*, *Stachys palustris*, *Polygonum hydropiper*, *Elodea Canadensis*, *Bidens tripartita*, *Bidens cernua*, *Barbarea vulgaris*, *Sparganium ramosum* and scores of common plants. We find very near to each other here, the three most common species of *Alopecurus geniculatus*, *pratensis*, and *agrestis*. In the wood we find *Melica uniflora*, *Arenaria trinervis*, *Acer campestre*, *Castanea vulgaris* (which I suppose has been planted), *Allium ursinum*, *Viburnum opulus*, *Hieracium boreale*, and many others. The stream is not so productive as the canal and ponds, but the railway embankment and the rubbish about the quarries are worth visiting. *Verbascum nigrum*, with its pretty stamens, has appeared on the embankment for the last two years. *Linaria minor* is also found, while its more common relation *vulgaris*, is abundant, and farther down we have *Œnothera biennis*. *Avena flavescens* is very abundant, and near the quarries we find what we always find in similar spots, *Aira præcox*, *A. flexuosa*, and *A. caryophyllea*; the other common *Aira*, *A. cæspitosa*, is also found near the ponds along with *Diagraphis arundinacea*. We now pass through Shipley, go down the Aire valley a few miles, and we find *Sagittaria sagittifolia* in the canal, and in a field close by, the bulbil-flowered *Allium oleraceum*, *Tragopogon pratense*, *Solanum Dulcamara*, *Sonchus asper*, *Pyrus communis*, *Valerianella olitoria*, *Convolvulus arvensis*, &c.; in a field farther on we find *Stachys arvensis*, *Euphorbia exigua*, *Anagallis arvensis*, and, clustering anywhere where there is a bit of shade, is *Stellaria nemorum*. At Esholt, close by, we have *Lamium Galeobdolon*, *Milium effusum*, *Sanicula Europæa*, *Veronica montana*, *Crepis paludosa*, *Briza media*, *Lactuca muralis*, &c. At Yeadon, which is a little farther, we have *Littorella lacustris*, *Helosciadium inundatum*, *Triglochin palustre*, and a species of *Myriophyllum*, which I have not found in flower. If we turn the other way towards Hawksworth, we find *Fœniculum vulgare*, *Papaver somniferum*, *Centaurea cyanus*, *Habenaria chlorantha*, *Arctium intermedium*, *Œnanthe crocata*, *Aspidium aculeatum*, *Arum maculatum*, *Helosciadium nodiflorum*, *Rosa arvensis*, *Rubus discolor*, &c. In a field close by there is an abundance of *Plantago media* on millstone grit; at the edge of the pond is *Nasturtium sylvestre* with *Senecio erucifolius*, and a little higher up *Potentilla procumbens*. In the boggy land we find *Hypericum tetrapterum*, *Mentha hirsuta*, *Carex sylvatica*, *C. flava*, *Epilobium parviflorum*, *E. palustre*, with many other common species, and in the wood is an abundance of *Stellaria nemorum*, also in late autumn *Amanita muscaria*. I shall never forget my first glance at the above-mentioned piece of boggy land, for it literally bristled with *Orchis maculata* in many shades of colour, some of the flowering spikes measuring 3½ and 4 inches. We now get on to the moorland, and the first thing that strikes us, if it be late in the season, is the golden brightness of the bushes of *Ulex Gallii*; farther up the hill we have the three common heaths and *Empetrum nigrum*, *Juncus effusus*, *J. conglomeratus*, *J. glaucus*, *J. supinus*, *J. squarrosus*, *Scirpus acicularis*, *Aira flexuosa*, *A. cæspitosa*, *Vaccinium Myrtillus*, *Hydrocotyle vulgaris*, *Molinia cærulea*, and mosses in abundance; we also find the pretty *Agrostis canina* at the proper season, and I may here mention that in these remarks I take it for granted that the proper time of the year is understood, for we do not find *Ulex Gallii* in full flower at the same time that *Nardus stricta* puts out its solitary styles to wave in the breeze ready to catch the pollen. In the fields near we find *Ophioglossum vulgatum*, *Sherardia arvensis*, *Trifolium medium*, *Genista tinctoria*, *Triodia decumbens*, *Epilobium angustifolium*, *Sarothamnus scoparius*, and *Ulex Europæus*—the latter with *Orobanche major* attached to it. *Euonymus Europæus* I have also found here in several places.

We are now at the romantic glen of Shipley, where in spring we find *Cardamine sylvatica*, *Carex lævigata*, *Orchis mascula*, *Lathræa squamaria*, and later on are seen both varieties of *Orobus tuberosus*, *Milium effusum* in plenty, *Humulus lupulus*, and a host of common plants. In autumn the wood down the hillside is glorious with *Campanula latifolia*, gigantic specimens of *Heracleum Sphondylium* shoot up, some of which measure seven feet high, while not very far from here, on the rubbish from the quarry, I have seen this plant in full flower about six inches high, thus showing the remarkable influence of opposite surroundings and soil; *Pteris aquilina* grows to a height of ten feet in the same wood. Not far from here is the village of Eldwick, where in the fields we find *Narthecium ossifragum*, *Montia fontana*, *Carex binervis*, *C. stellulata*, *C. flava*, *Comarum palustre*, *Salix pentandra*, *S. repens*, *Habenaria viridis*, *Listera ovata*, *Scirpus setaceus*, *Juncus supinus* (viviparous), *Nephrodium Oreopteris*, *Betulus alba*, *Rosa tomentosa*, &c., along with many that I have mentioned already for other places. If we take on to Rombald's Moor, we find *Eriophorum vaginatum*, *E. angustifolium*, and large beds of Sphagnum and Polytrichum; and this reminds me that I have always searched among the Sphagnum of this district in vain for *Malaxaris paludosa*. Farther on the moor are found sparingly, *Trientalis Europæa*, *Vaccinium Vitis-idæa*, and *V. Oxycoccos*. About Shipley we find *Hypericum Androsæmum*, *H. pulchrum*, *H. humifusum*, *H. tetrapterum*, both varieties of *H. perforatum*, *Scirpus setaceus*, *Menyanthes trifoliata*, *Valeriana dioica*, *Festuca sciuroides*, *Mentha sativa*, *M. arvensis*, *Sanguisorba officinalis* in abundance; *Potentilla procumbens*, *Ornithopus perpusillus*, *Gnaphalium uliginosum*, *Bromus secalinus*, *Tamus communis*, and *Acer campestre*. Proceeding towards Bingley, we find *Geranium pyrenaicum*, *G. phæum*, *G. pratense*, *G. lucidum*, *G. molle*, *G. dissectum*, *G. Robertianum*, *Stellaria nemorum*, *Veronica scutellata*, *Potamogeton polygonifolius*, *Lamium galeobdolon*, *Sagina apetala*, *Prunus padus*, *Ranunculus auricomus*, *R. pseudo-fluitans* (in dense masses in the river), *R. Lenormandi*, *Daucus Carota*, *Conium maculatum*, *Epilobium obscurum*, *Myrrhis odorata*, *Lactuca muralis*, *Circæa lutetiana*, and we pass the place where *Trichomanes radicans* "did once inhabit." If we take up the hill to our left, we come across *Rosa tomentosa* again, and in the pools on the moorland we find the pretty *Scapania undulata*, with *Myosotis cæspitosa*, and I have found *Festuca ovina* near here in a viviparous state. If a ramble is taken towards Allerton, very similar things are found, though not so great a variety; in the inlet to Chellow Dean reservoir will be found in spring an abundance of *Batrachospermum moniliforme*, and to our left we have *Prunus padus* and *Euonymus Europæus* again; we also find *Peplis portula* and *Chenopodium Bonus-Henricus* in many places, and very sparingly *Silaus pratensis* and *Pimpinella magna*. If we took another ramble, first taking train to Guisley or Otley, we should find a few different plants; proceeding from Otley to Poole we have *Iris Pseudacorus*, *Ribes nigrum*, *Carpinus Betulus*, and *Pyrus Aria*, the last of which I am told we are to consider planted, as it is off the limestone. Towards Adel we find *Ranunculus arvensis*, *Spergularia rubra*, and plenty of sedges; *Limosella aquatica* has been abundant here; going on towards Meanwood we find many of the bog plants mentioned before, and on the edges of the stream *Scrophularia Balbisii*; on the hedgebank above, *Rosa mollissima*, and nearer Meanwood, *Senecio Saracenicus*. The bases of the trunks of the trees in some parts of the wood are covered with a mixture of *Tetraphis pellucida* and *Lepidozia reptans*, which gives a charming effect. I do not pretend to enumerate all the rarer plants about here, for I have not yet worked some parts of the district; the following are abundant, *Anagallis tenella*, *Drosera rotundifolia*, *Pinguicula vulgaris* and *Narthecium ossifragum*. A good walk from Bradford will bring us to the district round Halifax, which is very good hunting ground. We find here *Anthemis cotula*, *Pyrola minor*, *Vaccinium Vitis-idæa*, *Lolium temulentum*, &c. If we wish to get a lift on the way for about twenty miles, we can ride to Gargrave, then commence our notices as far as Malham. We find here on the roadside, *Cornus sanguinea*, *Rubus cæsius*, and *Campanula latifolia* again, and before we arrive at Malham we find *Viola hirta*, *Cochlearia officinalis*, and *Polemonium cæruleum*; a little farther on we find together, *Carex dioica*, *Primula farinosa*, *Eriophorum latifolium*, and *Pinguicula vulgaris*. We are now at Malham, where we find *Thlaspi occitanum*, *Draba muralis*, *Arabis thaliana*, *Rumex scutatus* in an old deserted enclosure full of plants, such as *Circæa lutetiana*, where it may have been cultivated a long while ago. On the roadside in the village we find *Lamium maculatum* growing intermingled with *L. album*, but it is near a cottage, and has certainly escaped therefrom at some time. If we proceed to Gordale, we find *Saxifraga granulata*, *Blysmus compressus*, and *Primula farinosa* again. We now climb up one side of the vale and find *Rhamnus catharticus*, *Hypericum montanum*, *Rubus saxatilis*, *Carlina vulgaris*, *Rosa spinosissima*, *Draba incana*, *Geranium sanguineum*, *Taxus baccata*, *Thalictrum minus*, *Scabiosa Columbaria*, and *Viola hirta* again. We now turn round to behold the enraptured scene; we gaze on the rippling water meandering down the valley before it reaches the waterfall at Janet's Cave; and whichever way we turn, we feel a joyful thrill of delight as we take in the pretty sights, and oh, how much more pleasure has a naturalist in such a scene than the mere sightseer! We come carefully down the steep side of the vale and go up to the waterfall, where the scene is truly majestic. We now fasten all our traps on our backs, for the stream is swollen and we have to climb the precipitous rocks, for which it is quite necessary that we should have both hands at liberty to help our uncertain feet; before we reach the top we arrive at a small resting-place, where we have a waterfall above us and another below us, whilst a perfect shower of spray falls all around us, refreshing us for the remainder of the ascent. Those who know how to look can now find *Asplenium viride* fairly abundant, *Potentilla alpestris* is here too, and *Sesleria cærulea*, *Ribes petræum*, *Cystopteris fragilis*, *Gentiana amarella*, *Viola lutea*, and the ever-recurring *Primula farinosa*. We now arrive at the Tarn and find *Pinguicula vulgaris*, *Drosera rotundifolia*, *Menyanthes trifoliata*, *Sagina nodosa*, &c., trying which can cover the most ground. We now see *Potamogeton perfoliatus*, *P. lucens*, *P. densus* (a very stout form), *Alsine verna*, *Habenaria albida*, and *Scirpus pauciflorus*. On our route back by way of the Cove we see *Valeriana dioica*, *Salix repens*, *Paris quadrifolia*, *Veronica anagallis*, *Sesleria cærulea*, and the pretty *Primula farinosa* again, which I think ought to be mentioned last, as it is one of our rarer plants and here occurs very often.

VANDALISM.—Till last July, I knew as a fact that a wild specimen of *Cypripedium Calceolus* was growing in a secluded Yorkshire dale. What was my sorrow and indignation to hear that a botanist, living in the county, had transplanted the flower into his own garden! Surely a man must be sadly deficient in generous and patriotic, not to say enlightened, ideas, who would rather himself possess a rare flower than that it should be a member of the British flora. Such a despoiler is moving one of the landmarks of the geographical botanist, besides lessening the pleasures of the nature-loving public.—*C. G.*

MICROSCOPY.

Mounting Insect Organs, &c.—W. B. asks for information on above subject. The following is the method I have adopted for some time, with satisfactory results. Soak insect or organ in liquor potassæ for a day, or longer, if large. Wash and lay out upon the glass slip, arrange in position, and gently press while in the water with another slip. Remove to weak solution of acetic acid for a few hours, or longer, if not desired to finish rapidly. Wash again in clean water, and transfer to glass slip and drop on spirits of wine; arrange the object and put over another clean slip; gently press and lightly fasten with thread; place end down in a small quantity of spirits of wine and leave for a few hours, which hardens in position. Then remove the thread and gently lift off one slip, the whole still wet with the spirit, when the object will adhere to one of the slips; drop on absolute alcohol and work object into centre of slide. Then apply oil of cloves, and in a few hours the object will be ready for the balsam to finish. I generally put such slides away for a month or two to dry, but if put in a warm place they will be ready for finishing with ringing cement in much less time. For finishing I usually use shellac cement first, and then finish with black or any other colour preferred. —*Charles D. Holmes, Hull.*

"Micro-Slides for Science Classes," by B. Piffard. We have much pleasure in drawing attention to a very interesting and instructive slide

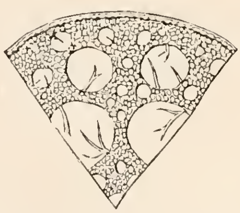


Fig. 139.—Section of stem of Water Lily (*Nymphæa alba*).

just sent out, of the transverse section of the water lily (*Nymphæa alba*). The accompanying illustration will give some idea of the beauty of this object.

Journal of the Royal Microscopical Society.—The August part of this Journal contains a very important paper (illustrated) "On the Red Mould of Barley," by Charles George Matthews, F.C.S.; other papers, also illustrated, are "On the Spicules of *Cucumaria Hyndmanni*, *C. calcigera*, and two allied forms," by Professor F. Jeffrey Bell; and "On a Method of Preserving the Freshwater Medusa," by Peter Squire, F.L.S. The latter is effected by a solution of bichloride of mercury, which not only preserves the animals, but also renders them perfectly opalescent, so that the minutest details of their structure are visible. The strength of this solution is four grains to one pint of distilled water. In addition to above communication, there is the usual well-digested "Summary" of papers, &c., relating to microscopical investigation and research.

Catalogue of Works on Microscopy, &c. We have much pleasure in drawing attention to Mr. W. P. Collins's recently issued catalogue of Microscopical and general scientific works. From it students may derive much useful information, both as to what books and papers have been published on the various subjects of their special studies, and where these can be obtained. Moreover, Mr. Collins's catalogue is a model of neat arrangement.

Another Revolving Table.—On pages 208 and 209 of Science-Gossip for this month, C. A. Lowe gives details of construction of an ingenious "substitute for a revolving-table" for use with the microscope. I have somewhere seen a much simpler contrivance recommended, which I believe would answer the purpose equally well, and cost less (both in cash and time) to make. A piece of board of any shape preferred, large enough to hold the microscope with lamp and stand-condenser, and about 1¼ inch thick, is covered on one side with American leather-cloth, and on the other with green baize. The covering material in each case to be turned over and nailed on the edge of the board, and the junction of the two edges of material covered with a strip of leather or braid, running all round the edge of the board. If the table has a polished top, or is covered with ordinary table-baize or "oil-cloth," the green baize side of the board should be downwards, but if a cloth table-cover is in use the American leather side should be downwards. A board of this kind with microscope and lamp can be slid easily across or around a table in any direction, and of course will answer equally well for a square or oblong table as for a circular one, which is not the case with any contrivance working on a radial arm.—*W. Officer.*

A Substitute for a Revolving Table.—Possibly the following may be of some use to your numerous readers, who look for help from the pages of Science-Gossip. I have a table with a metal stand and a fixed mahogany top, over which I placed a cover of stout oil-cloth, which envelopes about three inches; it is then drawn underneath the table by means of strings, in the same manner that the mouth of a bag is closed, of course not drawing too tight; the oil-cloth cover will then revolve with the greatest ease, even when it has a considerable weight upon it. I have used this table with great success and comfort for more than ten years, and have put it to the severe test of a Conversazione. Any small table with a round top may be used, and if it should be a light one, to give it greater fixity, heavy books may be laid against the legs. A round card-table would do very well, if not too light. I know no better table than an ordinary eating-house table with a stone or marble top.—*Rev. W. A. Pippet, Rokeby, West Cowes, Isle of Wight.*

ZOOLOGY.

British Freshwater Bivalves.—I should be greatly obliged to any readers of Science-Gossip who will kindly furnish me with lists of localities for, and any information respecting the habits, habitat, and anatomy of the above. I am at present engaged in collecting facts respecting the life-history of our bivalves, and any information will be of service, especially if accompanied by authenticated specimens of varieties, for which I should endeavour to make an adequate return.—*J. Darker-Butterell, 2, St. John's Street, Beverley.*

Natural History of Hastings and St. Leonards. (First Supplement.)—In 1878 a Catalogue was published of the Fauna and Flora of the Hastings district. During the last five years so much additional information has been gathered that the compilers of that list have found it necessary to issue a supplement. This forms a most valuable appendix to their previous work, containing complete lists of all the Coleoptera, Hymenoptera, Diptera, Hemiptera, Neuroptera, Trichoptera, Polyzoa, birds, and Hepaticæ of the district observed up to the present time, together with additions and corrections to the rest of the catalogue. The Lists of the Fauna have been compiled by Mr. E. A. Butler, of Hastings, who is also editor of the work, and those of the Flora by the Rev. E. N. Bloomfield, of Guestling. Some of the lists are very full, nearly 1300 species of Coleoptera, and over 1000 Lepidoptera being contributed, bringing up the total of the Fauna to 4410 species, with thirty-one varieties. The Flora contains nearly 1500 species, with 86 varieties. The lists have been most carefully revised, and the latest nomenclature adopted. The supplement is illustrated by a carefully prepared outline map, making the work invaluable to naturalists visiting or living in the Hastings district.

New Application of the Doctrine of Evolution.—Professor Cope has been writing some very suggestive papers in the "American Naturalist." The first was on "The Evolutionary Significance of Human Physiognomy," in which he points out that in a population like that in the United States or Great Britain, we have every stage of physiognomical facial character from the Simian upwards. The nose appears to be the most suggestive. In the September number of the above able magazine, Professor Cope gives us an article on the "Evolutionary Significance of Human Character," in which he states that the species of human minds are probably as numerous as the species of animals, as defined by the latter's physical structure. He divides mental activities into emotional, intellectual, and volitional, and believes that they have as a rule been developed in this order. The primitive condition of the emotions is that of appetites, of which hunger is the first, reproduction the second, and anger the third.

New Views on Protoplasm.—Mr. Charles Morris, in the "American Naturalist," says there are some reasons for doubting that protoplasm, as we know it, is the only possible physical basis of life. We are beginning to recognise the fact that the essential quality in protoplasm is its high atomed chemical composition and its molecular instability, not some occult property which can exist only in this special compound of C. O. H. N.

Guide to Llandudno.—Some time ago we were asked to name a good guide to this interesting district. We have much pleasure in calling attention to the above by John Price, M.A. It is very pleasantly written, and contains a large reference to the geology, mineralogy, fauna, and flora of the neighbourhood of Llandudno.

The Essex Field Club.—Few natural history societies have so rapidly grown into scientific importance as the above. Its Transactions so far have contained most valuable papers, although chiefly relating to the district. Part 7 is now in hand, containing the following extensive communications, in addition to a number of short papers. (The latter is a new feature, which we commend to the notice of other societies.) "The Ancient Fauna of Essex," by Dr. Henry Woodward; "The Macro-Lepidoptera of the District around Maldon," by G. H. Raynor, M.A.; "On Dene-holes," by T. V. Holmes, F.G.S.; "The Presidential Address" (Darwin and modern Evolution), delivered by R. Meldola, F.R.A.S., at the annual meeting, January 17th, 1883; "In Memoriam: Sir Antonio Brady, F.G.S." (with an excellent portrait); "Primæval Man in the Valley of the Lea," by Worthington G. Smith, F.L.S.; "On the Species of the genus Primula in Essex," by R. M. Christie; Appendices, &c.

Birmingham Natural History and Microscopical Society.—The Report and Transactions of this society for 1882 have just been published. The volume contains a very able, and (to microscopists) valuable address by the President, Mr. J. Levick. There is also a lengthy "Report on the *Pennatulida*," collected in the Oban dredging excursion of the Society in July 1881, by Dr. Marshall, and W. P. Marshall, illustrated by some very artistic lithographs. In addition, we find papers as follows: "The

Myxomycetes," by W. B. Grove, B.A. (with a list of those found in the neighbourhood of Birmingham); "Notes on Beavers, and the Bute Beavery," by Egbert de Hamel; "Nomad Fungi, The Reclassification of the Uredineæ;" also by W. B. Grove, B.A. (illustrated); "On a Dragon Fly," by Sylvanus Wilkins; and a "Visit to Glen Clova and Callater," by G. C. Druce, F.L.S.

Good News for Ostriculturists.—Mr. J. A. Ryder, who has been doing excellent work for some time past, in connection with embryology, has at length effected a most important and practical discovery. It has been announced, first, in the form of a telegram to Professor B. Goode, the United States Commissioner to the International Fisheries Exhibition, which states that Mr. Ryder has finally solved the problem of the culture of oysters from artificially impregnated eggs, and that on the 4th of September, at the Government station, Hockton, Maryland, there were many millions of young oysters, three-quarters of an inch diameter, which had been hatched from eggs artificially impregnated forty-six days before. As many of our readers are aware, a single oyster will yield some millions of eggs, and if Mr. Ryder's method of artificially impregnating them can be carried out in British as well as American waters, we have no hesitation in saying this will prove one of the most important and triumphant results of modern zoological research.

BOTANY.

The Fertilisation of Willows.—I can endorse what Mr. Hamson says with regard to the infrequency of bees passing over from the male to the female willows, still they do pass over to them, as I have often noticed; but the question does not end here. Next spring let Mr. Hamson, or any one, when the catkins are just maturing, take a bull's-eye lantern, in the evening, and throw its beams on the first sallow he may find, and, if the evening is warm and moist, he will see various Lepidoptera, Geometers, and Noctuas, according to the locality, standing over the catkins, or clinging to them, sipping the nectar from either male or female plant. Further, get an umbrella, invert it beneath the boughs of the willows, while gently beating them with a walking-stick, and there is no doubt the whole insecta will be represented amongst the proceeds. At least the Diptera, Coleoptera, Hymenoptera, and Hemiptera will be found. On a warm sunny day may be noticed also common flies alighting on the female catkins of the willow, and if they are watched it will be noticed that they carefully mop all round the carpels, as carefully as a housewife would the drawing-room floor. In the evening, when the sun is fast gliding down the west, noislessly watch, from bush to bush, and from flower to flower, and the reward will be the pleasure of noticing various small cylindrical red and brassy coloured beetles on the catkins. These beetles will belong to the genera Meligethes and Epura. They will climb up one carpel on one side, over the stigma, and down the other side; this process may be repeated the whole length of the catkin. Touch the bough and they are off, perhaps to visit the next willow, which may be a male. Any one who has noticed this, will come to the same conclusion as I have done, that willows are not fertilised by bees alone, but by plant-loving insects in general, and that it is not necessary to bring the winds into the question at all in this case. Indeed *S. triandra* seems most unlikely to be wind fertilised, as the leaves appear with the flowers.—*G. Robson.*

The Cause of Double Flowers.—This subject has exercised the minds of many persons who have admired them, and sundry whimsical things have been written on the subject. Ten years ago some Sweet William seed was given to me, from which I had many plants with beautiful flowers in a variety of colours, but none double till this year, when I have had one quite double among the plants grown from the first ripe seed of a single plant gathered and saved in the summer of 1881. Now, if I may venture an hypothesis, I would say that the first flower opening on a plant is rather more likely to be self-fertilised than those which come after, on account of there not being then many flowers of the species in bloom. The seed from such a flower would be likely to produce a plant with quite as much vigour of vegetative growth as any other, but with less reproductive energy. A plant with such a constitution would be likely to grow vigorously and to evade, if possible, the duty of producing seed by assuming a petaloid character in those organs which should properly have been stamens. I rather think that some of Dr. Darwin's experiments with Ipomœa favour this hypothesis.—*John Gibbs.*

Œcidium Urticæ.—Mr. Williams expresses surprise at his inability to find this fungus in his excursions around Bath. But in the list he gives of the uredines he has found there, no mention is made of *Puccinia caricis*. If *P. caricis* does not occur near Bath he cannot expect to find the œcidium on nettle, for they are both states of the same fungus. *P. caricis* is a widely distributed species, and it is very unlikely that it does not occur in the district. If during the present autumn Mr. Williams searches for the puccinia on *Carex hirta*, for instance, he will most likely succeed in finding it. If he does so, he will have a clue as to the whereabouts of the œcidium next spring. It must be remembered that the œcidiospores are far less abundant than the uredospores and teleutospores of heterœcismal uredines. Witness the prevalence of *Puccinia graminis* and the paucity of *Œcidium berberidis* in this county generally. If Mr. Williams finds the *Puccinia, caricis* I would recommend him to gather a handful or two of the affected carex and place it amongst some nettles where it will not be disturbed during the winter, and no doubt next year he will be rewarded by gathering the œcidium in abundance.—*Charles B. Plowright, 7 King Street, King's Lynn.*

FASCIATED STEMS.—These are not less common than pointed out by Mr. Kidd, in his interesting article. Some time ago, I received a stem of wood spurge (*Euphorbia amygdaloides*), which was strikingly fasciated. Last spring a scape of cowslip (*Primula veris*), was brought me from Devonshire which was very broad and much flattened, and which bore more than one hundred flowers, some of them imperfect. Soon after this, I gathered at Caterham a smaller, but similar stalk of the same species, containing forty-six flowers. I have before me a well-marked example of the same phenomenon in thistle (*Carduus lanceolatus*), which I obtained in Clapton a few days ago. The greater diameter of stem is four times the smaller, and the flowerhead, crowded by suppression of the peduncles into a knob rather less than my two fists, are upwards of forty in number, some at the top being only partly developed. And, lastly, there are in my garden now, 1st of September, four hollyhock stems in all of which the flattening of stem and increase in number of flowers, with crowding, are as noticeable as in the thistle.—*J. T. Powell, Lower Clapton.*

UROMYCES POÆ.—After reading Mr. Plowright's interesting communication on *Uromyces poæ*, I was reminded of two places where I knew the Œcidium had been growing in the spring; one at Harborne, where it occurred on *Ranunculus repens*, the other at Salford Priors, where it was found on *R. Ficaria.* I visited both these places, and, needless to say, found the *Uromyces poæ* in plenty on the leaves of Poa immediately surrounding the ranunculus plants. To those who still deny the fact of heterœcism, it may be as well to point out that the evidence is cumulative. Of course mistakes may and must occur in associating the Œcidia with their respective Uredos and Puccinias, but observation will gradually correct these errors. But to the reality of the association, every fresh instance of inductive discovery, such as has taken place in regard to *Uromyces poæ*, bears increasing testimony. I may add that I can find no trace of the Uromyces where there is no ranunculus, even in the immediate vicinity of the places which I have mentioned.—*W. B. Grove, B.A.*

DRYING FLOWERS TO RETAIN THE COLOURS.—One of our correspondents suggests a simple plan to retain the pink, blue and other colours of flowers when drying in the herbarium press. We have tried the plan successfully, and are glad to make it better known. It is simply to brush over the petals (with a fine camel-hair brush) a weak solution of alum; in nine cases out of ten it never fails, and the specimens so preserved are really beautiful.

THE FLORA OF WROTHAM.—We have received from the Rev. J. W. Ewing, Boro' Green, Sevenoaks, a neatly published little brochure of 50 pp., giving a very full and complete list of the flowering plants in the neighbourhood of Wrotham. There are also appended lists of birds, butterflies, and moths.

LIGHTNING AND TREES.—It is no uncommon thing to find the lower parts of a tree cut up by lightning, while the upper portions and the highest branches are hardly, if at all, affected. Oaks, however, appear to be an exception to this general rule. Professor Colladon (who has long been studying the phenomenon in Switzerland) is of opinion that this partial attack is due to the fact that the upper parts of a tree contain more sugar than the lower, sugar being a good conductor of electricity.

DR. HERMANN MUELLER.—It is with much pain we have to record the death of this eminent naturalist, whose researches have been of such an original character as to form a new line of departure in botany and entomology. He was the first authority in one branch of natural science, the relation of insects to the fertilisation of flowers. A zoologist by profession, he paid special attention to, and greatly elucidated, those points in the structure of insects which adapted them to carry pollen from flower to flower, and thus secure cross fertilisation. His two chief works were "Die Befruchtung der Blumen durch Insekten" (a translation of which, with a preface by Charles Darwin, was recently published by Messrs. Macmillan), and "Alpenblumen; ihre Befruchtung durch Insekten." The genesis of the colours of flowers was a subject which he had worked out with great care.

GEOLOGY.

THE GLACIAL PERIOD IN AMERICA.—Professor Lewis, an American geologist, states there is every proof that, ages ago, the great Greenland glacier crept down so as to overspread the north-eastern parts of America, and the north-western parts of Europe. He treats of this northern glacier as a sheet reaching from Greenland to St. Louis, and from Alaska to New Jersey; so thick as to overtop Mount Washington; he estimates its thickness in New England at 5000 feet, and gives his reason for supposing that the melting of this glacier need not be longer than 10,000 to 15,000 years ago.

THE BRONTOSAURUS.—One of the most gigantic and remarkable of the extinct American animals is a fossil reptile, named by Professor Marsh, Brontosaurus. The professor has published a "restoration" of this huge creature, in which the chief points of interest are the smallness of its head, the strength of its back, and the hugeness of its hind limbs. A single individual was fifty feet long. The feet were plantigrade, and each foot-print must have been about a square yard in extent. The tail was remarkably large. So small was the skull that it weighs and measures less than the fourth or fifth cervical vertebra. The animal is calculated to have weighed more than twenty tons. It was more or less amphibious in its habits, and probably fed on aquatic plants. It was a slow moving creature, possessed of neither offensive nor defensive natural weapons.

Fossil Cryptogamia. — Two eminent fossil botanists, MM. Saporta and Marion, are of opinion that Siphonaceous algæ were in existence during the Silurian period, but that the higher kinds of seaweeds, &c., did not appear until the Oolitic period, and such groups as Fucaceæ, Floridæ, and Characeæ, not until the Tertiary. Similarly with terrestrial cryptogamous plants. The Primary and Secondary strata furnish no remains of mosses. The Cyathaceæ date from the commencement of the Carboniferous period, whilst the true Polypodiaceæ commence with the Rhætian. The Lycopodiaceæ began in the Devonian, and reached their climax during the Carboniferous epoch, afterwards degenerating into Selaginella, &c. The most highly developed Cryptogams now are Rhizocarpæ. The highest types of the Cryptogams were defeated in the struggle for existence by Gymnosperms and Angiosperms.

Remarkable Pebbles in the Boulder Clay. —Dr. Charles Ricketts, F.G.S., has published a very interesting paper on this subject, but bearing reference to the Boulder Clays of Cheshire, and Lancashire. He shows that, in addition to the ice-worn pebbles so abundant in these beds, there are also large blocks of granite, trap, &c., occasionally met with, having their surfaces entirely free from ice-marks. These are weathered all over, except at a neck-like portion where they were broken off. Dr. Ricketts thinks that in such examples the disintegration may have occurred whilst in their original position.

Rare Birds.—It is probable that the rare bird your correspondent speaks of as the "Pigeon pilfrey" may be a crossbill. They are handsome birds, and occasional visitors. They are fond of pine-woods and apple orchards, eating the seeds of the fir cones, and the pips, or, as some old writers term them, kernels of the fruit. They make their appearance in autumn, when the apple crop is ripe.—*Helen E. Watney*.

NOTES AND QUERIES.

Mind in Animals.—The dog to which I especially refer does "make towards the kitchen or the hall door, or the resort of the cats," and, what is more, she does not when I say "cats" run to the kitchen, nor when I say "meat" or "dinner" does she run to the garden. The dog, if I say "meat" does beg, and lick her lips, and utters little short barks of expectation, quite different from her behaviour on hearing the word "cats." Again, the thrush certainly does understand that "too hot" means too hot; for when I say "too cold" in the same tone of voice, the bird takes no notice, and, if the potato is really too hot, soon finds his mistake. While, if I say "too hot" without any gesture at all, even of a perfectly cold potato, the bird will not touch it. As to dogs not being able to communicate ideas to each other, I still opine that they can speak to each other as much as they need in ordinary circumstances. I have tried the experiment of introducing the words "sugar," "meat," or cats" into a sentence, quite separate from any qualifying words, and in a perfectly different voice, laying no stress on the words; but the dog shows by its signs that it perfectly understands the meaning of the words, though it does not get nearly so excited as if I say, even in the same tone, "Do you want some meat?" I have performed the crucial experient mentioned by Dr. Keegan; if I say "sugar," and at the same time seize a stick and go to the garden, the dog is puzzled; looking first at the cupboard, then at the garden, she follows doubtingly, knowing that the words and actions bore reference to quite different things.—*H. C. Brooke.*

Mind in the Lower Animals.—I am glad to see so many correspondents writing to say they cannot agree with Dr. Keegan's proposition that mind does not exist among the lower animals; certainly it is in all cases far inferior to what exists in man, but in my opinion it is merely a question of degree. I am afraid there are many people who cannot even bear the thought of their minds being compared with those of animals, they themselves being only a little lower than the angels, and so they try to get over the difficulty by saying that animals have no minds, only instinct; but when we ourselves do anything "instinctively" it is put down as being only "natural." I am not a dog-fancier myself, but what little I have seen of them convinces me that they vary in mind as much amongst themselves as we do; thus there are dogs more intelligent than others; some are sly and some are proud; some will never forget a slight, and will stand upon their dignity, besides many other kinds of dogs. And what is true of dogs is also true of other animals in various degrees; but as we descend the scale we may come so low that mind may practically be said not to exist, the animal merely having life with no more intelligence than a turnip.—*H. M.*

Two Birds from one Egg.—A canary belonging to a friend having laid an extraordinarily large egg, it was decided to remove the others and let her sit on this one to see what would come of it; this she did for the full time, or nearly so, when she left it for some hours, and my friend thought she had given it up as a bad job, and, alas, with true feminine curiosity broke the shell, when lo! there were the two perfectly formed birds alive, but the yolk not quite absorbed. They are both of fair size, and I have no doubt would have hatched all right if left to themselves. I should like to know if any reader of SCIENCE-GOSSIP ever actually saw such a thing before. Of course double yolked eggs are common enough, but I never thought it worth while to sit them, but looked upon them as abortive monstrosities.—*W. E. Harper.*

COMMON CELANDINE (*Chelidonium majus*).—Have you ever heard that the generic name of this plant is derived from the Greek of "a swallow," because it comes into bloom about the time that these birds arrive in Europe, and that there is an old tradition that swallows used the flowers to open the eyes of their young, as linnets were said in folklore to do euphrasia? Some of the foreign doctors have spoken highly of the celandine in the case of eye diseases, but it is a vegetable poison and in large doses will produce (when given to animals) loss of sight. The euphrasia (common eye-bright) is, I know from experience, a very good and safe collyrium. Milton and Shenstone both sang the virtues of "Euphrasy."—*Helen E. Watney.*

THE ROYAL FEATHER CLOAK IN THE INTERNATIONAL FISHERY EXHIBITION.—I dare say most of your readers have, ere this, gazed with admiration at the splendid scarlet and yellow cloak, made of the feathers of the Do and Mamo birds which dwell in the island of Hawaii. Lady Brassey has most kindly lent it, and a printed description of it is given away gratis. I wish, however, to call attention to the fact that this cloak has an important bearing upon a most difficult and interesting subject, i.e. the migrations and connections of the aboriginal Polynesians in prehistoric times. This cloak, although undoubtedly Hawaiian (Sandwich Islands) in origin, came from Tahiti in the Society Islands 2,200 miles away. It probably therefore reached these islands as a royal present in the ages during which the islands of Polynesia were unknown to Europeans. This proves that native skill in navigation was very great, and that their voyages were very considerable. Dr. Pickering ("Physical History of Man," Bohn's ed., pp. 298, &c.) has pointed out that there is a mass of evidence in support of this view. He says: "One of the Hawaiian headlands has been found to bear the name of 'the starting-place for Tahiti,' the canoes, according to the account of the natives, leaving in former times 'at a certain season of the year, and directing their course by a particular star.'" This illustrates, I venture to think, the comparative ease and facility with which a semi-civilised race or races may have migrated across Polynesia from Indo-China to America in prehistoric times, and accounts for the innumerable resemblances observable between the higher races of the American continent and those of Polynesia—resemblances attested by Pickering, Sir Charles Dilke, and many other writers. Thus this interesting and, to native ideas, priceless cloak, forms a link in a chain of evidence tending to clear up one of the most insoluble difficulties in ethnology and history, i.e. the origin of the civilised races of Mexico, Peru, Central America, and of their Asiatic affinities. I have this year communicated a paper to the Americanist Congress meeting at Copenhagen during the present month, entitled "Polynesian Antiquities, a link between the early civilisations of Asia and America." My deep interest in the subject must be my excuse for troubling you in the matter.—*Francis A. Allen.*

HAS HELIX ASPERSA BEEN FOUND FOSSIL IN BRITAIN?—In answer to Mr. Woodward's query under the above heading, in the May number of SCIENCE-GOSSIP, I may say that, a little over seven years ago, whilst collecting in the neighbourhood of Pontefract—Permian formation—in company with other members of the "Ramblers," a club formed for the practical study of conchology, but now non-existent, I took, as did several other members, and have now in my collection, *Helix aspersa*, *H. nemoralis*, *H. lapicida*, and *H. rotundata* in a sub-fossil state. These quaternary fossils were mixed up with bones—horse, ox, and sheep, and pieces of pottery, Samian ware, of several colours. Their exposure was due to the removal of material for glass-house purposes. Some of the specimens of shells which we dug out, were about one foot below the surface, in an earthy deposit.—*Henry Crowther*, *Beeston Hill, Leeds.*

BUTCHER'S-BROOM NEAR LONDON.—I shall feel obliged if you or any of your readers can inform me where in the neighbourhood of London I can find butcher's-broom (*Ruscus aculeatus*). I have searched in Epping Forest and Chislehurst Common without success, and guide-books mention both these localities as habitats. I was much surprised at finding the plant was not mentioned in my old edition of Balfour's "Botany." How is this?—*Henry Selby.*

NOTES ON THE LATE CAPTAIN CHAWNER'S COLLECTION.—I was asked this spring to look through and label an extensive collection of butterflies and moths made by the late Captain Chawner, a gentleman whose name is doubtless familiar to many of our living ornithologists and entomologists. To others it will be sufficient to state that Captain Chawner was a friend of the celebrated Curtis, whose beautiful engravings of insects have been the idolatry of German connoisseurs; and in the company of Curtis he made many an entomological excursion to choice localities, and nooks and corners frequented by rare and recluse species. However, in looking through the gems of the cabinet I was rather hindered in pronouncing judgment on account of the loss of a memorandum book, the specimens not being ticketed with date and locality. As regards butterflies I noticed one of the scarce swallow tails (*Papilio podalirius*) reputed to have been taken in England, peradventure one of those alluded to in Neville Wood's "Naturalist" (vol. iv. p. 227). I can only describe it as a meagre-looking creature, with narrow under-wings and slender tails turned a little outward, but I cannot say whether this be the cut of the true British type or not. There was likewise a large copper (*Chrysophanus dispar*) of either sex from the Fen country, a thing that used to be procurable; also a *Polyommatus Acis*, one of the old-fashioned sort, supposed to have become extinct till quite lately. I observed too an *Argynnis Euphrosyne* with black under-wings and with the markings on the fore-wings enlarged, a hermaphroditic meadow brown (*Hipparchia Janira*), a Camberwell beauty taken by a gardener engaged in sweeping the grass, and two Bath whites. Of the larger British moths most of the local and rare kinds were represented. *Deilephila livornica*, *galii*, a hybrid *Smerinthus ocellatus* and *populi*, and so on. One female ghost moth seemed of unusual dimensions. Lastly, entomologists will hear with pleasure that the identical *Ophiodes lunaris* noticed in Stainton's Manual was extant and in good preservation, besides which there were examples of the little orange *Argyrolepia æneana*, an insect I used to hunt for in vain among the Willesden ragweed. In conclusion, it would be interesting to discover what claims the unique *Ophiodes lunaris* has to be considered British. It is fancied that this moth was taken near Selborne, where it might have bred in the woodland. Had it been taken on the coast there would have been, I think, little doubt but that it had been imported. Some thirty years ago when I was in the habit of driving across Bursledon Bridge that spans the river Hamble in Hampshire, the toll-keeper produced a large box of exotic moths for sale, which sailors had captured in the Southampton Docks. On my complaining that they were not Britishers he found me a little starved *Deilephila Euphorbiæ*, that, according to his account, he captured on the wing in the neighbouring wood one Sunday afternoon. The specimen is now in my cabinet, and though I half think it must have come from France, there is still a secret pleasure in fancying it may have bred in the charming seclusion of that little Hamble river.—*A. H. Swinton.*

STRANGE SITUATION OF A YEW-TREE.—In the quiet old-fashioned Devonshire village of Culmstock may be seen a curious phenomenon. Growing out from the side of the tower, on a ledge immediately beneath the battlements, 100 ft. from the ground, is a yew-tree. The main stem may be 12 or 13 inches in circumference. Its roots are insinuated between the leads and the wooden ceiling of the belfry. I have no means of ascertaining its age; but an old inhabitant on the shady side of sixty informed me last week his grandfather had told him he remembered it as a boy. The generally received opinion of its origin in so curious a situation is, that a seed from the yew-tree in the churchyard had been swallowed by a bird and deposited in its excreta on the ledge. The tower is a lodging house for colonies of jack-daws and starlings; but these are not berry-eating birds, so far as I know. To the no small regret of the village worthies, this venerable parishioner is showing unmistakable signs of decay, certainly not from old age, as what is evidently its parent, is far from patriarchal. It has undoubtedly suffered much from the visits of the adventurous, the curious, and the profane, who, mounting the tower, regard it a sacred duty to tear off mementos of their excursion.—*W. Jacobs, Acton Vale.*

NATURE PRINTING.—I and I dare say many of your readers have looked anxiously for a detailed description of Mr. Thomas Honywood's method of printing from nature, of which a mere notice was given in No. 223, page 159, of the present volume of SCIENCE-GOSSIP. If the process bears out all that is claimed for it, it will prove of inestimable advantage to botanists and students of nature in general, and the earlier we have it the better, as the season during which it can be applied and found most valuable is drawing rapidly to a close.—*J. T.*

DISEASE OF PUSS LARVÆ.—Were Mr. Finch's larvæ kept in too confined a space? I used to lose a great many caterpillars by premature death, until I became careful to give them plenty of air and not crowd them too much.—*Albert Waters.*

HELIX POMATIA.—Will some reader inform me if *Helix pomatia*, L., has been found in the Isle of Wight? Also in what counties Mounces and Shaftocrag are?—*A. Loydell.*

RANUNCULUS FICARIA.—I would say in answer to Mr. E. T. Scott's note on *Ranunculus Ficaria*, p. 187, that Mr. J. R. Neve is only following popular usage in calling this plant the common celandine. There would be no confusion, if *Chelidonium majus* were always called the greater celandine, and *Ranunculus Ficaria* the lesser; but I think that most people, and the poets universally, are thinking of the latter when they speak of the celandine; nor is it surprising that a beautiful spring flower, studding every hedge, should have acquired a name, part of which belongs to a rather rare and comparatively unknown plant. "Pilewort," I imagine, is preserved as a synonym, in remote country districts only. I think that Mr. Scott has confused the fruit of ranunculus with the seed, which latter he would find on opening one of the numerous "achenes."

WHITE CRANESBILLS, p. 188.—I find that Sowerby says distinctly that most of the species of geranium are occasionally found of a white colour, so that Mr. Walter Cordwell can only claim a rarish variation of colour in his specimen of *G. molle.* I have seen *G. rotundifolium* myself with pure white flowers.—*C. Stickland.*

ANOTHER GARDEN PEST, &c.—Is not the larva described by Mr. W. H. Harris as attacking the onion plant that of *Tabanus bovinus?* His description and plates correspond exactly with a specimen of that larva in my cabinet. Could you, or any of your readers, recommend me any book on British insects, which would give a description of the various species of Diptera, Hymenoptera, and Arachnida?—*J. H. Moorhead.*

QUERY AS TO PLANTS.—Would some one kindly inform me, through SCIENCE-GOSSIP, the botanical names of the following plants, mentioned in Robinson's "Herbal" as medicinal, viz. dog's or goat's arrach; St. Peter's-wort; one blade bishop's-weed, or cumen royal, or Herb William, or Bull-wort; Blites, red and white; Walter Calthrops, or water-chestnuts; cock's-head, or red fitchling; Saracen's woundwort. I cannot discover them.—*S. A. Brenan.*

LAND AND FRESHWATER SHELLS.—Can any reader say which recently published Manual or handbook gives the fullest descriptions of all the varieties of British land and freshwater shells?—*Geo. Roberts, Lofthouse.*

THE SUNDEW.—The charming article by E. T. D. in last month's SCIENCE-GOSSIP conveyed much information on these curious little plants, and, to one, who, like myself, is well acquainted with the district mentioned, and has botanised there in bygone times, it brought to the memory thoughts of sunny days and happy hours spent in investigating the flora of this delightful Hampshire hunting-ground. It struck me, however, as rather curious that E. T. D. should have experienced any difficulty in spotting the sundew, for in most New Forest districts, and I am acquainted with the greater part of the neighbourhood, at least two species of drosera are extremely common; the best known form, *D. rotundifolia*, the only one by-the-way that E. T. D. mentions, is so abundant as to give a red tinge to the surface of the ground, while the little drops of fluid which have exuded from the glands of the tentacles sparkle in the morning sun, and have all the appearance of dew-drops—have, of course, the popular name. *D. intermedia*, a species having spathulate leaves, is also very common in New Forest bogs; but while *D. rotundifolia* seems to luxuriate in beds of sphagnum, this plant revels in the black mud of the ditches. The only other English species, *D. Anglica*, a larger and rather more handsome plant, is also to be found in this prolific neighbourhood. Within a quarter of a mile of the little station called Holmsley all three plants may be found growing. When ascending Ben Nevis a few weeks ago, I found a plant of *D. rotundifolia* which had captured a large fly, nearly as big as a "blue-bottle," so big, indeed, was it that little more than the head was enclosed in the leaf. An insect as large as this must have been possessed of sufficient muscular power to have made its escape during the gradual inflection of the tentacles, for its hind legs and wings were entirely free from the gummy exudations of the plant. The question occurred to me whether the fluid sought after by the fly contained any intoxicating or anæsthetical qualities, by which the insect was rendered inactive until killed by immersion in the acid exudations by means of which the sundew kills its prey. While writing of New Forest sundews, it may be of interest to some of the readers of SCIENCE-GOSSIP who think of visiting the locality, to know that other insectivorous plants beside Drosera are to be met with. One or two species of bladderwort (Utricularia) may be found in the ditches, and on the heaths the butterwort (*Pinguicula Lusitanica*) is abundant. I should be glad to know if any botanist has found *D. vulgaris*, the plant that is so common on the Scotch mountains, in the forest, and if so I should be glad to know the locality. —*A. E. Gibbs*, *St. Albans.*

MISTLETOE ON THE APPLE-TREE.—Some years ago, when living at Upper Norwood, a plant of mistletoe appeared on one of the dwarf apple-trees in my garden, and grew to a considerable size. Is it usual to find mistletoe so near London, or, indeed, near any large or populous town? I have since tried to grow the plant on my apple-trees here, by very carefully inserting seeds in cracks of the bark, but always unsuccessfully.—*H. E. Wilkinson*, *Anerley*, *S.E.*

WHITE STARLING'S EGGS.—I can also bear witness to the occurrence of white starling's eggs, having myself met with at least one or two. Like Plutarch, I have also taken white thrush's eggs, though very rarely.—*Albert Waters.*

DESCRIPTIONS OF CATERPILLARS. — Will some reader kindly oblige by giving me full descriptions, with length, food, plants, &c., of the following caterpillars: *Lycæna Arion*, *Nola centonalis*, *Ennomos alniaria*, and *Leucania loreyi*.—*F. A. A. Skuse.*

A SILICIFIED PLANT AND A BLOOD PRODIGY.—There are ever those to whom a piece of silicified wood is a marvel of marvels, who see in the fossilised tree trunks that strew the sea margin in the Isle of Wight, or the petrified forest lying in the valley of dry water-courses, a glimpse of the Pre-Adamite that no drawer of fossils could ever evoke. The Egyptian silicified wood, however, is simply sun-baked wood turned to flint on the desert sands; the tender plant before me is coated caddisfly-like with sand and iron, a veritable casting in forest stone done by dame Nature out on the Wolds. It was found upon the sandy eminence of St. Martha's that represents (as far as I am enabled to judge), the upper ferruginous beds of the Shanklin Sand hereabouts (Mantell, "Geology of the South-East of England," p. 171). One day when ascending this specular elevation, I passed through a cutting where the veins of silicious iron had wound their snaky contortions through a bed of brightly variegated sand, and here I whiled some sunny moments in detaching from the bank an object that first resembled a stick of macaroni and eventually presented the appearance of a bird's shin bone and claws. This curiosity I now unquestionably pronounce to be the stem of some plant, since interiorly to its coat of slag there is a distinct ring of vegetable fibre peeling vertically, if you may skin a flint. I think I may further pronounce it to be the stem of an herbaceous plant, since the root is a knob with a vertical and lateral sucker, and many smaller rootlets, and the stem, about three-quarters of an inch in diameter, is bent towards the lateral hold-fast and flattened on that side like a crushed hemlock stalk. I am still doubtful, however, whether this plant grew upon the Shanklin Sand, or whether it was washed into it. I fancy it to be somewhat unique. Inside its hollow root are some minute spongy globules like miniature puff balls, and those who have examined the productions of chalybeate springs might not consider a fossil fungus an impossibility. When on this subject I may allude to a recent blood prodigy. As I was picking hurts on the neighbouring Leith Hill at the commencement of August I came upon a blackberry bush all bedabbled with blood. The cause of this was not far to seek. At the reverse of each blood spot, beneath the leaf, there grew a minute fungus, black or yellow, and in some remote relation to spots and powdery fungi, I discovered an almost inscrutable red worm on the leaves, and what appeared to be an imperceptible red Dipterous pupa.—*A. H. Swinton.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

F. H. A. (Orchis).—You are quite correct; it is *E. violacea* of the L. C.

W. M. P.—We are sorry to defer your Exchange on account of its length. We limit Exchanges to three lines of print (unless paid for as advertisements), so as to enable as many of our readers to avail themselves of the column as possible.

S. E. HILL.—The specimen of Nasturtium you sent us is a good illustration of fasciated stems.

F. C.—Your plant is the large St. John's Wort (*Hypericum Androsæmum*).

C. F. W.—We have just seen Donn's "Hortus Cantabrigiensis" offered in a secondhand catalogue for 5*s.*

O. P. C.—Your fungus is *Scleroderma vulgare.*

J. A. (Preston).—As you rightly judge, it is a fungus; you will readily find it in Cooke's "Micro-Fungi."

A. L. (Thornhill).—No. 1 is *Potamogeton heterophyllus*? Being only an imperfect specimen and devoid of floating leaves, we mark it doubtful. No. 2 is *P. perfoliatus*; 3, *Carex œderi.*

E. G. (Felstead).—We believe it to be some exotic *Sison*, but very unlike any we have seen. In November No. of SCIENCE-GOSSIP it will be reported fully.

R. H. A. (Swanshurst).—Thanks for the hint about drying specimens, it is well worth trying. The species are, No. 1 *Hypnum splendens*, *C. Campanula patula*, very distinct from *C. rotundifolia*, *D.* milkwort (*Polygala vulgaris*), used formerly in Rogation week; 3, *Hypnum rutabulum*; 4, *Bartramia*; 5, *Ceratodon purpureus*; 6, some Bryum, intermixed with several Hypna.

W. B. M.—The leaf of *Aristolochia sipho* was furrowed by the burrows of some species of leaf-mining caterpillar.

F. H. WOOD.—Professor Nicholson's "Manual of Palæontology," 2 vols. would meet your wishes, also Dr. Andrew Wilson's "Chapters in Evolution," published by Chatto & Windus, price 7*s.* 6*d.*

T. J. W. (Mile End Road).—We should advise you to secure Hooker's "Student's Flora," as the most serviceable. The plants are, No. 1. Skullcap (*Scutellaria galericulata*, L.); 2. Burdock (*Arctium Lappa*, L.); 3. Comfrey (*Symphytum officinale*); 4. Gypsy-wort (*Lycopus Europæus*).

W. H. (Stoke Newington).—No, it is evidently a stunted form of *Trifolium filiforme.*

A. J. S. (Kentish Town).—Stock's is a very useful work. No. 1. is *Polytrichum commune*; 2. *Sphagnum acutifolium*; 3. the same as last; 4. *Dicranum heteromallum*; 5. Common Whortleberry.

J. RASOR.—An exotic species; will be reported next month.

EXCHANGES.

THE three first vols. of SCIENCE-GOSSIP, bound, and in good condition; micro slides wanted, or offers.—H. Moullow, 34 Lorrimore Road, Walworth, S.E.

WANTED, a small collection of the land and freshwater shells of Yorkshire, with varieties. SCIENCE-GOSSIP, unbound, natural history books, or cash offered.—George Roberts, Lofthouse, Wakefield.

FOR a first-class, silver-plated banjo, machine head, almost new, cost three guineas, what offers? Botanical specimens and books preferred.—J. Guardia, 19 Turret Grove, Clapham, S.W.

WANTED, old coins (English); exchange books, &c.—J. S. Lyddon, 2 Oakland Villas, Redland.

WANTED, in exchange for well-mounted micro objects or material, good, named micro fossils (not for section cutting), zoophytes, British or foreign, algæ, eggs of lepidoptera, or foreign coleoptera in quantity preferred. List of objects sent if required.—J. M., 59 Hind Street, Poplar, London, E.

MICROSCOPE wanted; will exchange Busson's harmoniflute, 3-octave keyboard and stop, in perfect order (cost £4 4*s.*).—H. Ebbage, 34 Queen Square, Wolverhampton.

WANTED, a small naturalist's dredge. Cash, specimens, or micro slides in exchange.—W. H. Shrubsole, Sheerness-on-Sea.

EGGS. Wanted a clutch of each of the following species: tawny owl, stonechat, goldcrest, nuthatch, all the pipits, woodlark, woodpeckers, kingfisher, sandpipers, geese, ducks, gulls, &c. I can offer clutches of killden plover, American billwa, Bartram's sandpiper, fork-tailed petrel, and other good eggs.—W. Wells Bladen, Stone, Staff.

WANTED, Rye's "British Beetles" or Rimmer's "Land and Fresh-water Shells" in exchange for collection of British grasses, seventy species, correctly named, collected 1883.—F. Tufnail, Amity Street, Reading.

THIRTY-TWO species of British lichens, correctly named and localised, to exchange for shells either recent or fossil.—A. Loydell, 10 Aulay Street, Ossery Road, S.E.

WANTED, *Paludina vivipara*, *P. contecta*, and *Dreissena polymorpha*, in exchange for other British shells or well-rooted plants of exotic ferns, greenhouse blooming plants (not bedding), and the cactus tribe.—M. A. O., 82 Abbey Street, Faversham, Kent.

WANTED, four large live shells of the *Globose janthina*; must be perfect, beautifully coloured, and localised specimens, and all from the same locality.—W. Palmer, Seywell, Blakesley, near Towcester, Northamptonshire.

I HAVE several duplicate microscope slides, chiefly geological, to exchange for others. Correspondence invited.—F. R. T., Port Hill, Stoke-on-Trent, Staffordshire.

FOR exchange, one of Stafford Smith's permanent postage-stamp albums (15*s.*), containing about 850 foreign stamps, many very rare; wanted in exchange, scientific books, fossils, or minerals. Correspondence invited.—F. R. T., Port Hill, Stoke-on-Trent, Staffordshire.

I HAVE Turkish and Indian sand, full of small shells, which would be splendid objects for the microscope. All those who have a microscope should not fail to get some.—Herbert George, 143 Stepney Green, London, E.

WELL-mounted slides of botanical sections, double stained, in exchange for insect or anatomical.—R. Gill, 7 High Street, Chorley, Lancashire.

LEPIDOPTERA.—Duplicates: *L. corydon*, *S. populi*, *S. Liliæ*, *V. rnberata*, *B. perla*, *M. alveriella*, and numerous others. Desiderata: various.—George Balding, Ruby Street, Wisbech.

GEIKIE'S "Outlines of Field Geology," for Newman's "Insect Hunters."—T. W. Brewis, Boro' College School, Rotherham.

NECTARY of *Parnassia palustris* (mounted in balsam), also a few duplicate micro slides.—John R. Marten, Cottage Hospital, Red Hill, Surrey.

Thlaspi alpestre, *Draba incana*, *Orobanche rubra*, and other rare plants for others, especially Carices and Potamogetons.—John Percival, 15 Low Ousegate, York.

DUPLICATES: Artemis, Galathea, Hypecanthus, *Tithonus pamphilus*, Megæra, *Sylvanus linea*, Tages, Alveolus, Jacobæ, Filipendulæ, Cardamines, Alexis, Phleas, Cardui, Atalanta. Desiderata: any other butterflies, British or foreign.—W. H. Scott, Eastwood Villas, Humberstone Road, Leicester.

OFFERED, L.C., 7th ed., 122, 146, 204, 226, 399, 426, 430 *a b*, 433, 542, 704, 755 *b*, 777, 782, 786, 831, 1188, 1193 *a b*, 1195 *b*, 1303, 1357, &c., in exchange for other rare plants.—A. E. Lomax, 56 Vauxhall Road, Liverpool.

WANTED, a Greek Lexicon, also Gatty's "Seaweeds;" a liberal exchange in microscopic slides or herbarium examples of cryptogamic plants offered in exchange.—Lichen, 15 Horton Lane, Bradford.

SKIN (with scales) of the sand launce (*Ammodytes lancea*, sent to any one who is interested in fish scales. Send address to J. Sinel, David Place, St. Helier's, Jersey.

L. C., 7th ed., Nos. 140, 317, 642, 650, 747, 1125, 1321, 1420, 1500, 1548, in exchange for other plants.—E. Langdon, 4 Castle Down, Hastings.

FOREIGN ferns and shells, and British ferns, mosses, and shells, for other foreign ferns and shells—T. Rogers, 27 Oldham Road, Manchester.

FOR slide of *Aulacodiscus Kittoni* (Diatomaceæ) send any good mount to A. W. Griffin, Saville Row, Bath.

SPECIMENS of *Trochus zizyphinus*, *lineatus*, *major*, *cinereus*, *umbilicatus*, and *striatus*; also *Nassa reticulata* and *incrassata*, and *Murex erinaceus* and *corallinus*, in spirit, in exchange for good specimens of any of the following sponges:—*Pachymastia Johnstonia*, *Leucosolenia botryoides*, *Grantia compressa*, *Cliona celata* (*in situ*), *Tethia lyncurium*, or offer.—J. Tempère, Storrington, Sussex.

MITCHELL'S "Portable Encyclopædia," with plates; Baldwin's "African Hunting," pub. 21*s.*; Cassell's "Educator;" Cassell's "Birds;" "Ancient Atlas;" Dibden's "Lessons in Painting Plates," and sixty others, in exchange for anything of antiquarian interest.—Tunley, Albert Road, Southsea.

L.C., 130 *a*, 162 *b*, 218, 315, 406, 539, 1125, 1230, 1319, 1665, and several roses and Hieracia. Lists exchanged.—J. A. Wheldon, Mowbray House, Northallerton.

SCIENCE-GOSSIP, first six volumes, 1865–1870, bound in paper boards, clean, and in first-rate condition. What offers in micro apparatus or cash?—George Ward, Wallwood Nursery, Leytonstone.

WANTED, *Petricola lithophaga*, *Venerupis Irus*, *Mya arenaria*, *Sphænia Binghami*, *Neæra cuspidata*, *Solecurtis coarctatus*, *Mactria helvacea*, *Astarte triangularis*, *Solecurtis candidus*, *Venus chione*, *Isocordia cor*, *Arca tetragona*, *Avicula tarentina*, *Lima hians*, in exchange for fine shells of *Astarte sulcata*, *Dentalium*, *D. entalis*, *Venus ovata*, *Mangelia gracilis*, *Trochus majus*, *T. exigens*, *Tapes decussata*, *Cardium papillosum*, *Calyptræa Sinensis*, *Mangelia attenuata*, *M. purpurea*, *M. rufa*, *Lamillaria perspicuus*, *Murex corallinus*, *Emarginula rosea*, *Nucula nitida*, *N. radiata*, *Trochus granulatus*, *Trochus zizyphinus*, &c.—A. J. R. Sclater, Museum, 23 Bank Street, Teignmouth, Devon.

FOR foramini erous sand, send stamped and directed envelope, with small exchange (micro material or insects) to—F. A. A. Skuse, Stepney Green, London, E.

OFFERED, many various forms of Uredines, for Discomycetes and other fungi.—H. T. Soppitt, Saltaire, Yorkshire.

BRITISH land and freshwater shells found within a radius of two miles around Brentford. Land shells, *Succinea putris*, *S. elegans*; *Vitrina pellucida*; *Zonites cellarius*, *Z. nitidulus* (small specimen), *Z. purus*, *Z. crystallinus*; *Helix aspersa*, *H. nemoralis*, *H. hybrida*, *H. hortensis* (one minor), *H. arbustorum* (one specimen not full grown), *H. Cantiana*, *H. rufescens*, *H. hispida*, *H. rotundata*, *H. pulchella*; *Clausilia rugosa* *Tua lubrica*, *Carychium minimum*.—Mrs. Skilton, Brentford.

BOOKS, ETC., RECEIVED.

"Nature near London." By R. Jeffreys. London: Chatto & Windus.

"The Evolutionist at Large." By Grant Allen. London: Chatto & Windus.

"The Poets' Birds." By Phil Robinson. London: Chatto & Windus.

"A Handy Guide to Llandudno." By John Price, M.A. London: Simpkin, Marshall & Co.

"The Age of the Newest Gneissic Rocks of the Northern Highlands." By Dr. C. Callaway.

"Easy Lessons in Botany." By Edward Step. London: T. Fisher Unwin.

"Some Materials for a Flora of Wrotham and its Neighbourhood." By the Rev. J. W. Ewing.

"Land and Water."
"Midland Naturalist."
"Journal of Conchology."
"Natural History Notes."
"The Practical Naturalist."
"Young Naturalist."
"Ben Brierley's Journal."
"American Naturalist."
"Science."
"American Monthly Microscopical Journal."
"The Botanical Gazette."
"The Popular Science News."
"Canadian Entomologist."
"Cosmos: les Mondes."
"Le Monde de la Science."
"Feuille des Jeunes Naturalistes."
"Bulletin de la Société Belge de Microscopie."
&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 11TH ULT. FROM:—J. M.—H. E.—A. J. S.—W. H. S.—J. F. R.—W. B. G.—C. G.—C. F.—T. W. M.—R. G.—W. W. B.—J. P.—F. R. S.—J. T. P.—W. P.—F. T.—W. T. S.—M. A. A.—J. H. R.—R. A. B.—T. J. W.—G. H. B.—A. L.—A. H. S.—T. W. B.—E. T. D.—F. A. A. S.—W. M. P.—G. B.—J. T.—A. H. W.—E. L. B.—E. W. E.—J. S.—A. J. R. S.—W. W.—J. A.—F. T. M.—W. A. P.—H. S.—W. J.—C. A. L.—W. L.—W. B. M.—A. E. L.—W. H. S.—S. C. C.—J. P.—J. R. M.—F. C. M.—J. A. W.—G. W.—W. H. T.—W. O.—J. T.—W. R. T.—T. R.—A. B.—F. H.—F. S. L.—A. E. B.—J. G.—J. F. R.—E. D. M.—J. S.—A. O.—W. D. R.—J. P. B.—A. W. G.—H. L.—H. T. S.—E. H.

A CHAPTER ON BRITISH FOSSIL BIRDS.

By ARTHUR SMITH WOODWARD.

[*Continued from page* 223.]

PASSING on to the Cainozoic formations, the London Clay of the Eocene period contains the most interesting relics of an avian fauna. No bird-remains appear to have been recorded yet from the Thanet sands, and only very few fragmentary ornitholites have been met with in the overlying Woolwich and Reading beds.

In the London Clay of the Isle of Sheppey, more or less imperfect skulls belonging to four genera of birds have been discovered; and the other remains of the same class, which have been described by Professor Owen, consist of a sacrum from Sheppey, some wing-bones from Sheppey, a sternum from Primrose Hill, London, and a sternum, associated with other fragments, from Sheppey.

The detached sacrum, though certainly that of a bird, is not of any great importance, owing to the fact that no idea can be obtained of the order or family to which the individual, of which it formed a part, belonged. The sternum from Primrose Hill, likewise, cannot be relegated to any very definite position, although there seems to be little doubt but that it indicates the existence of a genus of wading birds in early Eocene times.

The four fragmentary crania are of the greatest interest, and possess certain well-defined characters which have revealed many facts regarding the ornithology of the South British regions, at the remote period when the London Clay was deposited. The most remarkable specimen is the hinder portion of the skull and mandible of a dentigerous bird, designated by Professor Owen, *Odontopteryx toliapicus.*

In *Odontopteryx*—of which the total length of the perfect skull was probably not less than 5 or 6 inches—the beak is longer than the cranium, and both upper and lower jaws exhibit the peculiarity of possessing tooth-like processes, consisting of conical, sharp-pointed projections from the bone of the alveolar borders. Indeed, so remarkable is this latter character that, together with one or two other peculiarities, it might at first sight lead to doubts as to whether *Odontopteryx* was really a bird, and not a creature of the reptilian class. When, however, we find that all the modifications for the characteristic movements of the beak, as it is employed by birds, are to be detected, and when we consider the size of the orbits, the form of the condyle, and the conformation of the well-developed brain, it is not difficult to perceive—as Professor Owen has pointed out—that the interesting cranium must have belonged to one of the feathered tribe. Further proof of the correctness of this conclusion is to be obtained from a portion of the atlas-vertebra attached to the specimen, which is truly of the avian type.

The denticulations of the jaw have a truly osseous structure, and are not covered even at the extremities with enamel. They are distinct processes of the bone, retaining not only its microscopical structure, but also certain delicate markings which characterise its surface. All the denticles are not of the same size, but the series of both upper and lower jaws consists of smaller cones separated at intervals by solitary larger ones; they are slightly inclined forwards, and, supposing that the length of the alveolar borders was originally three inches, and that the "dentition" was uniform throughout, there would be forty of the larger cones in the complete mouth. No known living bird possesses any structure analogous to that exhibited in the mandibles of *Odontopteryx*, and even those existing species that do appear to make any approach to it—such as the falcons, dodlets, butcher-birds, &c.,—owe their "teeth," not to any development of the osseous tissue, but to pointed processes of the horny enveloping sheath.

The fact that the beak of *Odontopteryx* is longer than the cranium at once suggests affinities with the aquatic birds, as this is a character rare in other orders; and another feature—the absence of a gland-pit over the orbit—seems to limit comparisons to the families Totipalmates and Lamellirostres. Taking into consideration all structural peculiarities, Professor Owen has decided that this extinct genus was probably a piscivorous bird, with webbed feet, and having most affinities with the Anatidæ.

It is a most singular fact, and yet one which is established beyond a doubt, that birds of the struthious order existed in the area of Western Europe in the early part of the Eocene period. In the Paris basin, limb bones have been found that clearly indicate a genus of Ratitæ, to which the name *Gastornis* has been applied; and one British fossil—a cranium from the London Clay of Sheppey—offers interesting confirmation of the truth of this discovery. The eminent indefatigable palæontologist, Professor Owen, who has contributed by far the largest share to our knowledge of the British fossil birds, provisionally refers the remarkable skull to a new genus, termed *Dasornis*, but thinks there is just a possibility that it may eventually be found to belong to the Paris basin genus, *Gastornis*. In size, it is quite equal to that of the great extinct *Dinornis giganteus* of New Zealand, and the few definite characters that can be discerned in the specimen (which was considerably broken and abraded before its entombment in the argillaceous sediment of the London Clay), seem to show that its possessor was intermediate in organisation between the Dinornithidæ and the Struthionidæ, but most nearly allied to the latter.

Argillornis is another genus of birds from the London Clay, of which one species (*A. longipennis*) has been described by Professor Owen. The genus was first founded by the Professor in 1877, upon portions of the right and left humeri of a bird, the study of which led to the conclusion that the form to which they belonged was generically distinct from any now living, but not very far removed from the albatross (*Diomedea exulans*). Two years afterwards, an interesting portion of the skull of a bird from the same deposit, and the same locality, was discovered, and the author of *Argillornis* claimed it as part of the skeleton of this avian genus; from its dimensions, too, compared with those of the previously described humeri, it was inferred to belong to the same species. The specimen when found was very much worn, the cancellous tissue of the bone being in most parts exposed. Probably, when perfect, it was somewhat more than seven inches in length, and there is nothing to make improbable the supposition that the alveolar borders were dentigerous, although further fossil evidence will have to be supplied before anything definite can be known on this point. However, it is interesting to notice, in the example already described, that "at one short tract on the right side, which appears to be the uninjured alveolar border, there are the outlets of four small vertical pits, like the sockets of teeth, but filled with matrix." (Owen.)

Allies of the kingfishers lived in the Eocene period: the only evidence of this fact yet discovered is to be found in a specimen of the hinder part of a small cranium. Originally, this fossil was figured in König's "Icones Fossiles Sectiles," and described as belonging to an extinct species of gull, being accordingly named *Larus toliapicus*. But Professor Owen has proved this to be a wrong identification, and pointed out that many structural peculiarities separate it from the gulls and approximate it to the kingfishers; nevertheless, it differs generically from the skull in all known living forms, and has, consequently, been regarded as the type of a new genus, *Halcyornis*. König's specific name is retained.

The remains of a small bird allied to the vultures are the only other avian fragments from the London Clay that have, to the present time, been determined with anything like precision. The fossil evidence of this interesting species consists of a nearly perfect sternum, associated with the proximal ends of the coracoids, a dorsal vertebra, distal end of the left femur, proximal end of the left tibia, and fragments of ribs. Professor Owen has established for the bird indicated by these bones, the new genus and species, *Lithornis vulturinus*. It is chiefly remarkable as being of small size, compared with its accipitrine congeners of the present day.

We may just remark that a long bone from the London Clay of Sheppey, without any traces of the articular extremities, was described by Dr. Bowerbank in 1854, as being the shaft of the tibia of a large bird allied to, and a little smaller than, the emu; he named it *Lithornis emuinus*. But it ought to be remembered that a microscopical study of the tissue of the bone was the basis upon which the conclusions were founded, and hence not much reliance can be placed upon them.*

A considerable number of bird-remains have been obtained from the Middle and Upper Eocene strata of Hordwell Cliff, Hampshire, and a good series is to be seen in the British Museum; but hitherto no attempt seems to have been made to determine the affinities of these interesting relics.

It would be wandering from our present purpose were we to consider the abundant avian fauna represented in the Miocene deposits of the continent, although a study of the fossil remains would convey

* Dr. Bowerbank's specimen, and also the shaft of a bird-bone described by Professor Seeley under the name of Megalornis (Quart. Journ. Geol. Soc., xxx. p. 708), are now believed to belong to the Argillornis of Professor Owen.

to us some idea of the birds that may be assumed to have inhabited the British area during Miocene times. Passing on to the English Pliocene strata, exceedingly fragmentary evidence of bird-life has been found, and only one bone appears to have been even approximately identified. This single specimen is a humerus from the Norwich Crag, which Professor Owen considers to belong to a nocturnal bird of the size of the barn-owl.

In conclusion, it is scarcely necessary to detail all the birds whose remains have been recorded from Pleistocene and recent formations. Fluviatile deposits (as at Grays, Mundesley, and other localities), peat-bogs (as the fens of Cambridgeshire), and cavern accumulations (as the celebrated hyæna den of Kirkdale), have all yielded relics of the avian class. But, with scarcely any exceptions, the bones have indicated species now—or until lately—inhabitants of the British Isles. One notable exception, however, cannot be passed over altogether, namely, the occurrence of the pelican in the fens of Cambridgeshire, as determined by Professor Milne-Edwards. This determination is based upon a few wing-bones which the learned Professor considers to be sufficient for the foundation of his conclusions as to the genus, although enough evidence is not yet forthcoming to decide whether or not this pelican was of an unknown species. Still, whatever may have been its specific relations, it is clear that the bird was not a "straggler" in these regions, carried away from its native land by the winds, for the bones are those of a young individual which would be too weak to survive so long a voyage.

THE MICROSCOPIC GLASSES.

(A CHAPTER IN ADVANCE.)

ABOUT the year nineteen hundred, having just heard of the new and wonderful discovery, by which spectacles were manufactured of such a power as to enable the wearer at a distance of a few feet to distinguish the minutest object as clearly as with a first-rate microscope, I resolved to purchase a pair of these wonderful glasses, and, having done so, as a means of testing them, to proceed to the north of Lancashire, and there try their power upon one of the so-called "Insectivorous plants" found in the mountain-bogs of that district. I was very anxious to satisfy myself that the plant really was insectivorous. 'Tis true I had read about it, and knew that it was generally believed to be so by scientific men, but still, as there is nothing like personal knowledge of an alleged fact, I now determined to gain it for myself. So, after some difficulty, both on account of the high price of the spectacles, and their comparative rarity, I at length procured a pair, and started for the north. When I arrived at my destination, the weather was perfect, still, clear, and bright, and as this was very favourable for the object I had in view, I at once resolved to put the "Microscopic glasses," as they were called, to the test. As soon as I could, therefore, after my arrival, I proceeded to the desired spot, seated myself at a distance of a few feet from a specimen of the "drosera," or "sundew," as the plant is called, and, putting on the "glasses," fixed my eyes upon it, and anxiously awaited the result. I had not long to wait; in the course of a few minutes a small fly alighted on one of the leaves of the plant, and of course pressed against one of those long hairy appendages, with small protuberances at their base and summit, with which the leaf is covered.

The effect was intensely interesting. I distinctly saw a communication, apparently of the nature of a constriction, take place between the protuberance or gland at the base, and that at the summit of the hairy appendage or tentacle, and then again with the gland at the base, which now poured a sticky-looking fluid upon the body of the insect; while, at the same time, all the tentacles upon the leaf bent towards the one first affected, and the leaf itself slowly curled inwards over the body of the insect. After the lapse of some time, it again opened, when the fly had completely disappeared, or, at least, all but the hard outer parts. Now, although I had both read and heard that this was the case, I had not hitherto been able to realise it, and to have it thus brought before my eyes was very interesting. What had become of the fly? was its tissue indeed absorbed by the plant, and, if so, how? As I walked homewards—for I had taken lodgings in the neighbourhood, the better to investigate the matter—I pondered much upon this question, and it seemed to me that there could be only one answer. The plant had, somehow or other, absorbed the body of the insect into itself, but still the question remained, How was this effected? Again, but one solution presented itself, the body of the insect had been decomposed, and to enable it to do so, some peculiar property had probably been added to the sticky fluid above named. What was this? I had read that it was exactly similar to our gastric juice, and there the matter rested. I was, however, very anxious to see for myself this alleged decomposition and absorption of the fly's body, and so determined, if the following morning proved favourable, again to try the "microscopic glasses," and, if possible, be a witness of this wonderful phenomenon. Accordingly, the weather being all that could be desired, I repaired in good time to the place, and having put on my "glasses," again saw a fly alight upon the leaf of the plant, and by a careful adjustment of the "glasses" to the exact spot to be examined, aided by a small aperture in the leaf, to my great delight, was fortunate enough to witness that which I so much desired. What I now saw filled me with amazement and admiration. It seemed, as I had suspected, that the composition of the sticky fluid was changed; gradually the softer parts of the insect were decomposed and absorbed by the tissues of the leaf. This I witnessed with my own eyes, and am therefore enabled to bear, I hope, credible testimony to the fact. There could now be no reasonable doubt that the nature of the substance by which the composition of the sticky fluid was changed, was really similar to our own gastric juice. However, as it might perhaps be said, that I saw these things because I expected to see them, I took the precaution of carefully extracting a few of the plants, so that, in case of any one doubting my statement (which, considering my own former incredulity, I could scarcely wonder at), I might have the means of convincing them at hand, by simply exposing the plant, under favourable conditions, to air and sunlight, and thus probably bringing about a repetition of the phenomenon above described.

C. J.

THE HORNED APHIS (*CERATAPHIS LATANIÆ*, Licht.).

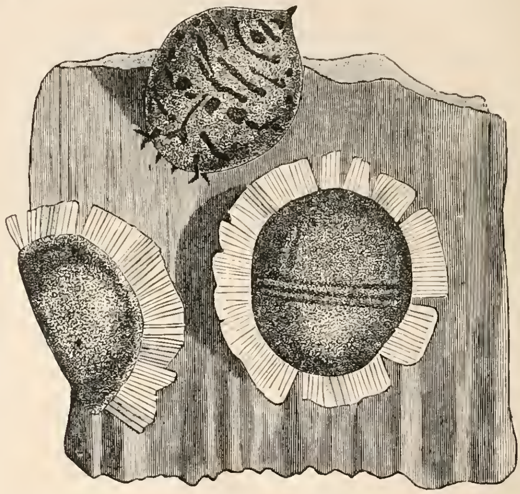
By Joseph Anderson, jun.

THE fourth and last volume of Mr. Buckton's magnificent monograph on British Aphides has just been published by the Ray Society. It contains the description with a coloured plate of a species of Aphis, the occurrence of which has hitherto not been noticed in Britain. Considering that it has as yet only been found in hot-houses, and perhaps could not exist without shelter in this country, it must of course be regarded as an introduction. Concerning this, however, Mr. Buckton has the following remarks: "Our modern facilities for transport are now so great that it becomes necessary to modify our notions as to when an animal is entitled to the term indigenous; indeed the naturalisation of a species now becomes merely a question of period and degree. Perhaps only two Aphides, out of the series I have described, have been introductions into Britain within historic times. They are the American apple Schizoneura, and the grape Phylloxera. In the March of this present year I received from Mr. J. Anderson, of Chichester, an interesting addition to our list of Aphides. As they infest only the palms, orchids, and a few other stove-plants, they must be looked upon as a species introduced from without."

As, it may be, only a certain number of the readers of Science-Gossip have the opportunity of seeing Mr. Buckton's superb work, and the insect being one of exceptional interest, a short account of it may prove acceptable.

On February 14th last, Mr. Gatehouse, of Chichester, who had noticed them for some time past, sent me some very curious insects which he found infesting the orchidaceous and some other plants in his hothouses. They so much resemble a coccus that I pronounced them at once to be such. M. Richter, of Montpellier, to whom I forwarded specimens, and to whom I am indebted for much of the valuable information respecting them contained in this paper, informed me that the insects were not Coccides, but Aphides.

They seem to have given systematists some trouble, being called by Boisduval *Coccus lataniæ*. In 1867 M. Signoret placed the insect with the Aleurodes, naming it *Boisduvalia lataniæ* in his monograph on those insects, avowing at the same time that he did not know really where to allocate it. M. Lichtenstein has for years given these Aphides his especial attention, and it was the finding of a perfect winged form by him, that enabled him to pronounce definitely upon them and assign them a proper position. "In May, 1881," he says, "I found a winged form; but



2 3 1

Fig. 140.—1, 2. Apterous female and part of another surrounded by discs of wax; they are fixed to a portion of an Orchis leaf; 3, another individual, placed so as to show the under side and the position of the rostrum. The disc has been removed.

unfortunately very mutilated. It enabled me, however, to state that I had to do with an Aphis belonging to the group of Schizoneura." M. Signoret himself also sent him another example, unfortunately, too in very bad condition. Subsequently he had the good luck to come upon a living winged insect in the hot-houses of the Jardin des Plantes at Montpellier, carrying its wings flat, like the Phylloxera, which it much resembles "par sa taille et par sa couleur" when it is young; but from which it is distinguished at first sight "by the antennæ of five articulations, and the forked nervure of the wings; moreover it is viviparous. In these characters the insect agrees with the genus Vacuna, where it might have been classed, but for a peculiarity distinguishing it from all other Aphides, the presence namely in the apterous form of two little pointed horns, springing from between the antennæ." This characteristic necessitated the creation of a new genus, to which M. Lichtenstein gave the appropriate name of Cerataphis—the Horned Aphis.

Being informed of the novelty of the discovery by M. Richter, I at once communicated with, and sent examples to, our distinguished countryman, Mr. Buckton. Acknowledging these, he writes, "I am rather surprised that the very Coccide-form larvæ of Cerataphis should produce an imago so like a Schizoneura."

Cerataphis lataniæ is indigenous to the Isle of Bourbon, or La Réunion, where it does serious soil as well as on the leaves. Seen under the microscope they are certainly extremely beautiful objects. The brown body is adorned with a most elegant fringe, resembling a frill of white muslin, "which is formed," says M. Signoret, "by a secretion produced from a series of little tubercles, which may be seen in the circumference of the body." Mr. F. Enock, so well known for his skill in the preparation of objects for the miscroscope without pressure, has furnished me with some exquisite slides from a supply which I sent him, and I can confidently recommend to all microscopists this charming addition to their cabinets.

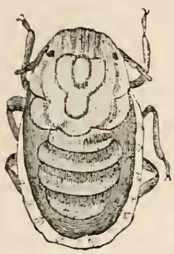


Fig. 141.—One of the young born from Fig. 140, 1. It has passed a moult, and the wax disc has commenced to grow.

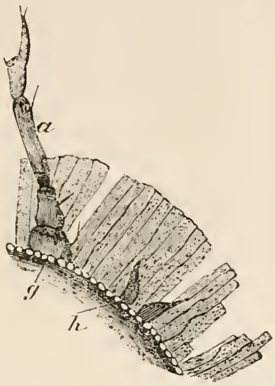


Fig. 142.—Inferior view of the head of Fig. 140, 1, showing at *g* the wax glands; at *h* the small horns; and at *a* the antenna much magnified.

Fig. 143.—Head, antenna, and fore leg of the imago.

Fig. 144.—Magnified fore leg, showing the tarsus and claws.

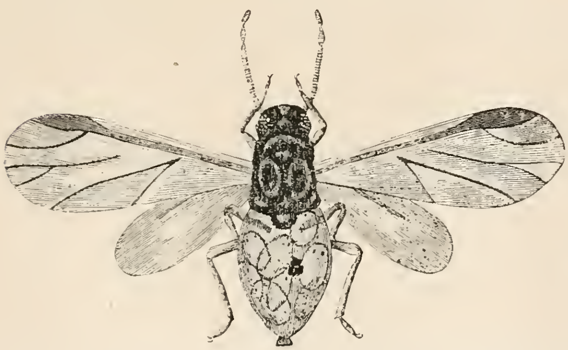


Fig. 145.—The winged viviparous female. The lower wings are faintly drawn in their probable position; they were lost in the specimen from which the drawing was made.

Fig. 146.—Cauda and minute papillæ of the imago.

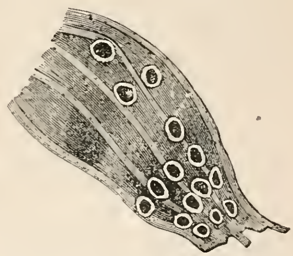


Fig. 147.—Part of the base of a palm-leaf studded with numerous larvæ of *Cerataphis lataniæ*. Natural size.

injury to the useful palm-tree, *Latania borbonica*. It would be interesting to speculate as to the way in which those infesting the leaves in Mr. Gatehouse's hot-houses were introduced. These apterous forms appear to be the Queen Aphis of Buckton, and *Pseudogyne fundatrix*, or Foundress of Lichtenstein, and the succeeding form, which closely resembles the former, and having the power, according to Lichtenstein, of reproduction, by a process somewhat akin to gemmation, almost indefinitely. I must not omit to mention that they are to be found thickly clustering on the base of the stems of the plants beneath the

Although I searched very diligently, and had the assistance of Mr. Gatehouse's gardener, I was not successful in finding the winged form (known in M. Lichtenstein's nomenclature as the Emigrant) in May. Possibly this may have been from ignorance of its habits, and I may be more fortunate with the pupifer, which appears in October, although this is a greater rarity even than the winged emigrant. In a letter bearing date Sept. 4th, M. Richter tells me that they never occur on the leaves as do the apterous forms; but only on the stem of the plant, hidden under the leaf-stalk, which embraces the stem, so that they are very difficult to catch or even to see.

The following is M. Lichtenstein's diagnosis of the known forms :

I. *Pseudogyne fundatrix.*—Brown-black, the body oval, rounded, with a brilliant mother-of-pearl fringe ; antennæ four jointed, of which the second is the shortest, and the third the longest ; two little conical and pointed horns between the antennæ and under the face.

II. Emigrant (or at least the form succeeding the Foundress) resembling this form exactly, except that it is of a clearer colour, and the antennæ have five articulations.

III. Pupiferous form.—Winged. Antennæ of five joints, all finely ringed, wings flat on the back. The superior present the nervures of the genera Schizoneura and Vacuna ; that is to say, the third cubital is forked at the extremity. It is by analogy with what takes place with the Phylloxera that I call this winged form pupiferous, for I have not been able to obtain the egg, and do not know if it will give me, as I reckon, males and females.

Mr. Buckton's measurements are—

Apterous female.

	Inch.	Millimetres.
Size of body . . .	0·060×0·050	1·52×1·27
Antennæ	0·010	0·025

Viviparous winged female.

Expanse of Wings .	0·160	4·06
Size of body . . .	0·0700×0·040	1·77×1·01
Antennæ	0·035	0·88

I must express my obligations to this gentleman for the kind permission accorded me, to make figures from his plate in order to illustrate this article.

FURTHER NOTES ON *ORCHIS MASCULA.*

I AM much obliged to your correspondents for the notice they have taken of my papers. Fortunately their questions can be answered.

First of all, Mr. Scott will have observed, if he has been kind enough to read p. 53 again, that it was nowhere stated that the common orchis bore no pollen, but merely that it was not fertilised in the ordinary way ; by which I meant, as Mr. Lett has already pointed out on p. 118, that the usual method of dusting loose pollen-grains on to the bodies of insects was not employed in this particular instance. Since April, I have succeeded in making many drawings of pollinia, and if Mr. Scott would care to see them, I could easily furnish him with some copies. I may add, moreover, that the pollinia of those species of orchis which are fertilised by bees, viz. *O. mascula*, *O. morio*, *O. maculata*, *O. latifolia*, *O. incarnata*, *O. militaris*, and also *Gymnadenia conopsea*, have their pollen-masses of a soft sea-green colour mounted on a yellow filament, whereas the pollinia of those species which are either self-fertilised, or fertilised by flies or moths, viz. *O. mascula* and *O. morio* (*white*), *Bee*, *Fly*, *Spider* and *Frog*, are entirely yellow, pollen mass, filament and all, so that it is possible to decide at a glance to which of these two classes the pollinia belong. I think this fact sufficiently curious to deserve notice, as it may, perhaps, throw some light on the white varieties of Orchis. Nor is this all, for the pollinia of the spider, fly, and bee ophrys have elbows in their filaments, an arrangement superbly suited to that forward depression, which, without the aid of insects, causes self-fertilisation. The pollinium of the frog orchis, however, has a straight filament.

On May 6, at 9.30 A.M., while the morning was soft and cloudy, the musical hum of wings outside the window attracted my attention, and I had the satisfaction of observing a large black-velvet humble-bee on a tall spike of *O. mascula*, with five pollinia attached to its forehead. Watch that bee I did, with feelings of profound peace and delight. I watched it crawling spirally up the spike, and I noticed that it remained longer on some flowers than on others. After a short visit, it passed over some bluebells and marigolds which were close by, and just looked at half-a-dozen plants of *O. morio* in full flower, but it did not settle. A second visit was then paid to the *O. mascula*, and rather a clumsy visit it was too, for the bee alighted on the same flower again, and seemed somewhat annoyed or tired, and it was only by peering intently that I saw it was trying to wipe off the pollinia with its forelegs. I was deeply interested, as this was precisely the reverse of what I had witnessed on April 23rd, 1881 (p. 76), and I longed to go out and pursue science, but the church bells were ringing, and the only weapon at hand was a Sunday hat, so the bee escaped.

Next, your correspondent, E. L. R. (p. 143), has asked for an explanation of the remark about bees and cats, and Mr. Ullyett and Mr. Gibbins have both given the answer. I thought, when I made the statement, that it would be superfluous to say more, but the passage, of course, to which I alluded is in Darwin's "Origin of Species," 5th ed. 1869, pp. 84–86, and is as follows : "I am tempted to give one more instance showing how plants and animals, most remote in the scale of nature, are bound together by a web of complex relations. One hundred heads of red clover (*Trifolium pratense*) produced two thousand seven hundred seeds, but the same number of protected heads produced not a single seed. Humble-bees alone visit red clover, as other bees cannot reach the nectar. Hence we may infer, as highly probable, that if the whole genus of humble-bees became extinct, or very rare in England, the red clover would become very rare or wholly disappear. The number of humble-bees in a district depends in a great degree on the number of field mice, which destroy their combs and nests; and Col. Newman, who has long attended to the habits of humble-bees, believes that 'more than two-thirds of them are thus destroyed all over England.' Now the number of mice is largely dependent, as everyone knows, on the number of cats; and Col. Newman says 'near villages and small towns I have found the nests of humble-bees more numerous than elsewhere, which I attribute to the number of cats that destroy mice.' Hence it is quite credible that the presence of a feline animal in large numbers in a district might determine, through the intervention first of mice and then of bees, the frequency of certain flowers in that district!" Shall I be accused of irreverence if I suggest, as an extension of this idea, that the presence or absence in any locality of spinster ladies may account for the occurrence of *Orobanche minor* in the fields?

Besides these notices, it will only be honest to mention the criticisms that have come to me from various gentlemen interested in British Orchids, to whom I applied for help. Sir John Lubbock and Sir Joseph Hooker were, of course, too busy to attend, and Mr. James Britten was afraid that he was too unimaginative to be convinced. But Professor Allman was most kindly encouraging, and considered it well to take up some single plant and work out its structure and history and to develop its significance in the economy of nature. The Rev. C. Wolley Dod confessed that he was not in a position to question many of the statements, and had no doubt they were correct: "but if the tuber really changes its position and depth in the soil by being dragged upwards and downwards by the roots [I didn't quite say that], it is a very extraordinary arrangement, and one I should not believe, if it did not rest on careful and repeated observations." [Hooker, "Science Primer," p. 40, and Schleiden's "Principles of Botany," p. 294.] The statement that the Orchis will not flower next year if the flower-stalk is broken is also new to me, though I cannot at present refute it. I have seen it stated that if Terrestrial Orchises are prevented flowering for two or three years by breaking off the bud, the flower becomes as it were "cumulative," being very large. I have no doubt that Orchis tubers pass many years without flowering, or as it were dormant, for when a coppice is cleared, Orchises flower which were not flowering whilst overgrown. [I have this year proved the fact of breaking the stem, and find it partly correct. For instance, the field, from which I obtained the specimen, figured on p. 54, was literally covered with *O. mascula* and *O. morio* in April 1882. I visited the field three times. On the last visit, all the plants were mangled and crushed by a roller, and in April 1883 there was not a plant to be seen. Again, in April 1882, I noticed two plants of *O. mascula*, and saw the flowerspikes picked, and determined to observe this year the result. On Jan. 16th, 1883, one of these plants was found out in full leaf, but it never flowered; and on April 13th, 1883, the other plant was found with a spike five inches long ready to come out. It will be alluded to farther on.] As regards the depredations of mice amongst bulbs, crocuses are almost the only bulbs which suffer—no narcissus nor hyacinth being ever touched. [See the next letter.]

Mr. A. D. Webster, whose acquaintance with British Orchids entitles him to much attention, doesn't believe that the spots on the leaves can be reduced by lime, as his experiments and observations lead him to think otherwise. Once he went collecting deeply-spotted orchises, and found pieces of old mortar adhering to their roots. He also planted a clump of orchises in his garden in loam and lime rubbish, and they now are as much, if not more, spotted than before. [Is one year sufficient to establish this objection?] He can't say that plants with spotted leaves are more common in the hedges than in the open ground. [In a subsequent letter, he thought he was wrong on this point.] On the lawn at Penrhyn Castle, where the ground has not been disturbed for a hundred years [twenty years in a subsequent letter], a great quantity of plain and spotted plants grow side by side, and many of both sorts are devoured by something. [*Aradus corticalis?*] He fancies that breaking a spike off strengthens next year's growth, and is quite certain that it is so in the case of the Butterfly orchis. [See last letter.] Destroying the tuber does not prevent the formation of the new one, nor does it in any way hinder the healthy development of the following plant. Mice are very fond of the tubers of *O. maculata*, a fact observed on March 7th, 1883, and slugs will eat the leaves of *O. mascula*, a fact also observed many times during the same week.

The Rev. B. S. Malden doesn't think the leaves increase in number by age, and of the hundreds of *O. mascula* noticed in May in Kent, only one had pure light green leaves without spots.

The Rev. A. H. Malan didn't understand the query about the age of the tuber on p. 53, occurring as it did, just after the statement that the tuber survived eighteen months. [It has been explained.] He then says, "you are quite wrong in comparing the scent of the tuber to the smell of nitrate of silver, for, after close attention to photographic chemicals for two years, I have never been able to detect the slightest smell either in the dry crystals or the aqueous solution." [It would be kind of Mr. Malan if he would state what the chemical is that has a scent like the scent of *O. mascula*. I have repeatedly asked him, and I am still in hopes of receiving an answer.] He also doubts if propolis is secreted, as artificial propolis is made of beeswax and resin.

Mr. Julius Neve doesn't see that I notice the horizontal annual motion of the tuber [p. 54], because in the course of years a plant will travel some little distance thus. [Schleiden says the tuber returns to its original place in the fourth year.] He was, however, much interested in the remarks about the leaves, and most firmly believes that nothing has been created in vain, and that therefore there must be some reason for the spots. He is accordingly inclined to think that they are the means of conducting from the air some chemical element, which the green colour does not, and he has noticed under the microscope that the cells of a spot are superposed on the green cells, the upper ones being white and purple, and the under ones green. Perhaps they have something to do with elaborating the colour, as in the cuckoo-pint.

Dr. Simpson, who was kind enough to treat some tubers of *O. mascula* which I sent in various ways, has not observed any marked result as regards the spots, but he noticed that one of the plants watered with soft water grew the best. He says that the papers on *O. mascula* are suggestive and calculated to make one look with more respect on the plant.

Lastly, there is this piece of additional information, which I am tempted to put down, tremblingly indeed, though it seems more likely than the previous suggestion. I must ask the indulgence of the reader for another theory of the spots. On May 6th, while reading that delightful book, "Freaks and Marvels of Plant Life," I was greatly struck by the facts announced on p. 371, in connection with the temperature of flowers. With their general temperature I am not concerned, except so far as to say that it seems that Dr. Hooker, from observations made in India, has come to the conclusion that the temperature of fluids in a plant coincide with that of the soil at the spot whence the largest absorption is derived; and the inference is that the liquids, taken up by the roots, being at the degree of heat which the soil possesses at that depth, tend to warm the plant in the cold season, and to cool it (in comparison with the air) in the hot season. Under certain conditions, too, especially during the periods of germination and flowering, great heat is evolved by plants. Oxygen combines with carbon and forms carbonic acid, which is thrown off, and the change or oxidation is accompanied by the evolution of heat; so that the burning log, the breathing animal, and the germinating plant all exhibit the same phenomenon of carbon in combustion. A familiar example of this is the process of "malting" barley. At a subsequent period, also, namely at that of flowering, certain chemical changes take place and much heat is evolved. This is best observed and with most satisfaction when a large number of flowers are associated together, as in the case of plants of the Arum family. Lamarck was the first to observe in 1777, then Senebier in 1800, and Hubert soon after. He found that a thermometer, placed among twelve spadices of *Arum cordifolium*, registered $142\frac{1}{2}^\circ$ when the temperature of the air was 74–75°.

Now how does this bear on the question of the spots on the leaves of *O. mascula?* Well, if a plant of common arum, which is spotted, evolves so much heat, surely a plant of *Orchis mascula*, which is much more spotted, must evolve much more heat. It must not be supposed, however, that the spots are the cause of the heat, and I do not mean to convey that impression at all. But, on the contrary, I believe now that the spots are intended to keep the plant cool. For, once more, consider the life history of the plant, and let us take the *O. mascula* alluded to above. It was found on April 13th with a spike five inches high: by May 23rd the spike was $15\frac{1}{8}$ inches high, and a tall perfect steeple of flowers was in bloom, highly scented and most attractive.

The chemical change and heat must both have been great. The tubers, each $2\frac{1}{2}$ inches $\times$ $1\frac{1}{5}$ inches, were exactly two inches below the surface, and the leaves were profusely blotched and blistered throughout their entire length. At the small depth of two inches there would probably be little coolness, but to compensate for this the leaves were blotched and blistered. Why should this be so? I cannot say for certain as yet, except that the *O. mascula* will not stand heat; but if, as I suspect, the shape of the tuber is designed to aid first of all a downward movement, and afterwards a return upward movement, then how admirably does this fit in with the plant's requirements! In the summer the new tuber buries itself, to find an unexhausted position and also to escape the heat, and then, as the roots appear it climbs back, like Horace to his Sabine farm, *causâ captandi frigus amicum.* In February the plant begins to shew leaves, and two months later (in April), when the air is warmer, it flowers. But by this time the leaves are well spotted. I noticed, last April, that the blistering of the leaves in some cases was coincident with the emergence of the spike. Truly this, if correct, is most wonderful, and I hope the wise will ponder it well. Mr. Webster asks if I am not mistaken as to the different depths of the tubers. I must confess that I have not found it so in the case of the experiments I have made, but I have found it so in nature, and I hoped to observe more closely this August, but have been unable to do so. Dr. Simpson is not inclined to accept this cooling theory of the spots, as he considers that the dark colour would have, if any, the opposite effect, for they would absorb more heat than the rest of the leaf. [But are the spots dark? Hold them up to the light: they are pink. It would be very interesting to have them analysed, for thus far I have only been able to test their coolness by Eau de Cologne, the analysis fee being so high.] Dr. Simpson also asks why the *O. mascula* should want to be kept cool; the family is one of hot rather than cold climes, and for many years past our summers have surely been cool enough. [But don't the coolest fruits come from the tropics? Aren't many tropical plants spotted?

and what are a few cool summers in ages?] And if this were the purpose of the spots, he continues, there would surely be some adaptation to the character of the season; in very cold ones, the spotted plants should do badly and the plain plants well, and the opposite should be the case in hot summers. [It is curious that I made this entry in my note book on April 9th, 1883: "Noticed that the recent severe weather had retarded and damaged the plants in the open fields, whereas the plants in the hedges had fared much better. Of these, the plain varieties were best off: one plant with many spotted leaves having all the spots picked out by the frost."] And he ends by saying that he fancies we are a little too ready to suppose we can explain various phenomena, when we can do nothing of the sort.

Mr. Reve's charming note on *Ranunculus ficaria* (p. 130) suggests to me that the two plants celandine and orchis are made to take up alternative positions, in order that they may not interfere with one another, and still occupy the same piece of ground.

There is very much left for future consideration. Meantime there are the spots on the leaves of *O. mascula*. If anyone will communicate with me on the subject, I shall be greatly obliged. The kind letter of Professor Boulger must remain unanswered at present, for want of time, and "G. M." will confer a favour if he will give me his address. My only object is to ascertain correctly all the facts about this very interesting plant.

EDWARD MALAN.

Cheam, Surrey.

ON THE CLASSIFICATION AND LABELLING OF MICROSCOPICAL OBJECTS.

By I. C. THOMPSON, F.R.M.S. (HON. SEC. LIVERPOOL MICROSCOPICAL SOCIETY).

IN our rapidly extending societies, comprising many members almost entirely self-taught so far as regards microscopic science, observations and methods of manipulation and practical work might with advantage be more frequently brought before us. As a means to an end manipulation is very important, and it is sometimes to be wished that workers and even teachers of microscopic physiology and morphology would descend to pay a little more attention to such points of detail. It is but a seemingly small subject that it is intended to touch upon in these few observations, viz., the arrangement, classification, and labelling of our slides.

We have now belonging to the Liverpool Society a large and valuable collection of objects, and probably the majority of our members have cabinets of their own, more or less extensive, and arranged and classified in various ways, according to the taste of the owner.

It is therefore upon a natural system of classification that I recommend our individual arrangement of cabinets. With labels specially adapted as essential (of which more later on) I am satisfied, after a little practical experience, that the result will be a success.

The advantage as regards the amount of knowledge of the various objects by this means impressed upon the mind through observation cannot be too highly estimated, for though entailing a little more time and trouble, especially to the beginner, the information gained is never lost, but constantly added to, as new objects fall into their proper places, and missing links are by degrees supplied; and a strong stimulus is afforded to remedy deficiencies, as objects become conspicuous by their absence.

It will be doubtless asked: What system of classification will you adopt? as each recognised authority differs from another, and all are fallible. In reply it is of comparatively small importance which special authority, if any, we follow, as each of their systems probably follows the poet's law of all systems, "they have their day and cease to be," because, if as open to conviction as all true followers of science always should be, we shall find alterations necessary from time to time, as species turn out to be merely varieties, either their modification, or the appearance of new varieties uniting what were before considered distinct species.

The Rev. H. H. Higgins, some years ago, read two valuable papers entitled, "Lines of Animal Life and Lines of Vegetable Life" before our society.

We could hardly do better than follow these in the main, as themselves agreeing very much with such acknowledged authorities as Koch in the animal, and Sach in the vegetable domain; and it is much on the same lines that Mr. Higgins has so clearly and admirably carried out the arrangement of the cases in our museum.

Thus by natural classification, the specimens of Difflugia now consigned to the very tail end of our collection, under the ignominious heading, "Miscellaneous," would at once take their proper places at the head of the list, under the Sub-kingdom Protozoa, Class Rhizopoda, aud Order Amœbœa, or Protophyta, according to the classification preferred.

The Foraminifera, of which we have a large number, would follow next, in their true places, followed by the Polycystina and the sponge spiculæ.

The next sub-kingdom, the Cœlenterata, which comprises the hydra, the jelly-fishes, and sea-anemones, does not appear to be well represented in our cabinet, and the fact of this omission being pointed out will probably induce some of our mounters to speedily supply the want. Indeeed it is one of the advantages of a proper classification that we can at once see wherein our strength and weakness lie.

Few objects could be more interesting in their proper places than carefully-prepared slides of the Campanularian and other zoophytes, showing the separate functions of the distinct zooids, on the same colony, and further illustrating the alternation of generations by the growth of the medusiform buds, and their conversion into jelly fishes and subsequent development of their eggs into zoophytes.

Of the Echinodermata, or third sub-kingdom, we have in our cabinet a few examples, but of the next sub-kingdom, the Vermes, which includes the Polyzoa (being also somewhat of a refuge for the destitute), we appear to possess no examples. With our geographical position, and the excellent hunting-ground of Hilbre close at hand, it is to be hoped that both the Cœlenterata, Echinodermata, and Vermes may be shortly as well represented in our collections, as sub-kingdoms so richly teeming in points of microscopic interest deserve they should be.

Of specimens representing the Arthropoda, we have, as might be expected, a large number, hitherto mainly classed as insects—and probably all will agree as to the advisability of a less general arrangement of them, as Crustacea, Arachnida, Myriopoda, and Insecta—the Crustacea and Insecta at any rate requiring further subdivision.

Microscopical attention has lately been rather prominently directed to the Crustacea, through the formation of a zoological station at Naples, and more recently at Jersey, &c.

Good slides representing this class, and especially illustrating the embryonic or zoea stages, have been produced, and should find place in our collections.

There is a good collection of slides of this division at the Fisheries Exhibition.

As one of the most beautiful and interesting divisions of natural living objects, independently of its extraordinary size (the number of known species of insects being not less than 200,000) and possessing specially microscopical characteristics, where not microscopic in their entirety, the Insecta or Hexapoda, deserves a natural classification in our cabinets. Insects are usually included under three great divisions: the Metabola, the Hemimetabola, and the Ametabola, in accordance with their passing through a complete metamorphosis, or a partial one, or none at all.

The Metabola includes the five Orders, Hymenoptera, Coleoptera, Diptera, Lepidoptera, and Neuroptera, the species comprised within these orders all undergoing complete metamorphosis. Comprising the Hemimetabola (those having incomplete metamorphosis) are the Orthoptera and Hemiptera, and under the Ametabola (those undergoing no metamorphosis), are the Colembola, Thysanura, &c. All of these divisions and orders are, or should be, represented in our collections, and the additional value and interest in having them classified is too apparent to need urging.

So much for the animal kingdom. A cursory glance at our catalogue will show that a similar criticism to the above might be applied to the arrangement of the slides representing the vegetable kingdom, and that they stand equally in need of classification.

The first sub-kingdom, the Thallophyta, which includes the sea-weeds, fungi, and lichens, should be well represented, as of entrancing interest microscopically.

Early in biological order, under Protophyta, we have an example of simple cell-life in the Glœocapsa, easily preserved and mounted for examination.

Oscillatoria and Euglenæ soon follow, but their special features are not well seen, except in the living state. The Orders Schizomycetes and Saccharomycetes are of surpassing interest microscopically, as the active accompaniments of putrefaction, disease, and fermentation, and will severely test our best objectives; the former includes the Bacteria, Bacillus, &c., and the latter the yeast plant. Many of them appeared to be best exhibited as stained and mounted objects.

The next class, the Zygosporeæ, includes the Myxomycetes, among the fungi, and among the Algæ and the Confervaceæ, Ulvaceæ, and Congregatæ, &c., the latter embracing the Desmidæ, and the Diatomaceæ. The very successful mounts of Mr. C. Vance Smith now enable us to possess the Desmids in our cabinets in their almost natural state, and with colour preserved; and the skeletons of the diatoms will always assert their rightful place, possibly sometimes taking up too exclusive attention at some of our hands.

Under Class III. the Oosporeæ, we have the Volvox and some of the lower seaweeds on the Algæ side, and the Saprolegnia (just now exciting considerable interest) on the Fungus side.

The microscopic fungi have many representatives in our cabinet, but the lichens are conspicuous by their absence.

The second sub-kingdom, the Cormophyta of Sach, or the Bryophyta of other writers, should be represented in all collections by the liverworts and mosses—full of minute interest.

Time will not permit, nor is it within the intended scope of this paper, to take even a hasty glance at many divisions of the animal and vegetable kingdoms—so we must not dwell upon the Pterodoplyta, though probably at least as worthy of a life-study microscopically as the Diatomaceæ. The classification of ferns is founded on their microscopic morphology, and the lycopodiums and equisetums are hardly less interesting.

Of the fourth and great sub-kingdom, the Phanerogamia, or seed-bearing plants, divided into the Gymnospermia and Angiospermia, and the latter again into the Monocotyledons and Dicotyledons, no doubt all our collections contain numerous specimens. In our cabinet they are at present included under the three headings, pollen, seeds, and vegetable tissues.

In a recent paper read before us, Dr. Carter pointed out the morphological peculiarities of vegetable fertilisation, as affording a vast field for summer microscopical work, and the desirability of our illustrating the subject by the preparation of permanent mounts. The Gymnospermia, which comprises the classes of plants bearing naked seeds not enclosed in an ovary, the Coniferæ for example, is at present represented in our cabinet by two slides—cuticle of pine, and radicle of date palm. How interesting it would be to possess slides illustrating the embryological differences of these great divisions! Similarly, by separating the Monocotyledons and Dicotyledons, the characteristic features of each will be better seen and understood, and a stimulus will be afforded to furnish the various connecting links, and supply deficiencies.

Of the slides illustrating the inorganic kingdom, the crystals and geological sections fall into their proper places, as of sedimentary, organic or igneous origin—or by such arrangement as our connoisseurs in that department consider best.

Of scarcely less importance than the classification, is the labelling of microscopic objects, and as the slide or slip is the almost universally adopted vehicle whereon to attach the object, it is of these I will speak.

With very few exceptions, and notably the very excellent mounts of Mr. Enock, the labels of microscopic slides are almost devoid of any further information than the bare scientific or unscientific name of the object, and that often conveyed in so vague a manner as to be hardly intelligible. On this ground, many otherwise good mounts have recently been removed from our cabinet—"wing of a moth," "hair of an animal," being terms too general to be of use. Slides, as ordinarily labelled, will not admit the insertion of much matter on the label, as the width must necessarily be something less than one inch; but if two labels are affixed, and placed horizontally on the slide instead of vertically, each can, as a rule, be a full inch or more in width, and may be arranged to contain a vast amount of information, and that of great importance.

By horizontal labelling, too, the name of the object can be readily seen while upon the stage of the microscope; a consummation usually accompanied with considerable chance of neck dislocation, should the slide be labelled in the orthodox manner.

As an experiment for my own cabinet, I recently designed some labels of this description, and have found them to answer very satisfactorily.

The kingdom, whether animal, vegetable, or mineral, heads the top of the left-hand label in bold letters, the labels for animal kingdom being further immediately distinguished by red type, the vegetable by green, and the inorganic by black type. Below the heading, follow in consecutive lines the sub-kingdom, class, order, family, genus and species, a blank line being left for the English or conventional name.

The corresponding label on the right hand gives desirable information respecting the mode of mounting and of viewing the object, naming the part mounted, the medium in which it is mounted, the name of mounter, date, and power required, and other details, concluding with the name of owner, as a corresponding finish to the "kingdom" on the other label.

The amount of information thus conveyed is most valuable, and though necessitating some expenditure of time and research, on the part of the beginner, at any rate, the knowledge recorded is stored up, not only in the mind, but upon the slide. As an example, from the animal kingdom, we have, say, a slide of the wood ant.

ANIMAL KINGDOM.		Part, *Entire Insect* Medium, *Balsam* (*dark ground illum.*) Mounter, *F. Enock* Date, 5/83. O.G., 2 *in.*, &c.
Sub-king., *Arthropoda* Class, *Insecta* Order, *Hymenoptera* Family, *Formicidæ* Genus, *Formica* Species, *F. rufa* *WOOD ANT.*		I. C. THOMPSON, Liverpool.

Another from the Vegetable Kingdom, a section of the female flowers of the yew.

VEGETABLE KINGDOM.		Part, *Female Flowers* *long. sect. stained* Medium, *Glyc. Jelly* (*see Sach, fig.* 388) Mounter, *C. V. Smith* Date, 9/82. O.G., ¼ *to* 1 *in.*
Sub-k., *Phanerogama* Class, *Gymnospermia* Order, *Coniferæ* Family, *Taxineæ* Genus, *Taxus* Species, *T. baccata* *YEW.*		I. C. THOMPSON, Liverpool.

It is a decided advantage to have the labels printed in sheets, with (say) eight or a dozen pairs of labels on each, as being more easy to write upon than if already cut up, and having a definite space between each the sheet is readily cut up, no trimming being required.

The use of square pieces of card of varying thickness, placed under the labels, forms a valuable protection to the object mounted between, further allowing of the slides being packed together side by side, thus obviating the necessity of rackwork during transit. Probably by calling attention to this part of the subject, other little similar suggestions of value may be elicited.

I would urge upon younger microscopists especially, the value of labelling their specimens by natural classification as a means of instruction.

Let us ever bear in mind that "all scientific appliances, classification included, are but imperfect means, the great end being the better appreciation of Nature."

A GOSSIP ABOUT FUNGI.

By George Massee.

[*Continued from page* 229.]

IN the second family, *Gasteromycetes*, the hymenium is contained within the substance of the fungus, and only exposed when quite ripe, or owing to decay. The "puffballs" are examples, the investing skin is the *peridium* (fig. 157), enclosing the hymenium, at first pulpy, afterwards becoming dry and powdery, consisting of threads and spores; the latter spring from sterigmata, supported on basidia, as in the hymenomycetes. Some members of this division are subterranean. Another section, the *Myxogastres* differs from all other fungi, in the plants, during the early or vegetative stage, being composed of naked cells, which form a gelatinous mass, sometimes very large, called a *plasmodium*, possessed of the power of motion, resulting from the amœboid movements of its component cells; these, at a certain stage, rapidly change their shape and position, owing to the protrusion of pseudopodia from various parts of the surface. Later on a skin or peridium is formed, and the interior becomes filled with threads and spores; the threads collectively constitute the *capillitium*, and are in some species intricately branched, in others free and furnished with spiral markings. This order has been the subject of much difference of opinion; by some they are considered as members of the animal kingdom, on account of the early amœboid stage, but those most conversant with the subject agree in considering them as true fungi.

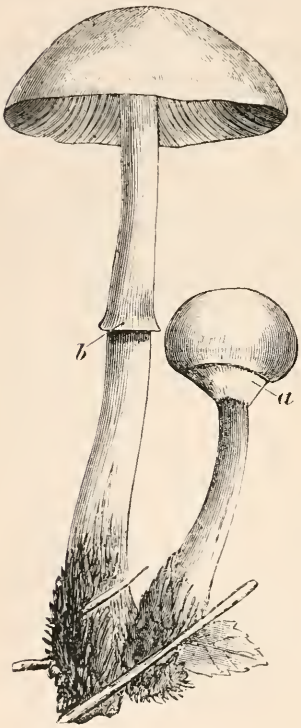


Fig. 148.

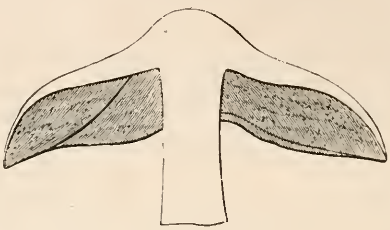


Fig. 149.

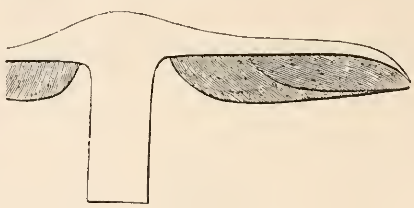


Fig. 150.

Fig. 151.

Fig. 152.

Fig. 153.

Fig. 154

Fig. 155.

Fig. 156.

In the *Coniomycetes*, there is no compacted hymenium, comparative absence of mycelium or vegetative part, and a superabundance of spores are the most obvious features. In one group the spores are at first enclosed in a covering or *perithecium*, looking like microscopic puffballs, but the covering is ruptured early, the margin being generally torn into a number of teeth which fold away from the centre, they are known as "cluster-cups," and are met with on living leaves; most of the species are parasitic on leaves or stems of plants, living or dead, in fact the order is artificially divided into two sections, depending on whether they grow on living or dead plants. The species are mostly microscopic, the spores of those that grow on living plants are often septate and bright in colour, while those that are met with on dead vegetables often appear like black specks or stains, with minute spores. Polymorphism is well illustrated in this order, many plants that were at one time supposed to belong to different genera, as *Uredo* and *Puccinia*, are now considered to be different stages of the same plant. In the two examples given, the former generally appears first, or in some instances the two forms are to be met with in the same pustule, as the little heaps of spores are called. Again, many supposed species are said—with more or less proof—to be stages of the ascigerous fungi. "Rust," "mildew," and "smut," are local names for these minute pests.

The last family of the Sporifera, called *Hyphomycetes*, includes the plants popularly known as "moulds;" the vegetative part is well developed, the threads being either combined into a common stem, the tips remaining free, and giving origin to the spores (fig. 163) or the filaments remain altogether free, when they are called *hyphæ*. The spores are often arranged in a moniliform manner, the one nearest the tip of the generating thread being the youngest; these strings of spores eventually break up. Here again, many that at one time were supposed to be autonomous, are regarded as stages of other fungi.

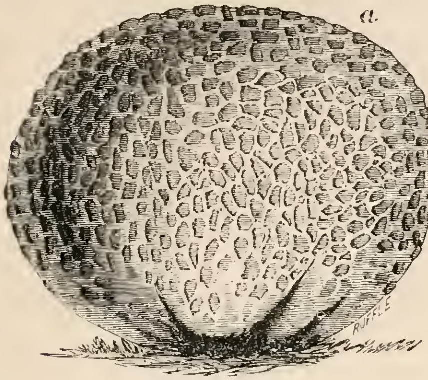


Fig. 157.

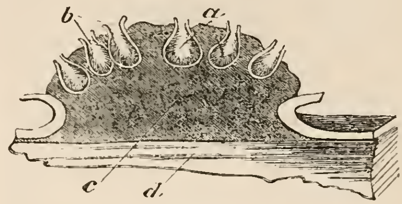


Fig. 161.

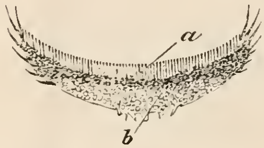


Fig. 162.

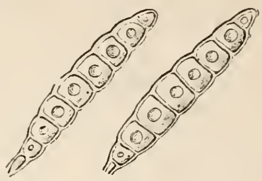


Fig. 163.

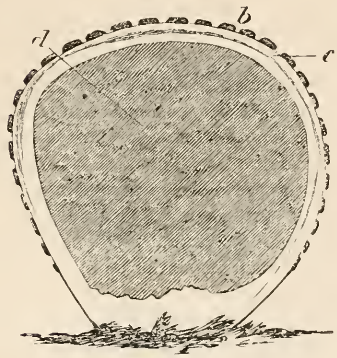


Fig. 158.


Fig. 159.

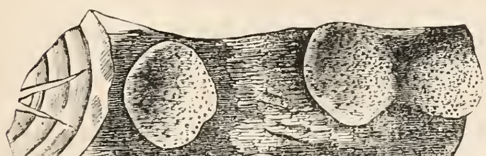


Fig. 160.

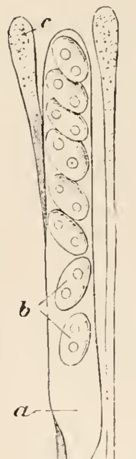


Fig. 164.


Fig. 165.

SPORIDIIFERA.

Two types of structure require notice :—

I. *Physomycetes.*—Sporangia containing an indefinite number of sporidia, and springing from hyphæ.

The typical forms are also known as "moulds," and somewhat resemble in general appearance the hyphomycetes; but it must be borne in mind that in the latter the germinating bodies terminating the threads are naked spores, whereas, in the present group, the vesicles are sporangia, containing sporidia, which latter are the equivalent of the spore.

II. *Ascomycetes.*—Asci crowded, forming a hymenium, and containing a definite number of sporidia, usually eight.

The "mildews," whose abundant white mycelium is produced on living plants, and gives origin at various points to small round pustules or *perithecia*, containing a few pear-shaped asci, includes such well-known forms as those producing the hop and potato disease; the perithecia are at first yellow, then nearly black, and are not furnished with an opening. The asci disappear at an early stage, and the sporidia are then free in the perithecia, when there is a possibility of confounding them with members of the physomycetes, a difficulty to be met by remembering that the latter are never developed on living leaves.

The truffle may be taken as illustrating the structure of another group; the species are subterranean, and often of considerable size. The peridium encloses a fleshy hymenium, generally very much wrinkled, and marked with lines corresponding to the fruit-bearing surfaces, so that the plants when cut bear no little resemblance to a section of a nutmeg.

Here again the origin of the fruit separates the present from a group belonging to the sporifera, with a similar habitat and general resemblance.

In the *Discomycetes* the receptacle is more or less succulent and fleshy, and varies much in form; in the morel it is large and pileate, whereas in the genus *Peziza*, it is more or less cup-shaped; the hymenium is early exposed in all cases.

The species of peziza are numerous, and vary in size from three or four inches in diameter to mere microscopic points; bright colours are common in this genus.

The receptacle or cup is distinctly cellular (fig. 162); externally it may be smooth—granular, owing to projecting cells, warted, woolly, or furnished with coloured septate hairs, which are generally most developed near the margin. Lastly the cup may be stalkless—*sessile*, or *stipitate*, furnished with a stem, which may be of uniform thickness, or gradually widen upwards into the receptacle. The hymenium, which lines the inside of the cup, consists of asci, and *paraphyses* closely packed side by side, their free ends forming the surface of the hymenium.

The asci vary in shape in different species, being *cylindrical*, when of uniform width, *clavate*, widest at the summit; they are produced in succession, and the sporidia, which are produced by free cell formation in their interior, escape when mature, either by an irregular rupture or through a definite opening at the apex.

The paraphyses, whose functions are not known, are usually much more slender than the asci they accompany, frequently septate, with the apex more or less thickened, and containing granules to which the colour of the hymenium is mostly due; in some species they are branched. A mucilaginous substance, the *Hymenial gelatine*, also occurs in the hymenium.

The remaining type illustrated by members of the order *Sphæriacei*, all of which agree in having the hymenium enclosed in a perithecium furnished with a pore, or *ostiolum* (fig. 161 *b*) at the apex, through which the sporidia escape after dehiscence of the asci. The perithecia are usually black, of a brittle or horny texture. The hymenial gelatine is very evident, and in that of *Sphæria spermoides* amorphous grains of starch are present. The plants are *simple* when the perithecia spring individually from the substance on which the plant is growing; *compound*, when the perithecia are buried in the substance of a receptacle or *stroma* (fig. 161, *c*), the surface of which is usually minutely papillose, owing to the projection of the ostiola. A very common plant on dead branches under the form of coral or brownish-red pustules (*Nectria cinnabarina*) illustrates this structure. The simple forms are common as minute black points on dead branches, herbaceous stems, and on leaves.

With regard to habitats, *Ubique* is the motto of fungi; a certain amount of moisture and something to grow upon, and you are certain to find a representative of the great fungal group in some stage or other. The larger kinds that grow on the ground are most abundant in woods, although some are peculiar to open downs and moors, some microscopic groups are confined to living leaves, and accumulations of rotten wood and branches, especially when deposited in damp and shady places, as the bottom of a ditch or in a wood, are certain to reward a patient search. When fungus hunting, don't waste the time in walking from one place to another; the mass of species can only be seen when specially looked for, and hours may be spent in a good locality without moving fifty yards from the starting-point. The large kinds are best carried in a basket, or wide vasculum, separately wrapped in paper, the heaviest at the bottom, and mixed with plenty of bracken fronds, which, being elastic, prevent the specimens from crushing each other. The leaf fungi are best placed in a book at once, to prevent the leaves from shrivelling; the other small delicate kinds may be wrapped in tissue paper, or, as in the case of moulds and others that will not bear touching, the piece on which the plant is growing should be pinned to the bottom of a cork-lined box. No difficulty will be experienced in drying the smaller kinds; care must be taken not to apply too much pressure, in fact the majority do not require any pressure at all; with respect to the fleshy fungi, my experience has been large, but success small, nevertheless it can be done, and ample directions have been already given in several works. With the exception of a few woody species, fungi when dried in the best possible manner, lose many valuable characters that no amount of soaking in water can restore; therefore ample notes and sketches made from living specimens are indispensable.

For example, suppose a species of the genus *Agaricus*, to which the edible mushroom belongs, is collected, after having procured the spores as follows, a hole through which the stem will pass is cut in a piece of paper, which is then passed up the stem close to the gills, and fixed in this position by passing a pin through the stem below the paper; if left in this way, the plant being supported in its natural position for a few hours in a damp place, the paper will be found marked with lines of spores which have dropped from the gills. Then the form of the pileus, which may be conical, depressed, &c., its surface is sometimes covered with a sticky gluten, with warts or scales, or of a silky or fibrous appearance, the margin, or sometimes the whole, is striate. The presence of fragments of the veil remaining attached to the margin also requires notice; the shape of the stem, surface, texture, appearance of ring if present; next a section is required through pileus and stem, this shows thickness of flesh of pileus, also its consistence, changes of colour in the flesh after being cut must be noted. The shape of the gills is important, but more so the relation they bear to the stem; they are described as *free* when not touching the stem (fig. 150), *adnate* when fixed to the stem but not running down (fig. 149); *decurrent* when grown to the stem, and running down it for some distance (fig. 151). In some species they are much crowded, in others distant; sometimes forked or connected by veins, and the margin is sometimes minutely toothed; the colour also should be ascertained at different ages. It has already been stated that the stem frequently differs from the rest of the hymenophore, the pileus and trama, in structure, being frequently more cartilaginous. This difference is expressed by Mr. W. G. Smith in his excellent "Analytical Key to the British Agaricini," as follows: "Hymenophorum distinct from the fleshy stem,"—stem separated from pileus by a sharp demarcation, as if the two were imperfectly articulated, gills free. "Hymenophorum confluent and homogeneous with the fleshy stem,"—stem passing insensibly into the pileus, and not furnished with a cartilaginous bark, gills adnate or decurrent. "Hymenophorum confluent with, but heterogeneous from the cartilaginous stem,"—stem passing without interruption into the pileus, but differing from the latter in being furnished with a cartilaginous bark; gills decurrent or adnate.

Some agarics and also other fungi possess a characteristic smell or taste. A coloured sketch will show the size, colour, and if a section be also drawn, the relation of parts; care must be taken to obtain the stem entire as the characters of the base—rooting end—are of value. The genus Agaricus is broken up into four primary divisions depending on the colour of the spores, which may be white, pink, brown, or black; the white spores are best collected on black paper, the others on white. In many leaf-parasites the spores are stipitate, and when as is too usual, a portion of a pustule is scraped off on the point of a lancet, the pedicels are seen to be very short, owing to having been cut through. A better plan is to make a section through a pustule, when the arrangement of the uninjured spores can be studied. To see the mode of attachment of the spores in moulds, they must be examined as opaque objects under a low power, and without a cover glass, as the application of moisture or pressure causes the loosely attached spores to fall away from their support, afterwards the plant can be placed in water and examined under a higher magnifying power, to ascertain the nature of the hyphæ, noting the presence or absence of septa, the angular divergence of the branches, also the shape, size, and colour of the spores. (See figs. 152, *et seq.*)

In the Ascomycetes a section is indsipensable. After describing the external characters, a section shows arrangement and form of asci and paraphyses (fig. 164). It is usual to measure the spores in decimals of an inch, or a millimetre; the tubercles, warts, and spines sometimes occurring on the cell wall require notice. Habit, whether solitary, gregarious, or crowded, also habitat, which differs widely in different species, must be noted.

In microscopical examination it will be found that the tissues and spores are frequently so hyaline that without the aid of some colouring re-agent, the structure cannot be satisfactorily made out. Chinoline blue, known commercially as "Aniline blue, No. 13," is useful and will stain living protoplasm, as the amœboid cells of the myxomycetes. In spores there are frequently bright globular spots commonly called nuclei, but which are in reality vacuoles. True nuclei may be seen in an ascus previous to the formation of its sporidia. A solution of iodine is also useful for staining tissues.

What a lot of trouble, and all about fungus! The foregoing, or some similar feeling will undoubtedly pass through the mind of many who may glance over this contribution.

If the trouble constitutes the pleasure, success is certain; not only in the study of fungi, but in every attempt to solve a problem in nature. Before classification can be understood or appreciated, a sound knowledge of structure and relative value of the various parts of a fungus must be thoroughly grasped.

A common mistake with beginners is that when the characters given in a specific diagnosis are known nothing more remains to be done, and too often persons are met with who consider they know a plant when its name is thus ascertained; it must be remembered that specific characters, as given in systematic works, are only intended to individualise nearly related organisms, and not in any sense to be considered as exhaustive of their structural or physiological peculiarities.

MICROSCOPY.

"STUDIES IN MICROSCOPICAL SCIENCE" (edited by A. C. Cole). No. 3 of vol. ii. of this serial has appeared, containing the subject of "The Morphology of the Cell." There is a beautiful black and white page illustration of Polycystina, from the Springfield earth, Barbadoes. The "Cell Theory" is continued in No. 4, and the slides sent out retain their well sustained character for beautiful mounting. One, giving a longitudinal section of the scale-leaf of *Fritillaria imperialis*, is particularly noticeable.

THE POSTAL MICROSCOPICAL SOCIETY.—Parts 7 and 8 of the Journal of this society have just appeared, edited by the hon. sec., Mr. Alfred Allen. (London: W. P. Collins.) It contains quite a miscellany of information relating to natural history, especially to its microscopical side. Among the papers are the following:—"Organisms from the Recently Discovered Ancient Roman Baths in Bath," by R. H. Moore; "Recent Researches in the Bacteria," by J. B. Jeaffreson, M.R.C.S.; "On Tubifex Rivulorum," by A. Hammond, F.L.S.; "The Eye," by M. Poignand; "On the Saprolegnieæ," by G. Norman, M.R.C.S.; "The Application of Photography to the Delineation of Microscopic Objects," by William Pumphrey; "Withered Leaves," by J. W. Fisher; "Methods of Microscopical Research in the Zoological Station in Naples," by C. O. Whitman; "Half an Hour at the Microscope, with Mr. Tuffen West, F.L.S.;" "Selected Notes from the Society's Note-book," &c. Most of the above papers, &c, are very nicely illustrated by lithographic plates.

"JOURNAL OF THE ROYAL MICROSCOPICAL SOCIETY."—Part 5 of vol. iii. of this publication is, as usual, replete with a variety of well-condensed paragraphs, of the greatest use to the practical microscopist. In addition, it contains a paper (illustrated) by Dr. C. T. Hudson, on *Asplanchna Ebbebornii* (nov. sp.).

NAMES OF HARE.—Would some reader kindly inform me where the hare is called a "Wat"?—*S. A. Brenan.*

ZOOLOGY.

"THE BUTTERFLIES OF EUROPE."—By H. C. Lang M.D. (London: L. Reeve & Co.) Part xv. of this beautiful work has now appeared, dealing with the Danaidæ and Satyridæ. The coloured illustrations keep up their high artistic character.

"PARROTS IN CAPTIVITY."—By W. T. Greene, M.D. (London: George Bell & Sons.) Parts ii. and iii. of this work have been published, each containing three very beautiful coloured plates of species. This class of bird is now so widely distributed in aviaries and otherwise, that the present work is a very timely publication, and nobody was better calculated to bring it out than Dr. Greene.

TESTACELLA.—A QUERY FOR WEST OF ENGLAND CONCHOLOGISTS.—May I inquire of the numerous ardent and successful conchologists who reside in the Bristol district to assist in clearing up a little mystery which seems to exist with regard to the number of species of Testacella to be found in the West of England? In the various printed lists which bear witness to the activity of the malacologists of the Bristol district, we find numerous records of the occurrence of *Testacella Maugei*, *T. haliotidea* and *T. haliotidea* var. *scutulum*. As to the first-named, there is no doubt whatever, as it is authentically known to occur in various localities in the district; but when we find so accurate a conchologist as the Rev. A. Merle Norman writing such a passage as I have now to quote, we feel constrained to ask our Bristol friends to set definitely at rest the question as to whether or not *T. haliotidea*, or its var. *scutulum* (or both) occurs as well. In his admirable catalogue of the "Inland Mollusca of Somersetshire" (1860, p. 140), Mr. Norman says:—"*T. haliotoidea*, Draparnaud, has been recorded as occurring in several localities in the West of England. In ail instances in which we have had opportunity of examining the specimens, the species has proved to be *T. Maugei.* The Testacella also, which was figured and described as *T. scutulum* in 'The Naturalist,' vol. viii. (1853 [*sic in orig.*, should be 1858]), p. 179, as found at Taunton, is evidently not the *T. scutulum*, but *T. Maugei*." These remarks considerably detract from the value of all the records which exist in respect of the occurrence of *T. haliotidea* or of its var. *scutulum* in the West of England, unless it can be shown that the recorders have based their notes upon personal observation and accurate discrimination. There is yet another point to be cleared up, and in this case other parts of Britain are concerned. Does the type of *Testacella haliotidea* occur in the British Isles? and if so, where? There is little doubt that many of the records of this species really pertain to its variety *scutulum*, and as attention is now being given to the subject of variation, it is very desirable that we should have precise and accurate records of the occurrence of the typical form of the species.—*W. D. R.*

THE BRITISH TESTACELLIDÆ.—It has been arranged that the new Monograph of the Mollusca of the British Fauna shall begin with the Testacellæ, and if a sufficient amount of material can be gathered together, the authors hope to be able to publish the first part in about a year or eighteen months. May they then ask all naturalists who are interested in the detailed working out of the British fauna to give their best assistance? They wish to have specimens (alive if possible, or spirit-specimens, or shells) of Testacellæ, from all the localities possible, whether British or foreign, and to amass precise and detailed information as to range and life history. Among the questions which yet remain to be settled is that of the occurrence of the typical form of *Testacella haliotidea* in Britain. So far there does not appear to be any direct evidence that it (as distinguished from the variety *scutulum*, which is apparently the prevalent, probably the only British form) occurs in these islands. Communications may, for the present, be addressed to *Mr. John W. Taylor*, *Potternewton Lodge*, *Leeds.*

VARIETIES OF BRITISH SLUGS.—I am indebted to the kindness of some of my correspondents for specimens of varieties of British slugs which do not appear to have hitherto been recorded as occurring in these islands. Mr. Ashford sent me lately from Christchurch, Hants, an example of *Limax maximus*, which answers to the var. *maculata* of Moquin-Tandon, having the shield and back irregularly marked with black spots; and Mr. R. Renton sent me a consignment of slugs from Fans in West Berwickshire, which included the var. *reticulata* of *Limax agrestis.* This has the insterstices between the rugæ darker than the rugæ themselves, thus producing a netted or reticulated appearance. May I supplement these notes by renewing the request for consignments of living slugs (the common species particularly) from as many districts as possible? as we wish to work out (for the projected new Monograph) their variation and detailed geographical distribution from personal examination of specimens, and for obtaining the material we are dependent upon the co-operation of naturalists generally.—*Wm. Denison Roebuck*, *Sunny Bank*, *Leeds.*

APTEROUS BEETLES.—Mr. Dewitz has shown that in such apterous beetles as *Niphus hololeucus* rudimentary hind wings appear towards the close of the larval period, but became obsolete during the further development of the insect. He therefore concludes that this species once possessed fully developed wings, which have gradually become aborted through disuse.

THE "MISSING LINKS."—In the anthropological section of the British Association, that strange specimen of humanity formerly exhibited at the Westminster Aquarium—the hairy child "Krao"—came up for discussion. It was shown there was nothing abnormal or simian about the child but its abundance of silky hair, and that it was by no means a "missing link." Regarding the "missing links" between humanity and the rest of the Animal Kingdom, Professor Struther, of Aberdeen, very sagaciously remarked that they were only too abundant, and that we could find them in any number in the idiot ward of any workhouse.

EXTRAORDINARY ABUNDANCE OF TIPULA OLERACEA.—*Tipula oleracea* (commonly called the "daddy long-legs") has been flying about here in extraordinary numbers during this month. As I write (13th September) several specimens are flying round the gas light in the room, others are apparently making frantic but ineffectual efforts to reach the burner of my reading lamp, and large quantities are to be found at rest outside. During my entomological experience (by no means a short one) I have never met with this insect so commonly before, and I believe they are now to be found in like numbers all over the country. Perhaps some of the readers of SCIENCE-GOSSIP can suggest an explanation.—*W. J. V. Vandenbergh.*

BACTERIA AND DISEASE.—Professor Ray Lankester, F.R.S., in the admirable address he delivered as President of the biological section, spoke on this subject as follows:—The amount of death, not to speak of the suffering short of death, which the knowledge of bacteria gained by the microscope has averted is incalculable. Yet, further, the discoveries of Ehrenberg, Schwann, and Pasteur are bearing fruit of a singular kind in other directions. It seems in the highest degree probable that the terrible scourge known as tubercular consumption or phthisis is due to a parasitic bacterium (bacillus), discovered two years since by Koch of Berlin, as the immediate result of investigations which he was commissioned to carry on at the public expense in the specially erected Laboratory of Public Health by the German Imperial Government. The diseases known as erysipelas and glanders, &c., have similarly, within the past few months, in German State supported laboratories, been shown to be due to the attacks of special kinds of bacteria. At present this knowledge has not led to a successful method of combating those diseases, but we can hardly doubt that it will ultimately do so. We are warranted in this belief by the fact that the disease, known as "splenic fever" in cattle and "malignant pustule" or anthrax in man, has likewise been shown to be due to the action of a special kind of bacterium, and that this knowledge has, in the hands of MM. Toussaint and Pasteur, led to a treatment in relation to this disease similar to that of vaccination in relation to smallpox. By cultivation a modified growth of the anthrax parasite is obtained, which is then used in order to inoculate cattle and sheep with a mild form of the disease, such inoculation having the result of rendering the cattle and sheep free from the attacks of the severe form of disease, just as vaccination or inoculation with cowpox protects man from the attack of the deadly smallpox. One other case I may call to mind, in which knowledge of the presence of bacteria as the cause of disease has led to successful curative treatment. A not uncommon affliction is inflammation of the bladder, accompanied by ammoniacal decomposition of the urine. Microscopical investigation has shown that this ammoniacal decomposition is entirely due to the activity of a bacterium. Fortunately this bacterium is at once killed by weak solutions of quinine, which can be injected into the bladder without causing any injury or irritation. This example appears to have great importance, because it is the fact that many kinds of bacteria are not killed by solutions of quinine, but require other and much more irritant poisons to destroy their life, which could not be injected into the bladder without causing disastrous effects. Since some bacteria are killed by one poison and some by another, it becomes a matter of the keenest interest to find out all such poisons, and possibly among them may be some which can be applied so as to kill the bacteria which produce phthisis, erysipelas, glanders, anthrax, and other scourges of humanity, while not acting injuriously upon the body of the victim in which these infinitesimal parasites are doing their deadly work. In such ways as this, biology has turned the toy "magnifying-glass" of the last century into a saver of life and health.

Association of Helix nemoralis and H. hortensis, and other Conchological Notes.—Anyone referring to an article which I contributed to the January number of Science-Gossip, will find a record there of the finding of *Helix nemoralis* and *H. hortensis* on one plant stem. Since then I have been most fortunate in finding a hedgebank, whereon *H. nemoralis* and *H. hortensis* are intimately associated. Also at Miller's Dale and Monsal Dale, in Derbyshire, I have found the two together. I trust to contribute an article dealing with their variation, and making some observations thereon. I am sure that conchological students, many of whom wrote me so kindly after the appearance of the above article, will hear with pleasure of these British finds, which will give us a chance of carrying the subject a step further. Every student of Darwin knows the historical experiment of the duck's feet suspended in an aquarium, until the young molluscs, which were hatched therein, crawled upon them ; and how even an Ancylus may be carried by a water-beetle. Lately, whilst experimenting upon *Sphærium corneum*, a bivalve which is extremely common in the canal at Leeds, I observed one specimen being transported about a small aquarium in which I had some of these molluscs, along with five species of gastropods, in a manner which I think worth recording. I had often noticed their aptitude in reaching any part of the weed (*Elodea Canadensis*) in the vessel, and suspending themselves therefrom, and that they could travel up the glass with the same ease as a gastropod ; a fact not recorded, I believe, in this species. But when I found one using the shell of a very energetic *Limnæa stagnalis*, the observations noted above in the "Origin of Species" came at once to my mind. The sphærium was attached by a muscular thread ; made up, as could easily be seen, in some positions through a strong lens of several fibres, which was emitted from the middle third of the foot. In this manner it made a tour a whole Saturday afternoon, and beyond withdrawing its siphons, its journey did not seem to incommode it much. The specimen was about half-grown, and so far I have noticed the proclivity in full-grown animals. In the same aquarium I placed, on July 16th, three specimens of *L. stagnalis*, whose shells had been broken in a jagged manner about the mouths, during a railway journey from Stockport here. During a period of little over three weeks, the youngest specimen—a last year shell—has added $\frac{3}{8}$th of an inch of new material, and has formed anew the mouth of its shell. The other two specimens, which are more fully grown, have both repaired their shell mouths, but the greatest breadth of new material does not exceed $\frac{1}{8}$th of an inch.—*Henry Crowther, Beeston Hill, Leeds.*

"Limax flavus."—In the first paragraph of page 224 of the present volume is not this a misprint for *Limax agrestis?* Various statements both in that and subsequent paragraphs, as well as the figures themselves suggest the possibility of this being the case. —*W. D. R.*

Migration of British Birds.—The committee appointed to report on this subject by the British Association, especially with reference to information derived from lighthouse-keepers, &c., concludes by speaking of the marvellous persistency with which, year by year, birds follow the same lines, or great highways of migration, when approaching or leaving our shores. The constancy of these periodical phenomena is suggestive of some settled law or principle governing the movement. It is clearly evident, from the facts already at our disposal, that there are two distinct migrations going forward at the same time, one the ordinary flow in the spring and ebb in the autumn across the whole of Europe. A great migratory wave moves to and from the nesting-quarters of the birds, in the coldest part of their range, north-east in the spring, and south-west in the autumn. Quite independent of this there is a continual stream of immigrants, week by week, and month by month, to the eastern shores of these islands, coming directly across Europe from east to west, and the reverse in the spring. These immigrants are mainly composed of these common and well-known species which every year make these islands their winter quarters, and, as a rule, take the place of our summer birds. They come in one broad stream, but denser on some special lines or highways than others—cutting the line of the Orkney and Shetland Isles, pouring through the Pentland Firth, even touching the distant Faroes; the southern wing crosses the Channel Islands, shaping its course in a north-westerly direction to the English coast.

Hackney Microscopical and Natural History Society.—The sixth annual report of this society has just been published, containing clear and concise abstracts of a goodly list of papers read by Messrs. J. D. Hardy, W. H. Twelvetrees, C. Upton, J. E. Greenhill, Dr. R. C. Kibbler, J. T. Powell, F. Cole, besides the address of the President, Dr. M. C. Cooke. The vitality of this society is furthermore shown by a capital list of papers down for reading during the present session.

The Rochester Naturalists' Club.—No. 2 of the "Quarterly Record" of this society has just appeared, containing original articles on "Natural History Studies in the Medway," by Dr. Sorby, F.R.S.; "The Microscopic Fauna of the neighbourhood," by R. E. Banham, and "Kentish Orchids," by the Rev. C. H. Fielding. There is also a good collection of notes, &c. of interest.

Lambeth Field Club.—This society holds its meetings in the old Vestry Hall, Lambeth Road. The past summer has been occupied with excursions to Wimbledon, the Fisheries Exhibition, Mickleham, High Beech, Bromley, &c., in addition to which papers have been read on "Bacteria," by Mr. Ramsay, F.G.S.; "A Naturalist's Holiday," by Mr. Loydell; "The Ocean," by Mr. Baskerville; and on "Insect Development," by Mr. Step. There are announced for the rest of the session papers as follows: "Natural History Names; their Origin and Meaning," by Mr. Masters; and a paper by Mr. R. W. Bowers. One feature of the club is the "Gossip Nights," which alternate between those in which papers are read.

Chester Society of Natural Science.—(President, Professor T. M. Hughes, M.A.) This flourishing society held its twelfth Annual Conversazione on September 27th, to which all members attending the British Association meeting at Southport were very cordially invited. There was a capital programme, and the exhibits were of an extensive and various character, illustrating every department of the Animal, Vegetable, and Mineral Kingdoms.

Norwich "Science-Gossip Club."—The annual report of this club, in which science and sociality are happily blended, contains the address of the president (Mr. J. H. Lyddon, M.R.C.S.), which very succinctly condenses the numerous papers read before the members during the past year.

Conference of Delegates of Scientific Societies.—The usual Conference of Delegates to the British Association from the various scientific societies of Great Britain was held at Southport on Friday, 22nd September; Mr. W. Whitaker, F.G.S. (of the Geological Survey), being in the chair. Among those present were Mr. H. G. Fordham, F.G.S. (hon. sec. of the committee), Mr. T. Lister (Barnsley Natural History), Mr. C. B. Hobkirk, F.L.S. (Yorkshire Naturalists' Union), Dr. Muirhead (Glasgow Philosophical Society), Mr. G. D. Sawyer, F.R.M.S. (Brighton and Sussex Natural History Society), Rev. G. Robinson (Belfast Naturalists' Club), &c. After a discussion of the report of the committee, which has compiled for the first time a list of British scientific societies, Mr. G. D. Sawyer, F.R.M.S., read a paper on "The Work of Local Natural History Societies," written by Mr. F. E. Sawyer, F.M.S.

"The Scottish Naturalist."—The October number of this serial, under the new editorship of Professor Trail, is altogether a good one, containing contributions, chiefly on Scottish Natural History, from Dr. Buchanan White, Thomas Edwards, Dr. Stirton, J. W. Taylor, J. W. H. Trail, Geo. Sim, Dr. Mactier, the Rev. J. Stevenson, &c.

BOTANY.

Lancashire Botanists. — In the Biological Section of the British Association, Mr. J. R. Byrom gave an account of the work of the Ashton-under-Lyne Biological Society, composed chiefly of workmen, and explained what had been done in classifying the flora and fauna of the district within a period of ten years. As the result of these explorations they had added two new plants to the flora of Great Britain—*Caulinia alaganensis*, and *Chara* (*coronata*) *Braunii*. Mr. Charles Bailey, F.L.S., of Manchester, said Lancashire was pre-eminently the county which produced the largest number of practical botanists. The discoverer of the Caulinia was Mr. James Lee, of Denton, one of a band of naturalists, who, in their hard-earned leisure, were doing good work in their district. Mr. Lee brought it to Mr. John Whitehead, of Dukinfield, who, finding some unusual characters in it, sent it to Mr. Bailey, who identified it as a

Caulinia. It has since been investigated by several botanists in London, one of whom (Mr. Ridley, of the British Museum) believes it to be identical with the *Caulinia alaganensis*. Some botanists consider it to be identical with the *Caulinia flexilis* of Connemara and of Scotland, but the presence of the two long teeth at the base of the sheaf of the leaf, and its large size, are against this view of it. The *Caulinia alaganensis* is known to occur in the humid plains of Lombardy, and the Italian botanists are of opinion that it was introduced there by the cultivation of rice. The plant also occurs in Egypt, and it is figured in Delile's "Flora of Egypt," but the leaves of the Ashton plant grow in more lateral tufts than they are represented in Delile's figure. Egypt, therefore, may be the source from which the plant has reached England, and, if so, cotton is the probable medium of conveyance. Mr. Bailey surmised that the plant grows in the irrigation ditches of the Egyptian cotton plantations; that ripe carpels of the Caulinia are carried in the water which is used for the cotton plants. These carpels cannot germinate on the surface of the dry soil, and they are either driven by the wind into collecting baskets of ripe cotton, or they attach themselves to the cotton through their accidentally falling on the soil. The Caulinia fruits then reach this country with the cotton, when the carding engines separate them from the fibre; the refuse of these engines is then turned out on to the rubbish heap of the mill-yard, whence the wind or other agency transfers it to the water which is used for condensing steam; here the tepid water becomes a suitable nidus for germination and growth, and the result is a new addition to our flora. If these surmises have any truth, the same plant ought to occur in any mill-pond connected with mills where Egyptian cotton is used, and where the water is raised to a permanently high temperature by the condensation of steam from the boiler. Bolton is the principal district which consumes Egyptian cotton, and the mill-ponds and canals of that neighbourhood might be worth the trouble of a search. The other new plant added to the flora of Great Britain has better claims to its being considered native than the Caulinia, because it might, antecedently, have been expected to occur in Britain from its recorded area of European distribution. This plant is the *Chara Braunii*, Gmel., and was discovered accidentally by Mr. Bailey some mile or so distant from the station of the Caulinia when visiting the neighbourhood in company with Messrs. Byrom, Lee, and Whitehead. Mr. Bailey sent it to Mr. Arthur Bennett, of Croydon, who at once pronounced it new to Britain, and belonging to the Coronata group of Charas. It was growing with *Potamogeton pusillus*, and Zannichellia.

Mycological Observations.—Three years ago I found *Puccinea graminis*, Pers., very common on straw that was lying about on the roadsides here, but I had never seen the fungus on living plants in this district, so I determined to carefully examine all the cornfields in the neighbourhood. I have done so each year since, and have not seen a trace of either the mildew or the rust. *Œcidium berberidis*, Pers., is also absent. The straw doubtless came from some other district. On Whit-Tuesday of the present year I visited Grange, and found on the branches of *Juniperus communis* (*Podisoma juniperi*, Fr.) a fungus which I had never met with before. Whilst I was there I examined the hawthorns (*Ræstelia lacerata*, Tul.), but only found remnants of last year's plants. I visited the same district in August and found *Ræstelia lacerata* very common indeed, especially near to bushes of juniper. *Ræstelia lacerata*, Tul., has not yet been found in this district (Airedale), neither has the podisoma. In the middle of June I visited Malham, and found in a wood near there *Allium ursinum*, badly affected with *Œcidium allii*, Grev. On September 1st I visited the same wood, and noticed about fifty yards away, over the stream, a quantity of *Phalaris arundinacea*. I gathered a few of the leaves, and upon microscopic examination I found they were attacked with the minute *Puccinia sessilis*, Schr. My friend Mr. Birks, of Goole, sent me a short time ago, from that district, *Œcidium rumicis*, Pers., and *Puccinea arundinacea*, Körn., the latter occurring on the common reed, which is altogether absent from this portion of Airedale. The same may be said of both forms of fungi. *Œcidium tussilaginis*, Pers., is very common throughout this district, and is generally associated with *Puccinea poarum*, Niel, a form that occurs on *Poa annua*, &c. *Œcidium ranunculacearum*, DC., is also common, and is, like the last, generally associated with *Uromyces poa*, Rabh., a fungus on poa grasses. During a ramble with my friend Mr. Hebden, of Keighley, we noticed *Œcidium tragopogonis*, Pers., on goatsbeard (*Tragopogon pratensis*), attacking both leaves, stem, and involucre. I gathered a few specimens and visited the same plants a few weeks later, when they were found to be badly affected with *Puccinia sparsa*, Cke. At the commencement of this spring I scattered a quantity of spores (teleutospores) of *Puccinia menthæ*, Pers., upon mint plants that were just coming up (inside). In a few weeks each plant was affected with *Œcidium menthæ*, D.C. I took the Œcidia spores and scattered them on mint in the garden. Every plant was affected with *Trichobasis labiatarum*, Lev. (so was my neighbour's), and at the present time every leaf is affected with *Puccinia menthæ*, Pers. *Œcidium urticæ*, D.C., is very rare here.—*H. T. Soppitt, Saltaire, Yorks.*

"Hardy Perennials."—By J. Wood. (London: L. Upcott Gill.) This useful and well-written work keeps issuing in monthly parts, and when completed will prove a very attractive manual of our old-fashioned garden flowers.

GEOLOGY, &c.

The Earthquake at Ischia.—Mr. H. Johnston-Lavis, whose name is familiar to many of our readers from the excellent papers he contributed to our pages a short time ago on volcanoes, has been personally studying the effects of the earthquake at Ischia, and he sent a paper on the subject to Section C at the British Association. He gave the results of his observations as follows:—The iso-seismals have almost exactly the same form and arrangements as in 1881, but from the far greater violence of the shock they are naturally larger. The houses were ruined to such an extent that hardly the stumps of the walls were left, and it was rare to find a piece of masonry not in fragments, or two or three stones still attached to each other. Objects were projected considerable distances; the iron tie-bars, put into walls after the 1881 injuries, were broken and bent like thin iron wire. The effect of geological structure was remarkable. Most of the houses on the brink of a valley, where the tufa was loose and incoherent, were quite destroyed from the fissures of an incipient landslip. Building with foundations on the loose alluvial tufas of the plains of valley-bottoms suffered less than others built directly upon the solid tufa. A number of landslips occurred—three remarkable for their extension. The reported fissures from which vapour was said to have escaped were really the sudden exposure of hot and moist tufa. He could find no change, either in the level of any locality, or in the fumaroles or mineral waters. The wells, said to have been dried up, were in two cases merely cisterns for rain-water. Cliff edges either slipped away or were fissured; roads along declivities either slipped down bodily, or were divided by fissures. There were many facts that negatived the idea of a submarine eruption. Fontana, as in 1881, again showed a set of injuries dependent on a vertical shock, but the damage was much more strongly marked. There were a set of fractures denoting a wave path coming from the north at a very low angle of emergence. The explanation of 1881 seemed to be confirmed. The vertical injury seemed to be due, as then, to the conduction along a column of trachyte, followed by the direct shock from Casamicciola, which produced the second set of fissures. The coast of the island showed no apparent change of level. The azimuths were regular, except near the mass of trachyte, which seemed to have reflected the shock so that the buildings received a direct and a reflected wave path, producing two sets of fissures, which caused complication. The focus seemed to have been an enlargement of the former one, and occupied almost the same topographical position, except that its northern extremity was more prolonged. The molecular velocity had not been ascertained.

The Lower and Midland Bagshot Sands.—The Rev. A. Irving, F.G.S., contends in the "Geological Magazine" that the well-known green colour of these beds is not due to mineral matter, but to vegetable impurities.

Erratic Blocks.—The British Association Committee appointed to report on these objects, stated that a remarkable group occurs at Crosspool, near Sheffield, at a height of 730 feet above the sea. It consists of slate rock, a tuff from the Borrowdale volcanic series of the lake district, carboniferous limestone and chert from North Lancashire; specimens also occur which were probably derived from the East Lowlands of Scotland, with magnesian limestone from the north-east of England. Near Clun, Shropshire, boulders from Rhayader and Machynlleth and neighbourhood are recorded. The highest boulder is upon Black Hill. It travelled from Rhayader, twenty-three miles west-south-west, and has an elevation of about 1400 feet. The report included a description of an enormous number of boulders, spread over an area of about two miles long by half a mile wide, the longer direction being south-east of Markfield, Leicestershire, from whence they were derived. It also gives an account of the erratics of the north of Herefordshire. At Kelsall, on the ridge dividing the district draining into the Thames from that draining north and north-east into the Cam, are two boulders lying about 500 feet above the sea level. The boulders noted point generally to a derivation from the Midland oolites and coal measures, and from crystalline rocks farther north.

The Common Inorganic Substances.—Mr. Thomas Laurie is publishing a new work on qualitative chemical analysis of the common inorganic substances, by Mr. A. H. Scott White, B.Sc., B.A. It is prepared specially with a view to the preparing of candidates for the examinations of the London University and South Kensington and the Local Examinations of Oxford and Cambridge.

The Origin of the Rhinoceroses.—At the British Association meeting, Messrs. W. B. Scott, and H. F. Osborne, two American naturalists, read a paper on this subject, based upon extensive researches made by them in the Tertiary lacustrine deposits in the North-Western Territories. There, they believe, they have discovered the ancestor of the rhinoceros group—an ancestor from which also the tapirs have descended—in a fossil animal called Orthocynodon.

Nordenskiold's Voyage to Greenland.—News has reached us from Baron Nordenskiold of his endeavour to penetrate into the interior of Greenland. His party made their way nearly 300 miles inland, when they reached the height of 7000 feet. Baron Nordenskiold was originally of opinion that the interior of Greenland was not covered by continental ice, but the results of his expedition have proved that this surmise was incorrect. The whole country was seen covered with ice, in which occur masses of fine dust, probably of cosmical origin.

NOTES AND QUERIES.

VARIETIES OF BIRDS AND EGGS.—As I am at present engaged upon a work on "British Birds' Nests and Eggs" in which a special feature is descriptions and figures of extreme varieties of birds and eggs, I should be glad to have accounts of any extreme forms of either which collectors, who have not already communicated with me, may be fortunate enough to possess.—*S. L. Mosley, Beaumont Park, Huddersfield.*

THE "ACADIAN SCIENTIST."—Send your name and address on a postal card for a sample copy of the "Acadian Scientist," a new and popular journal published in the interests of teachers of elementary science, collectors and amateur naturalists. Contains reports of the "Acadian Science Club," an international society of amateur working naturalists. Any one may become a member. For copy of "Scientist" and prospectus of the club address the editor and secretary—*A. J. Pineo, Wolfville, Nova Scotia.*

BUTCHER'S-BROOM.—Many thanks for your insertion of my inquiry in this month's issue. Since writing I have succeeded in finding butcher's-broom in Epping Forest, and very plenteously on Hayes Common. But I am still in the dark as to the reason why the plant is not mentioned in "Balfour," dated 1855. I shall feel obliged by any information as to the plant, and more especially the leaf-like spinose organs on which the flowers are placed.—*Henry Selby.*

"BUTCHER'S-BROOM" NEAR LONDON.—It is rather remarkable that Henry Selby cannot find this shrub in Epping Forest, seeing that it grows there in great abundance. I see it also in Hadley Woods.—*W. Mawer.*

BUTCHER'S-BROOM NEAR LONDON.—*Ruscus aculeatus* grows plentifully in Epping Forest, within a mile of Loughton station. It also occurs in Abbey Wood, and again near Addington in Surrey, I have taken it in flower at each of these places.—*J. O. B.*

MR. REUBEN WEBSTER, of the Museum Hotel, Sheffield, has received a male osprey. It is a magnificent bird, measuring six feet from tip to tip of extended wing. The day after, the female bird was sent to him. Both were shot immediately after a predatory visit to the Strines reservoir.

"ANOTHER GARDEN PEST."—The name of the creature described by me in SCIENCE-GOSSIP in August last is *Anthomyia ceparum.* On July 8th I collected twenty-five pupæ from the open ground and placed them in a large pot covered with net, from these emerged at dates varying from the 15th of July to 3rd of August, nine females and sixteen males. In four cases the flies appeared very weak and sickly, and on opening them they were found to be infested with parasites of the group Nematoidæ; to all appearances they would not have propagated their species, had I allowed them to live. This, in a measure, confirms my surmise that the grubs had an enemy, and it would probably account for the small percentage attaining the pupa stage. The petroleum process I found quite useless; while the scent remained pretty strong the flies refrained from alighting, but, as the odour passed off, they returned as before, and in the end the flies had by far the best of the season's fight; but I intend to try a dressing of gas-lime this winter, and thus destroy those left in the ground, when the crop was removed.—*W. H. Harris, Cardiff.*

FRESHWATER SHELLS NEAR BRENTFORD.—I have found the following species near Brentford. *Sphærium corneum, S. corneum,* var. *flavescens* (two only); *S. rivicola, S. lacustre* (two); *Pisidium amnicum, P. pusillum,* var. *obtusalis; Unio tumidus, U. pictorum, U. pictorum,* var. *radiata; Anodonta cygnea, A. anatina; Dreissena polymorpha* (one specimen); *Neritina fluviatilis; Paludina vivipara; Bithynia tentaculata; Planorbis contortus; P. vortex, P. complanatus, P. corneus, Physa fontinalis; Limnæa peregra, L. peregra,* var. *oblonga, L. stagnalis, L. palustris,* var. *roseo-labiata; Amylus fluviatilis, Limna?*—*Mrs. S.*

THE PRACTICAL NATURALISTS' SOCIETY.—On Saturday, September 15th, a meeting of the Scotch members of the Practical Naturalists' Society was held in Edinburgh. The earlier part of the day was occupied in rambling over the Pentland Hills, for the purpose of investigating the entomology of that district. Although the weather was dull and foggy, and occasionally wet, a fair number of captures was reported. In the evening the members met in a room taken for the purpose, when several excellent papers were read on various subjects; and a large number of specimens in all departments of natural history were exhibited.

HEDGEHOGS.—Will any of your many correspondents let me know, first, what these animals eat? Do they eat rabbits, as I have sometimes got them in rabbit-traps set in burrows? 2nd. How long they live? 3rd. Do they sleep during the day, and do they hibernate? 4th. How they cohabitate, and is there much difference between the male and female? if so, what?—*R. T. V. S. W.*

PRESERVING SEA-ANEMONES.—I should be very much obliged to any correspondent of SCIENCE-GOSSIP who would tell me how to preserve sea-anemones in bottles. What fluid should be used, as spirit would take away their colour? Would glycerine and water, with solution of carbolic acid, answer? Also how can they be made to expand after they are dead or killed instantly in an expanded condition? Any information will much oblige—*R. A. R. Bennett, Oxford.*

ŒCIDIUM URTICÆ, &C.—With regard to *Œcidium urticæ*, I found it on the banks of the Thames. With regard to *Œcidium tragopogonis* I have not yet found it, partly because I have not watched the plants of goat-beard early enough. I shall keep my weather-eye open to find *Uromyces poa* on *Poa trivialis* as Mr. Plowright says.—*Alex. Ogilvy.*

QUERY AS TO PLANTS.—Dog's arrach (old English), *Chenopodium olidum* (Linn.); *Leonurus cardiaca* (L.); goat's arrach (O.E.), *L. cardiaca* (L.); bullwort (O.E.), *Sison Amomum* (L.); *Scrophularia aquatica* (L.), *Fœniculum vulgare* (Gaertn.); bishop's-weed (O.E.), *F. vulgare* (Gaertn.), (English), *Sison Amomum* (L.); common bishop's-weed (E.), *Ammi majus* (Willd.); red Blite (E.), *Amaranthus blitum* (L.); wild Blite (E.), *A. blitum* (L.); water caltrops

(E.), *Trapa natans* (L.); water chestnut (E.), *T. bispinosa* (Rox.), *Scirpus tuberosus* (Rox.); cock's-head (Scotch), *Stachys palustris* (L.), (O.E.), *Hedysarum Onobrychis* (L.); red fitchling (E.), *H. Onobrychis* (L.); herb William (O.E.), *Fœniculum vulgare* (Gaertn.); St. Peter's wort (E.), *Hypericum Androsæmum* (L.), *H. Ascyron* (L.), *Diervillea lutea* (Pursh), *Symphoria racemosa* (Pursh), (N. U. States) *Ascyrum stans* (Mich.); Saracen's woundwort (O.E.), *Stachys palustris* (L.), Saracen's woundwort or confound? (O.E.), *S. palustris* (L.).

QUERY AS TO PLANTS.—I can give Mr. Brenan the Linnean names of some of his plants: St. Peter's wort (*Lonicera symphoricarpos*): floating water calthrops (*Trapa natans*); Cockead (*Hedysarum caput-galli*). I find two kinds of Bishop's weed: greater bishop's weed (*Ammi majus*); prickly-seeded bishop's weed (*Ammi copticum*).—*C. F. Worters, Grafton House, Forest Hill.*

QUERY AS TO PLANTS.—In reply to S. A. Brenan, the following are the botanical names of the plants mentioned: Dogs orach or arach (*Chenopodium olidum*; St. Peter's-wort (*Primula veris*); Bishop's-weed or herb William (*Ammi majus*); Bull-wort, (*Scrophularia nodosa*); Blite (*Chenopodium bonus-henricus*); Calthrops (*Centaurea calcitrapa*); cocks-head (*Onobrychis sativa*); Saracen's confound or woundwort (*Senecio Saracenicus*).—*A. Pearson, Milnrow.*

BREEDING SNAILS.—I should like to hear the experiences of other experimenters as to their success in keeping and breeding snails in confinement. I have kept several couples of *H. nemoralis* and *hortensis*, hoping to get a cross between the two species or varieties, whichever they may be; but without success, never having succeeded in getting them to pair, though they all appeared in perfect health, as far as one could judge by their feeding powers. I have found no difficulty in getting either nemoralis or arbustorum to complete their shells, however young when taken, and I have kept numbers of them through the winter. I have a *H. aspersa* hatched in confinement during the summer of last year; it had attained the diameter of three-eighths of an inch by the time its growth was stopped by the advent of winter (the direct action of cold could not have affected it, as it was kept in a room where the temperature never sank below 45°); now, the 5th of October, it is just one inch in diameter. In measuring the height of a helix, what are the points taken? Of course the tip of the spire is one, but I do not know whether the other point is the edge of the lip or the base of the shells at the opposite side; it cannot be the centre of the base, as that part is occupied either by a depression or an umbilicus. I find coltsfoot the plant most generally relished by the helices, next come nettles and the cabbage tribe. Any hints as to feeding, the preferences of various species, and the influence of different foods, will be useful.—*W. Gain.*

A STRANGE LITTLE DOG.—Perhaps some of your readers may remember my account of poor old Kit. Through the kindness of a most amiable lady, we received this queer little dog, and called him Snap. He came down from London per G. W. R., and the guard delivered him to our maid at Highbridge. We were looking out of the window, and saw her coming, with a little dog in front of her. All at once he left her, and ran up our steps and began to whine to be let in. He had never seen us, or been in the place before, and our house is one of a terrace, with many houses exactly alike, it seemed as if he had some inward knowledge that this house was his future home. How do you account for this? Poor little chap, he did not want water, thanks to the guard's kindness, but food. Now this strange little animal, after recuperation, played with an indiarubber ball just like a kitten with a cork; even now, staid and respectable as he ought to be, as a young man, and with all his responsibilities and Mrs. Grundy, he amuses our visitors with this ball. He and our old cat had amiable "passages at arms," but on the whole were good friends. We suppose he caught the trick from old Kit, for a more ludicrous thing was never seen in the last bitter winter than Snap and the cat, necks by jowl before the fire, sitting up, and warming their poor little half-frozen paws.—*A. H. B.*

GOLD-FISH.—Will some reader inform me how it is that gold fishes in a glass aquarium die so soon? I have been told they can be kept for fifteen years, which I very much doubt. I have tried both rain and town water, fresh every three days, still they die in a week.—*Edward W. Easton, Woodlesford.*

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—As we now publish SCIENCE-GOSSIP earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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.

WE request that all exchanges may be signed with name (or initials) and full address at the end.

B. BAILY.—Rimmer's "Land and Freshwater Shells" is by far the best of the list you enclose.

C. H. WINTER.—It is healthy to keep plants in a room during the daytime, as the leaves then give off oxygen gas: but during the night this function is suspended, and a little carbonic acid is given off instead from the growing parts and the flowers. Therefore we should say it is preferable *not* to keep plants in a room during the night.

J. W. D., G. B., C. P. H., &c.—Both words and music of the song you name were, we believe, composed by a scientific lunatic for scientific lunatics. Apply to the Superintendent, Hanwell.

F. R. TENNANT.—You may obtain named sections of various rocks from E. Wheeler, 48 Tollington Road, Holloway; of T. D. Russell, 48 Essex Street, Strand; or of James How, 73 Farringdon Street, London.

F. H. P. wants to know the best books or pamphlets on British *Murina*.

H. SEARLE.—We should be pleased to have the specimen of new Naias, &c., you mention.

RITA wants to know if white dormice are rare, and where they can be obtained.

E. G. (Felstead).—The umbelliferous plant you sent to us was too immature to decide with certainty. It is, however, a species of Ammi.

J. RASOR.—It is the *Siegesbeckia orientalis*.

A. G. (Bridge of Allen).—The bracts on the Viburnum are very common in the autumn, and are not, as you suppose, peculiar to North Britain.

S. A. B. (Cushenden).—Fasciated stems have been frequent this season, though we cannot say we have seen any of the garden pea; thanks for the information you so kindly send respecting it.

S. S.—The best work on the subject is Balfour's "Plants of the Bible." The fern with scaly frond is *Ceterach officinarum*; it is also found in England; the other is the maidenhair fern (*Adiantum capillus-veneris*, L.).

M. T. (Dudley).—No. 1, *Lastrea dilatata*; 2, *Polystichum aculeatum*; 3, Lady-fern. The rest are too young to tell correctly.

C. C. H. (Greetland).—It is the *Crocus nudiflorus;* the *C. speciosus* is a very different species.

G. M. (Brechin).—No. 1, *Epilobium montanum;* 2, *Fumaria officinalis;* 3, Yarrow (*Achillea millefolium*); 4, *Scabiosa succisa;* 5, *Polygonum aviculare;* 6, *Polygonum hydropiper.* You will find them all in Hooker's "Flora."

H. L. (Maidstone).—Yes, it is *Lamium galeobdolon.* The other is too imperfect to speak about accurately.

EXCHANGES.

Science-Gossip wanted for 1869, 1871, 1872; will give land and freshwater shells. — C. T. Musson, 119 Derby Road, Nottingham.

Land and freshwater shells. Will Nottinghamshire collectors please send their address to C. T. Musson, 119 Derby Road, Nottingham.

Well-mounted slides in exchange for parasites prepared for mounting, or other material. — E. M., Farncombe Villas, Godalming.

Dredgings and other material, rich in diatoms, got round shores of Orkney, in exchange for good, well-mounted slides of diatoms.—R. Muir, Albert Street, Kirkwall, N.B.

Wanted, Lond. Cat., 7th ed. Good specimens of 180, 184, 192, 304, 484, in exchange for 49, 104*a*, 521, 566, or other rarer Scotch plants. Will exchange list of duplicates.—A. Davidson, M.B., Thornhill, Dumfriesshire.

Wanted, Sachs' "Text-Book of Botany," 1882, and Hooker's "Student's Flora," latest edition, for other standard works, or cash.—F. C. King, Ashton-on-Ribble, Lancashire.

Micro slides of specialities in entomology offered for other specialities; lists exchanged.—J. Neville, Wellington Road, Handsworth, Birmingham.

Wanted, set of Sopwith's models in exchange for five Grove's cells (pints), complete in frame, and large good coil.—F. G. S., 10 St. Michael's Terrace, Wood Green, London, N.

Selected Jurassic or Tertiary fossils, including Lias ammonites and Oolitic plants, also the commoner British shells, offered for other fossils, the rarer British shells, or Quarterly Journals Geological Society.—E. Wilson, 18 Low Pavement, Nottingham.

Wanted, deep-sea soundings, named and locality; also, Gorgonia spicules (a quantity preferred), or horn for section-cutting, viz., rhinoceros, bison, or hoofs of any interesting description; well-mounted objects, anatomical or botanical, in exchange.—J. M., 59 Hind Street, Poplar, London, E.

Andreæ, British or foreign, wanted; for which rare British mosses will be exchanged.—J. Cash, Osborne Road, Coston Park, Manchester.

Well-mounted slide, paper-like fabric of wasp's nest, showing wood cells *in situ*, in exchange for other slide.—John Moore, 86 Porchester Street, Birmingham.

Forty-seven inch Duplex Excelsior bicycle, perfect condition, cost £14 10*s.*; wanted, a microscope by good maker, binocular preferred.—John R. Marten, Cottage Hospital, Red Hill, Surrey.

Wanted, *Helix hybrida* (living), also one-banded *H. hortensis.* List of duplicates on application.—Baker Hudson, 15 Waterloo Road, Middlesbrough.

In exchange for *Epipactis violacea* and other plants; wanted, 23, 62, 65, 804, 979, 1135, 1255, 1292, 1552.—Rev. F. H. Arnold, Hermitage, Emworth.

Autotype portrait of Darwin, in black frame, 17½ × 20 in.; what offers?—W. Ernest Milner, 47 Park Road, Haverstock Hill, N.W.

Offered, L. C., 7th ed., 535*a*, and numerous other good plants for exchange.—John Jackson, High Street, Wetherby.

For sale or exchange, "Crag Mollusca," large bound vol.; wanted, Palæontographical Society's "Memoirs of Old Red Sandstone" and platyscopic lens.—W. Rose, Abergavenny.

British plants, fossils, and shells, also some rare foreign stamps; want to exchange for fossils, shells (British or foreign), stamps, or birds' eggs. All specimens must be named and localised; lists exchanged.—H. L. E., Hay-Gordon & Co., Widnes.

Various natural history books and well-set British Lepidoptera given in exchange for coins and books on coins and tokens. — O. C. Goldthwait, 2 Grove Villas, Grove Road, Walthamstow.

Eggs of Sandwich tern, little grebe, cirl bunting, &c.; skins of rose-coloured pastor, mealy redpole, ringed guillemot, Richardson's skua, blue-throated warbler, and many others, for skins, eggs, and nests.—S. L. Mosley, Beaumont Park, Huddersfield.

Wanted, Carpenter's book on the Microscope and other scientific works, and micro material of all kinds; will give in exchange well-mounted slides (anatomical, pathological, botanical, micro fungi, parasites, objects of natural history, diatoms, &c.): no cards.—F. L. Carter, College of Medicine, Newcastle-on-Tyne.

Wanted, correspondents in all parts of the world to exchange micro material.—F. L. Carter, College of Medicine, Newcastle-on-Tyne.

Wanted, a few good slides showing adulterations, in exchange for other slides of interest.—D. Burford, Bowbridge, Stroud, Gloucestershire.

A quantity of odd numbers of the "Bibliograph," "Antiquary," "Intellectual Observer," and the early numbers of "Knowledge," in exchange for works on botany or microscopy, or micro materials or slides.—A. E. Gibbs, The Hollies, Cumberland Road, St. Albans.

Offered, L. C., 7th ed., 10, 15*b*, 45, 118*b*, 161, 201, 202, 315, 533, 681, 924, 1236, 1248, 1357, 1432, 1437, 1446, 1449, 1672, 1679, *Chara Braunii*, for others not in collection.—H. Searle, Ashton-under-Lyne.

Exotic butterflies, numerous duplicates; collectors please send lists in exchange for mine. Watercolour drawings and chromos—wanted, mutual loan of, for copying.—J. C. Hudson, Railway Terrace, Cross Lane, near Manchester.

Land, freshwater, and marine shells (British), including *Helix Cartusiana, Achatina acicula, Unio tumidus, Limnæa glutinosa, Bithynia Leachii, Tellina fabula,* &c., in exchange for British or foreign land and freshwater or British marine.—S. C. Cockerell, Glen Druid, Chislehurst, Kent.

For specimens of *Achatina acicula, Hydrobia ulva, R. parva,* v. *interrupta, Mactra stultorum, L. stagnalis* (dwarfed). *C. rugosa, Tapes pullastra,* &c., send box, with label and return postage, to T. D. A. Cockerell, 62 Wimpole Street, London, W.

Wanted, "Journal of Postal Microscopical Society"; offer, "Northern Microscopist," vegetable sections, or cash.—W. White, Litcham, Swaffham.

"Knowledge," first three vols., bound in cloth, complete, also Wood's "Field Naturalist's Handbook"; wanted, books, &c., on cryptogamic botany.—W. Mills, 1 Rankeillor Place, Edinburgh.

Exchange: Anodon, Unio, Sphærium, Helix, Achatina, &c., many species and varieties; wanted, *Helix revelata, obvoluta, depilata, Zonites excavatus, glaber, Limnæa involuta,* the varieties of *L. peregra,* and many others; small collections of land and freshwater shells (thirty-six species and over), in exchange for flint implements, marine shells, or coins not in collection.—W. Gain, Tuxford, Newark.

For exchange, sand from the bottom of the Mediterranean Sea, full of microscopic shells.—E. C. Stedman, 115 Stepney Green, London.

Fine and well-preserved specimens of *Echinus Melo, Spatangus purpureus, Astropecten arneciacus,* and *Equinaster cæspitosus,* offered in exchange for rare sponges, or diatomaceous material.—J. Tempère, Storrington, Sussex.

Wanted, *Hyale cratægi, Daplidiæ sinapis,* Cassiope, Iris, *C. album,* Lathenia, Cinxia, Athalia, Betulæ, Penni, *Rubi argiolus,* Alsus, Arion, Paniscus, Comma; good exchange, duplicates numerous.—J. Bates, 10 Orchard Terrace, Wellingborough.

A few specimens of each of the following to offer for fair exchanges: L. C., 7th ed., Nos. 41, 275, 367, 821, 858, 906, 1127, 1288, 1367.—P. Sewell, 18 Mount Parade, York.

Very fine specimens of *Limnæa stagnalis* and *palustris,* and *Spherium corneum;* desiderata very numerous.—Robt. Barker, 11 Townsend Street, The Groves, York.

Offered, *Draba rupestris, Alsine rubella, Sagina nivalis, Erigeron alpinus,* &c., for healthy pupæ of Lepidoptera.—G. Horn, 57 Bell Street, Calton, Glasgow.

BOOKS, ETC., RECEIVED.

"The Starry Heavens." A Poetical Birthday Book. London: Chatto & Windus.

"The Organs of Speech." By G. H. Von Meyer. London. Kegan Paul & Co.

"Studies in Microscopical Science," edited by A. C. Cole.
"Land and Water."
"Midland Naturalist."
"Natural History Notes."
"Ben Brierley's Journal."
"American Naturalist."
"American Monthly Microscopical Journal."
"Science."
"Popular Science News."
"The Botanical Gazette."
"Cosmos: les Mondes."
"Le Monde de la Science."
"Ciel et Terre."
&c. &c. &c.

Communications received up to 11th ult. from:—A. H. S.—J. F. R.—R. T. V. S. W.—S. B.—M. T.—G. R.—W. H.—S. S.—L. L.—W. M.—G. R. G.—A. D.—W. H. H.—C. C. H.—C. P. H.—J. M.—M. M.—F. C. K.—B. H.—G. B.—J. W. D.—W. S.—E. S. S.—A. O.—A. D.—T. G.—W. K.—J. B.—C. H. W.—J. M.—M. H.—G. W. P.—H. C.—J. R. M.—B. B.—J. H. M.—R. A. R. B.—J. C.—J. M.—E. W.—H. H.—J. C. H.—S. C. C.—S. L. M.—F. R. T.—A. J. P.—J. C. T.—O. C. G.—W. C. H.—H. L. E.—T. W. O.—W. R.—J. J.—W. E. M.—T. M.—F. H. A.—G. F. W.—A. W.—J. M.—F. H.—F. E. S.—G. D. S.—W. D. R.—H. S.—A. P.—H. U.—F. H. P.—F. L. C.—W. F. jun.—W. W.—W. G.—E. E. T.—T. D. A. C.—A. H. W.—A. E. G.—D. B.—J. T.—F. L. C.—W. M.—G. M.—W. J. V. U.—J. P.—H. C.—J. P. S.—E. C. S.—A. E. B. S.—P. S.—J. B.—R. B.—T. V. S.—J. T., &c.

DRAWING FROM THE MICROSCOPE.

By E. T. D.

THE adaptability of the neutral tint reflector, as an instrument of precision for drawing purposes, compared with the camera lucida, seems a trivial matter for discussion. But it would be a source of regret if a palpable error were recorded in the pages of SCIENCE-GOSSIP, a periodical aiming at exact information, and the educational and scientific instruction of many young microscopists with artistic tastes. Mr. Bernard Hobson in the September number commenting on the "hastily condemned appliance," the neutral tint reflector, as a drawing accessory, states that its radical defect of "inversion" may be overcome by a semi-rotation of the object itself on the stage of the microscope, which would assist the after drawing of details without difficulty. To prove the fallacy of this remedy, it may be necessary to recapitulate some previous statements. For drawing, or rather, fixing lines involved in an elaborate microscopic object, the improved Wollaston camera lucida is the only instrument; a cheaper and handier form of lucida, for certain purposes, is the tinted glass reflector; but its capabilities are so extremely limited, that all after work, pursued direct from the microscope, either in line, colour, or shadow, is frustrated by the "inversion" of the picture, which no arrangement of the object on the stage can obviate or overcome; even the practised artist is thus fairly bewildered in following up a drawing under such circumstances; the trouble is exactly tantamount to painting a landscape from Nature, not only upside down, but when placed as it should appear with the right turned over to the left; the neutral tint reflector effects this inversion by having only one reflecting surface. Mr. Hobson says on page 195, that it is perfectly obvious a semi-rotation of the stage carrying the object will put the matter right. The impossibility of this is demonstrated by the following simple diagram.

It is clear, that the semi-rotation of the object, fig. 166 (1) will place it in the position of (4); (3) is a representation of (1) as drawn with the neutral glass reflector. The problem is: to finish the drawing (3) from direct observation of either (1) or (4), and to fill in details of an involved object under such circumstances (say, a section of injected lung) with reflected light, is simply insuperable; but, to place the matter beyond all dispute, take the impression of a sixpence turned over on the surface (not rubbed from beneath) of a piece of soft paper, such an impress would represent its contours as sketched by the neutral tint reflector; no rotation or any arrangement of the coin would make its appearance coincident with the impression. To afterwards copy with scrupulous accuracy the details would be, to say the least, a great trouble, immeasurably increased, supposing the object involved a mass of complicated structure. It may be generally insisted that all mechanical aids in drawing should be avoided, beyond the point of saving time. The ultimate result of artistic and graphic representation is the outcome of close and sensitive observation, which cannot be helped by elaborate, or any apparatus whatever. Such an arrangement as specified by Mr. Hobson in his paper, clever and ingenious as it may be, is not equivalent to, and can never take the place of, the practised eye and the reliable hand. There is an "abandon," a "go," in fine art results, which no mechanical appliance or aid can assist. In microscopical work the camera lucida is merely a preliminary adjunct of limited utility in determining proportions; *no graphic or perfect drawing is helped by its continued use;* after affording the barest outlines and positions, the instrument becomes an encumbrance, and those who are practised in its employment feel a palpable sense of relief and breathe again when it is got rid of, to settle down to the earnest work of direct vision from the microscope. If the apparatus Mr. Hobson describes in his paper could be used with facility, everything would be reduced to mere rule of thumb, destructive to the peculiar charm of a "picture." It has been urged by the writer that a good microscopic preparation may be as fine a subject for painting as a group of poppies, or a nest of birds' eggs; but no true artist ever dreams of employing mechanical appliances to assist him in rendering such models. William Hunt used photographs

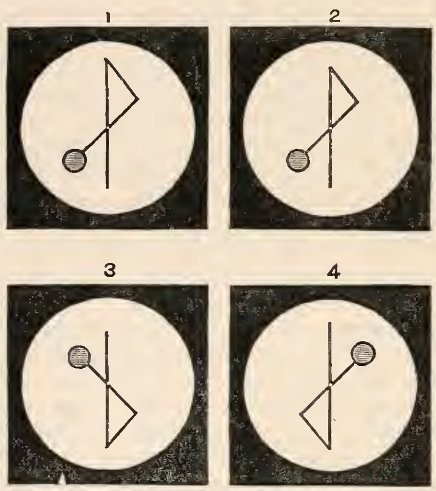


Fig. 166.—1. An object as seen through the microscope. 2. An object as reflected by the camera lucida. 3. An object as it appears through the neutral tint reflector. 4. The object after "semi-rotation of the stage."

as an aid in his wonderful studies of still life, but only in the sense of enabling himself to calmly contemplate the involved intricacies of line and form; and Mr. Ruskin, in his works on elementary art, recommends the study of, and copying sun pictures, to impress on the mind the subtle truths of natural contours. Every true artist, under such education, develops eventually an innate sense of beauty and colour, and a capability of expressing it, only limited by his earnestness. This principle is intensified to a degree hardly yet understood or experienced, except by those who have persevered in its practice, in dealing with the wonderful elegance and delicacy of microscopic forms; need it be said, that all such efforts must necessarily be trammelled and impeded by any royal road to such work; as an instance, the microscopical photograph is worthless, beyond being a record of proportion and mere character; as a picture it is an utter failure; in a word, beyond the legitimate and cautious use of the camera lucida, all aids to microscopic representations should be avoided, every scheme to obtain results in drawing, independent of accuracy of eye, and love of the work is not worth pursuing. No other branch of art can be approached with a keener or deeper sense of the absolute necessity of close and conscientious observation. Structural beauty as seen in the marvellously dissected organs of animals and stained tissues of botanical specimens, or even in what might be considered repulsive subjects (pathological preparations), cannot be extolled too highly; in the whole range of natural objects, no greater beauty can be discovered. In scientific professions, clear and accurate drawing is of importance; to the naturalist the accomplishment is of deep significance; not very difficult of attainment; the key-note of the mind of the artist microscopist is, that touchstone of all good work, admiration! It has been well said that in all cases of artistic feeling, the pursuit is the reward, not the result; a fact so patent that often the charm and beauty of a mere sketch, direct from nature, is more valuable in its simple truth than any elaboration it might receive by after adventitious aid. Advocating in these papers the pursuit of highly finished microscopical painting as a branch of "fine art," the fact must never be ignored that a few rapid lines from direct observation produced on the spur of the moment, possess an interest of a most appreciable character. This acquirement is not beyond the capability of the merest tyro soon discovered and realized when he cultivates the habit of having a drawing block, pen and pencil as adjuncts to his instrument.

Crouch End.

A MONSTER SEA CRAB (*INACHUS KEMPFERI*).

SOME years ago there was exhibited at San Francisco the largest crab in the world. Since that time not having seen an account of a larger one, I send a description of it, which has been taken from the papers published at the Californian capital about the time the crab was shown to the public.

This Crustacean monster was captured in the Bay of Yeao, Japan, clinging to the wreck of the ill-fated United States' corvette *Ouide*, which came into collision with the English steamer *Bombay;* it was captured by some native fisherman employed by the Japanese authorities to drag the spot where the collision occurred, for the purpose of recovering the bodies of those who went down with the vessel.

Possibly this monster was attracted to the spot for the purpose of feeding on the remains of the unfortunate passengers. It is stated the native coasting population feed upon a large crab, the *Inachus Kempferi*, which frequently attains a large size; specimens having been caught measuring ten feet between the tips of its nippers. The body of this monster sea-spider before it went into the hands of the taxidermist reached the enormous weight of forty pounds. The carapace was a deep red and covered with irregular knobs or excrescences. The length of the legs was over five feet, "and had evidently shrunk at the joints since caught. These elongated limbs resembled thick bamboo canes and were a sickly pale yellow in colour. From tip to tip of these clam-feet—which are furnished with two rows of regular teeth—it measured over thirteen feet. The mouth and eyes of this monster of the deep somewhat resembled those of a toad, and the former is armed with two long tusk-like teeth, and surrounded by circles of stiff wiry hair, like that seen in the mouth of the whale."

Another account says: "The mouth of this Japanese monster is provided with two large teeth, which are quite worn, giving evidence of great age, and its tongue is covered with coarse beard." Several ordinary-sized star-fish were placed on the board, to show by comparison the size of this gigantic cancer. The party who brought this monster crab from Japan experienced considerable difficulty with the local authorities, as a law exists making everything of that description the property of the government. The following amusing description was culled from the "San Francisco Evening Bulletin:"—"We have been shown by a gentleman who arrived on the last steamer from Japan, a crab of proportions far exceeding anything in the shell-fish line that we have ever heard or read of, not even the marvellous ichthyological wonders seen and recorded by that prince of "fish-story" letters, old Bishop Pontoppidan (to whom we are mainly indebted for our knowledge of sea-serpents, gigantic cuttle-fish, and other marine monsters), had fully prepared us to realise the huge dimensions of this King of the Crustacea." "This Crustaceous mastodon was exhibited to upwards of 20,000 persons (?), who unanimously pronounced it to be the greatest natural wonder ever brought to the United States." So says a placard which was freely distributed over the city.

There was a very large individual of this species in the Fisheries Exhibition, but I think it is far short of the dimensions of this gigantic Crustacean.

John Davis, F.R.M.S.

Pied Lapwing.—I have had a very handsome pied lapwing brought to be stuffed this week; knowing it to be very unusual, I thought many readers of your interesting paper would like to know it. The whole of the back and part of the wings are white, with a buff band across the tail instead of white, the usual colour. I should like to know if it has been observed before.—*G. Bristow, jun.*

A DAY'S BOTANISING.

To the naturalist, a day's run with a brother nat. is always looked forward to with the greatest delight and expectation. It is to him an approaching day of enjoyment, such as few but lovers of nature ever can experience. He knows that the conversation will be such as befits his tastes, that it will be free from vulgar scandal, and will be almost entirely upon his favourite hobby. It was with such feelings that I planned a day's botanical excursion with my enthusiastic friend Mr. Cannon, whose forte is vegetable morphology and physiology.

We started, then, on Thursday morning, June 1st, from Strood by the 8.7 A.M. train for Maidstone, accompanied by my son, a youth of 14. Arrived at Maidstone, we at once struck off along the banks of the Medway. The river here and for many miles up is still a large and imposing stream, though it ceases to be tidal at Allington Lock, a few miles below Maidstone. The scenery from here to Yalding, the farthest point of our day's journey, is extremely beautiful, the banks of the river being skirted with woods or trees, on one or both sides nearly the whole distance, and lined with a rich, varied and luxuriant vegetation, attractive even to a non-botanical eye, and therefore much more so to ours. There are pretty picturesque old bridges at East Farleigh, West Farleigh and Yalding. Their crumbling walls are richly decorated with plants, whose green waving leaves and branches contrast finely with the grey background upon which they grow. Among them we noted the rue-leaved spleenwort, pellitory, wild marjoram, ivy-leaved toad-flax, and many others. The river is well stocked with fish, and affords fine sport for the disciples of Walton. There are splendid little glimpses of scenery that would well repay the artist for a few visits to its banks. The watercress (*Barbarea vulgaris*), with its dark green cup-leaves and brilliant yellow flowers, everywhere decorated the river banks, and everywhere the beautiful and aromatic pansy (*Tanacetum vulgare*) waved its rich green feathery-looking leaves. At intervals was to be seen the lovely yet poisonous hemlock (*Conium maculatum*), its graceful leaves and artistically spotted stem lending a charm to the scene. Near the bridge at East Farleigh we found in some abundance the sweetly pretty *Potentilla argentea*, some exceedingly fine specimens of *Medicago maculata* (with almost spotless leaves), a very small flowered variety of *Ranunculus acris*, a single plant of *Linum usitatissimum* in bloom, as also the silver weed and many others. On reaching the bridge at West Farleigh, we left the river-side, and made for the "Chequers Inn," a large and commodious house, where we were well entertained by "mine hostess." Along the road to this house we found several mints: *Nepeta cataria*, *Stachys sylvatica*, *Torilis anthriscus* and others. After lunch we returned to the river and proceeded towards Yalding. On the way we found some wonderfully fine specimens of *Sonchus palustris*, *Scrophularia nodosa* and *S. aquatica*. In ponds, some distance from the banks, we gathered flowers of *Iris Pseudacorus* and the beautiful and interesting *Nuphar lutea* (yellow water-lily), also fine specimens of *Œnanthe Phellandrium*. In the same ponds we saw *Sagittaria sagittifolia*, *Alisma plantago*, and other interesting plants. At Yalding we partook of a light tea, then walked back to West Farleigh, crossed the bridge to Wateringbury, thence across Barming Heath to Aylesford, when we took train home. I should have mentioned that along all the railway cuttings, and in every craggy place, *Centranthus ruber*, the red valerian, gladdened the eye with its richly-coloured blooms. This plant seems now to have become fully naturalised in the south, and the railway cuttings seem its favourite habitats. Among other plants observed or gathered I may enumerate *Lythrum Salicaria*, *Galium cruciatum*, *Spiræa Ulmaria*, *Veronica Beccabunga*, *Lycopsis arvensis*, *Lychnis dioica*, *L. Flos-cuculi* and *L. vespertina*, *Tragopogon minor*; *Epilobium hirsutum*, *Lathyrus pratensis*, *Stellaria graminea*, *Apargia hispida*, *Lotus corniculatus*, *Viburnum Opulus*, *Sium latifolium*, *Armoracia officinalis*, *Rhinanthus crista-galli*, and several species of Potamogeton. Although an east wind was blowing and the early part of the day looked somewhat gloomy and forbidding, yet it cleared up about 10.30, and the rest of the day was all that could be desired for a day's outing. I can truly say that I have rarely returned from a day's excursion with a better filled vasculum, and my friend's was equally well filled. The day was thoroughly enjoyed and we are looking forward to a similar day, at an early date, on the Thames and Medway marshes, when I have no doubt we shall return with equally good collections, but of a totally different kind.

Rochester. JOHN HEPWORTH.

THE DELUGE OF ARGYLL.*

WHAT, the Deluge once more? Yes, zounds, you may smile,
'Tis the Flood, not of Noah, but that of Argyll,
Not the same, but in wonders quite equalling that
Which stranded the Ark on Mount Ararat;
For its waters arose from a forty days' rain,
While Argyll's occurred from a "burst" in the main.
The great water main which it won't do to snub,
—Not the main supplying the wants of the tub!—
That breaking its bounds with tumultuous roar,
Of plain and of mountain made one common shore,
O'erwhelming all creatures that breathe with its force,
The Rhinoceros, Mammoth, the Elk and the Horse,
And among funny things for His Grace to unravel,
Landing on Tryfan the famed Tryfan gravel.
The shells of the ocean it swept up, until
It lodged them pell-mell 'mong the stones of the Till
And left that deposit—'tis as clear as the day,
As a margin of muck—round the land as it lay.
Then rushing o'er Europe as its motion grew less,
Strained out the formation of loamy Loëss,
Filled with snail shells and twigs, and spoils of the land,
For the flood became fresh as it left its old strand.
And the bones of the Beaver, the Mus and the Fox,
Took the place of the boulders and striated blocks;
But description in detail this Deluge would "spile,"
So, reader, refer to the words of Argyll.
Where Baron Richthofen's declared to be musty,
And Loëss is found to be "not quite so dusty."
But the strangest of facts—we state it as curious,
All floods but Argyll's are fictitious and spurious,
Poor base imitations, or floods that "won't wash,"
Depositing fossil in rocks, and such bosh.
For *the* Deluge was one that the earth only purged,
Washing dirt from the land so deeply submerged,
Superficial and sudden in action and temp'rary,
Behaving for floods in a way most exemplary.
So says the great Duke, its ingenious inventor
—No hen with her chickens could cackle contenter—
'Tis true, men of science the Deluge discarded,
But then they let facts pass away unregarded.
In language thought vulgar certain facts they "let slide,"
For a Duke from the Highlands alone to provide.
Hutton, Lyell, and Darwin, the whole of the throng,
Are sadly at sea on the subject, and wrong
As in everything else that relates to the race
Of man and his tools, his growth and his place,
They grovel and twist, misconceive and debase.
For the tools may be rude yet the user polite,
Though the skin may be dark, in the mind may be light.
To call such men savage really makes the blood "bile,"
Of the lamblike descendant of "Grim" Earl Argyll.
Yet such "arrant nonsense" is just now the fashion,
Yes! these are the words of Argyll in a passion.
Which proves if a savage may be quite polite,
A Duke in rude language can also delight.
This is a digression—the tongue of Argyll
Proves fluent for mischief and pungent in style,
His new patent flood is another "great bore,"
For ourselves we prefer much the old one of Noah.
And stick, as in childhood, to forty days' rain,
Over which we have wondered and wondered again.
A true "pluvial period" ante-dating A. Tylor,
And long before "Ages of Ice," or what's viler,
The flood of small talk on the "wherefore and why,'
That refuses to let the most foolish thoughts die.
Rather keeps them alive with a science of muddle,
Or assertions dogmatic, and old women's twaddle.
"Cock-sure," in all things the truth to explain,
By making that difficult which is perfectly plain,
In ways like the Heathen Chinee "that are vain."
In such "mixed" speculations that miss by the mile,
The greatest by far is the Duke of Argyll.

A. CONIFER.

* "Geology and the Deluge." A Lecture by the Duke of Argyll. See "Glasgow Herald," Saturday, October 13th, 1883.

NOTES ON A CURIOUSLY DISTORTED SPECIMEN OF *HELIX NEMORALIS.*

I HAVE taken, during the past summer (1883), a curiously distorted specimen of *H. nemoralis* (plain pink variety). When I first observed the animal, it was feeding on the coarse grass which covers the sand dunes at Redcar. I noticed that the shell had been slightly crushed on one of the upper whorls (I have marked the locality by a black patch in fig. 167), and also that the animal, having already completed a normal lip, was commencing a farther addition to his shell, and had then completed about one-sixth of another whorl, which began just within the margin of the lip. The new deposit of shell was, however, colourless, very uneven, wrinkled, and exceedingly brittle. I took the specimen home and placed it among some of its fellows, in a vivarium which had been stocked from the same locality some time previously. Although well supplied with food my little prisoner seemed very inactive, though he continued to add to his shell at intervals, and in the course of about five weeks he completed quite half a whorl. Having to leave home for a short time I was unable

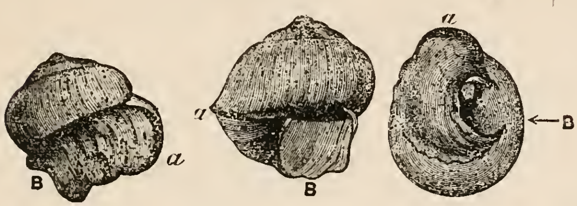


Fig. 167.—Distorted Specimen of *Helix nemoralis*.

to watch him longer, and on my return I found him in a dying state. After hot water treatment, I very carefully extracted his remains, but only succeeded in getting a portion of the dark-coloured part of his anatomy which had occupied the upper whorls. I however appeared to have taken out all that had recently been alive. The extreme end of the dark part was very large, and rather lighter in colour than is usual, and when the animal was coiled, I saw that it was not complete, though the skin was perfect. From this I am led to believe that when the upper whorl was crushed a part of the animal perished, and that a process of reparation commencing, the animal found himself growing too large for his abode, and endeavoured to remedy the defect by the construction of another whorl. This is only surmise, and I should be glad to have any collector's views on the subject.

Fig. 167 shews the extra whorl, "A" being the first lip; "B" the second (incomplete for lack of ribs).

The next figure gives another view of the shell, exhibiting the second lip at "B," the first at "A."

The last figure shews the inner margin of the first lip, in the region of the columella, within the aperture "B."

Middlesbrough. BAKER HUDSON.

AN ANCIENT ATOLL REEF.

IN the Geological Section of the British Association Mr. James Thomson, F.G.S., of Glasgow, showed that at Arbigland, fifteen miles to the south of Dumfries, the rocks along the shore for several miles consisted of calciferous sandstone. In Arbigland bay the lower members of the carboniferous limestone are exposed in a series of sinuous bands of more or less impure limestone. The limestone is largely composed of corals of various kinds. The most abundant form is Monticulopora. Indeed, in some parts this genus forms the greater part of the limestone. There are also masses of *Lithostrotion Martini*, *Diphyphyllum fasciculatum*, Syringopora, Cladochonus, Aulopora, &c. This band of limestone extends along the shore for at least two miles, and in Arbigland bay it forms a deep semicircular ridge, recurring at either extremity, and extending along the coast line. Around the inner margin of this ridge the limestone passes into a dark calcareous, arenaceous shale, which when split reveals numerous impressions of fucoids; indeed, the fucoids are so abundant, that they have rendered this band a blackish-gray colour. This band passes into a dark calcareous shale, indicating shallow-water or shore conditions. Imbedded in this shale are numerous domes of corals of various dimensions, belonging to the genus Lithostrotion, chiefly *Lith. Flemingi*, *Lith. Portlocki*, and *Lith. M'Coyi*, with here and there crushed examples of simple corals, principally that of the genus Caryophyllum. The total width of this outer band of limestone or reef of coral rock is 2976 feet, dipping inwards downwards to the centre at an angle of 45 degrees. Around the inner margin of this semicircular mass there are ten successive reefs, and all dipping inwards and downwards; at the lateral margin of the tenth reef it becomes less open, and the circular aspect is nearly complete. The open space is to the south. Each of the succeeding reefs is composed of the remaining corals, chiefly belonging to the genera referred to. On the southern open space, and inside of the semicircular reef, and imbedded in the calcareous shale, the domes of Lithostrotion are of gigantic proportions. One dome measured eleven feet ten inches in diameter. These domes diminish in size on the opposite extremity of the circle. The smallest specimen procured was one inch in diameter. Here, therefore, around the inner margin of this nearly circular reef, are domes of corals varying from one inch up to eleven feet ten inches in diameter. These are intermixed with masses of *Lithostrotion Phillipsi*, and a species of fossil sponge, which has been described by Mr. Carter as *Pulvulus Thomsoni*. One specimen of this sponge measured eleven inches long, by five inches broad. Those of larger dimensions were found at the open face of the semicircular reef, diminishing in size to an inch inside of the circle, where the water was less pure, and where consequently the conditions were less favourable. These facts imply conditions similar to those described by Dana and Darwin in the seas of the present day. The shale passes into a calcareous sandstone, in which are found numerous fossil shells, chiefly a small variety of *Productus giganteus*. The sandstone deposits are overlaid by a bed of limestone three feet thick, largely composed of fossil corals of various kinds. Monticulopora is largely represented, together with masses of Lithostrotions, chiefly *Lith. junceum*, *Lith. Phillipsi*, Syringopora, Aulopora, and Cladochonus, &c. This reef is circular in outline, and the limestone becomes more arenaceous, and then passes into a calcareous shale. Here again there are domes of Lithostrotion, but of greatly smaller proportions, surrounded with indications of shallow water during their life. This circle is 240 feet in diameter, inside of which there is a succession of fringing coral reefs, but all indicate that the conditions were less favourable for their growth, than are found in the outer and larger reefs, and which pass into a band of calcareous sandstone seven inches thick, which forms the floor of the centre of the circle. The total facts indicate that the old coast line was fringed first by a series of linear reefs, which became more and more circular until in the centre of Arbigland bay they assumed a circular form. Mr. Thomson gave his reasons for supposing that the water in the centre, when the outer reef was young, was at least upwards of fifty fathoms deep. The shale, or hardened calcareous clay, is largely composed of triturated coral rock, was silted in from the open sea by the opening in the south side of the reef. The silt inside the circular reefs was washed inward between the masses of coral. The domes and simple corals imbedded in the mud, just as we find in Atolls of present seas, plainly point to similar conditions to that now existing. The Atoll at Arbigland is the first one recorded of carboniferous age.

A DAY'S MOSS-HUNTING AT THE LAND'S END.

SOME years ago, in the course of conversation upon the relative productiveness of the different counties of England from a bryological point of view, a question arose as to the probable number of mosses which might be collected in the course of a few walks from any one spot in a tolerably good district; and I remember that the estimates were widely diverse; although very likely each would have proved sufficiently near the mark if distinct localities had been specified and actually put to the test. Every one knows that certain districts in England are, from some cause which is not always apparent, vastly richer in variety both botanically and entomologically than others possessing somewhat similar features, and yet the unexpected discoveries which are continually being made and the unlooked for things which year after year turn up and reward the persevering naturalist, all tend to confirm and strengthen the common saying which has now almost passed into a proverb: "The best-worked district produces most."

As regards cryptogamic plants, the Land's End, judging by the lists published in the Transactions of its local society, can hold its own against many favoured localities in England, and in the matter of mosses it may take at least a respectable position.

Early in September I planned a fair day's walk, having for its object merely the cataloguing of all mosses which should come under my notice; simply indeed to satisfy my own curiosity, and the result having somewhat surpassed my expectations, I purpose giving, as concisely as I can, an account of my findings, in the hope that it may not be altogether without interest to those readers of SCIENCE-GOSSIP who happen to be bryologists. By the way, the word Bryologist is very uncouth and ponderous for common use, and Muscologist is a hybrid barbarism; cannot some more simple term be brought into use, say Mossists, a compact designation which at once explains itself?

A couple of miles from Penzance there is a tolerably large bog, known as Tremethick Moor; it is rich in plants, some of which, like *Hypericum Bæticum* and *Pinguicula grandiflora*, are noted rarities. The latter was introduced from Ireland many years ago, and is now well established and thriving. This bog I considered a good starting-point, for although I determined that this should be a *bona-fide* single walk, there could be no reasonable objection against selecting such a one as would afford the best variety of hunting-ground.

On the way to Tremethick Moor a few species caught my eye, and they served to head the list; viz., *Tortula lævipila* and *Zygodon viridissimus* on trunks of trees, and *Atrichum undulatum*, *Hypnum confertum*, *Weissia controversa*, and *Pogonatum nanum*, on the stone hedges by the roadside. No better field could be found than this bog for studying the infinite variation of the sphagnums; many species and no end of varieties and forms grow side by side, or even intermingled in the same clump. Here are *Sphagnum acutifolium*, with its legion of variations; *S. subsecundum*, var. *rufescens*, *S. papillosum*, some bright-coloured tufts of *S. rubellum*, with the clavate male amentula of a deep rich purple, and large cushions of *S. intermedium*, which is without exception the most beautiful in habit and colour of all our sphagnums, especially when it grows to a height of ten inches or so. Intermixed with sphagnum, almost everywhere I observed *Aulacomnion palustre* and *Dicranum palustre*, and in some of the wettest parts, fringing the little watery hollows so rich in desmids and other algæ, *Hypnum revolvens*, *H. intermedium*, *H. stellatum*, *H. aduncum*, *H. sarmentosum*, and

H. scorpioides. All these have from time to time fruited here, but on this occasion none but barren specimens fell under my notice. *Campylopus flexuosus*, forming a soft green velvet on the wet heath, could not escape observation whilst crossing the upper part of the moor in order to reach the road.

Taking the footpath leading through the village of Boswednan, I found myself in the green shady lane which skirts the Trengwainton ponds, and leads up the valley. *Dicranum scoparium*, *Hypnum prælongum*, and *H. cupressiforme*, were collected on the way, and (being just those common things which one is so likely to overlook) safely lodged in the vasculum. A recess in the hedge, tapestried with Sibthorpia and overhung with ferns—one of those fairy-like nooks of greenery which nobody but the moss-hunter ever sees—produced *Hypnum denticulatum*, *Mnium hornum*, and *Fissidens bryoides*. *Thuidium tamariscinum* was growing in profusion in the old hedge, at the foot of which there is a half-boggy strip of ground well worth twenty minutes' search. Very conspicuous by the bright green colour of its soft tufts was *Sphagnum cymbifolium*, var. *squarrosulum*, a form in general appearance very closely approaching *S. squarrosum* (which I did not find) although differing in structural characters. Here I also found *Polytrichum commune* (very tall), *Hypnum cuspidatum*, *Sphagnum subsecundum*, var. *contortum*, *Bartramia fontana*, and *Hypnum stramineum*, and a rather starved specimen of *H. ochraceum* on a stone in the stream which runs at the side of the lane.

A few hundred yards up the valley may be seen a singular cavern-like excavation in a high gravelly bank, probably at one time a gravel pit, but long disused; this cave is lined, roof as well as sides, with that little gem among mosses, *Schistostega osmundacea*. Standing at the narrow entrance you will see gleams of glittering sheen, paler, greener, and colder than burnished brass, and suggesting to my mind the sparkle of the glow-worm's light. This metallic brilliancy is caused by the light being in some peculiar manner reflected by the confervoid threads of the prothallus; it disappears on close inspection, and also on removal of the plant from its natural habitat. Here and there upon the gravelly sides of the cave *Pleuridium subulatum*, in fine fruit, was growing intermixed with the Schistostega. On the earth-topped wall at the side of the path were three mosses which may be found everywhere in similar situations: *Polytrichum piliferum*, *P. juniperinum*, and *Ceratodon purpureus*; and on the lichen-covered stone hedges, *Ptychomitrium polyphyllum*, and *Racomitrium heterostichum*.

Arrived at the end of the path bordering the plantation, a magnificent landscape of heath and rock, trees and cornfields, opened out to the view, every shade and tint of colour brought out with that vivid distinctness which belongs only to a sunny September morning. Crossing the little bog which lies in the lowest part of the valley immediately below Trengwainton Carn (where I gathered a fine form of *Sphagnum cuspidatum*), I ascended the heathy hill-side, just now in the pride of its autumnal beauty. The great boulders and weatherworn stones were sprinkled with tufts of *Racomitrium fasciculare* and *Hedwigia ciliata*, the latter perhaps the most lovely of all saxicolous mosses. Amongst the heath stems and bracken *Hypnum splendens*, *H. purum*, *H. triquetrum*, and *H. Schreberi*, formed large tussocks, springy and soft as air-cushions; whilst *H. squarrosum* was pushing up its star-tipped stems wherever there was a little moisture.

The rugged crest of the carn (a Carn in Cornwall becomes a Tor in Devon) towered up stern and gray high above my head, and the huge masses of lichen-spotted rock presented tempting attractions; but the hours had slipped by unnoticed, and there remained a considerable bit of ground to hunt over; so merely gathering *Andræa Rothii* and *Bryum alpinum*, I strode rapidly on to Madron Well, or rather Madron Chapel, a ruin of great antiquity and much interest. On the ivy-covered walls I found *Neckera pumila* and *Fissidens taxifolius*, with *Bartramia pomiformis* close by; and then I made way for the road leading to Bossouljack. Curiously enough I stumbled upon *Leucobryum glaucum*, which was luxuriating among other mosses on the hedge-bank, a rather unusual habitat. The descent of a kind of ravine, locally called "Break-neck lane" (an appropriate name, for it might have been the bed of a mountain torrent, judging by its present condition), brought me to the village of New Mill, on the Gurnard's Head Road. By this time my vasculum had become heavy, and there still remained the Trevaylor Valley to explore, which could not fail to add several species.

The elder-trees on the roadside were covered with mosses—*Homalothecium sericeum*, *Ulota phyllantha*, *Cryphæa heteromalla*, *Orthotrichum diaphanum*, and *Didymodon rubellus*; and the soft mossy banks on the opposite side of the road consisted in part of *Dicranum majus*. All the way down the Trevaylor Valley the stones amongst which the noisy little stream bubbles and plunges are clothed with mosses, *Hypnum flagellare* being perhaps the most noticeable by its fresh green colour. *H. plumosum*, *H. heteropterum*, *Mnium punctatum*, and *Racomitrium aciculare*, all grow in abundance along the streamside, and *Fontinalis squamosa* floats down in long waving streamers; *Fissidens polyphyllus* occurs here and there on the banks, at times attaining a length of several inches.

In moist shady hollows nestling among fern roots, *Hookeria lucens* was flourishing in rich luxuriance, and close by it the pale *Hypnum undulatum*, and the lovely little *H. elegans*, which I once found fruiting here abundantly in one small spot. On every side the tree trunks were literally "with verdure clad" in the shape of *Hypnum myosuroides*, *H. resupinatum*, *Isothecium myurum*, as well as others which I had previously gathered. On the ground, too, were great clumps of that splendid moss *Hypnum brevirostre*, and smaller bunches of *H. striatum*, *H. loreum*, (not common) and *Thamnium alopecurum*. Close by the rude stone bridge which crosses the stream below Trevaylor House, upon the trunks of several small trees I noticed *Neckera pumila*, and on the ground at my feet *Mnium undulatum*. Rain having by this time set in steadily, I regarded it as an intimation that a sufficient number of mosses had been collected for one day, so I turned homewards. Fortune favoured me, however, during this wet walk to the extent of adding four more species to my vasculum load; viz., *Trichostomum littorale*, *Hypnum rutabulum*, *Bryum capillare*, and *Tortula muralis*.

On emptying out my vasculum and pockets in the evening I found I had collected in this day's walk eighty-three species, all of which are enumerated above. The specimens themselves I sent with this paper to the editor, asking him to accept them as a trifling souvenir of the Land's End. There are no local rarities in this list, although some of the species are confined to the west of England. It may be as well to add in conclusion that the farthest point I reached during the day is well within an hour's walk of Penzance, and that the entire distance traversed might be roughly estimated at ten miles. A cryptogamic botanist, however, is very erratic in his movements, and the hours glided by so rapidly that possibly the journey may have somewhat exceeded this; but then being quite alone I did it very leisurely.

Penzance. E. D. MARQUAND.

THE CARBONIFEROUS CORALS OF SCOTLAND.

A STORY OF HARD WORK.

NOTWITHSTANDING the palæontological wealth of the carboniferous limestone in England, Wales, and many parts of Ireland, it is doubtful whether Scotland does not surpass them. And it is certain that for number and variety of fossil corals, reef-building, and otherwise, no other part of Great Britain can compare with it. Fortunately, among the numerous diligent workers in Scottish fossils, one man, Mr. James Thomson, F.G.S., of Glasgow, has devoted the whole of an enthusiastic

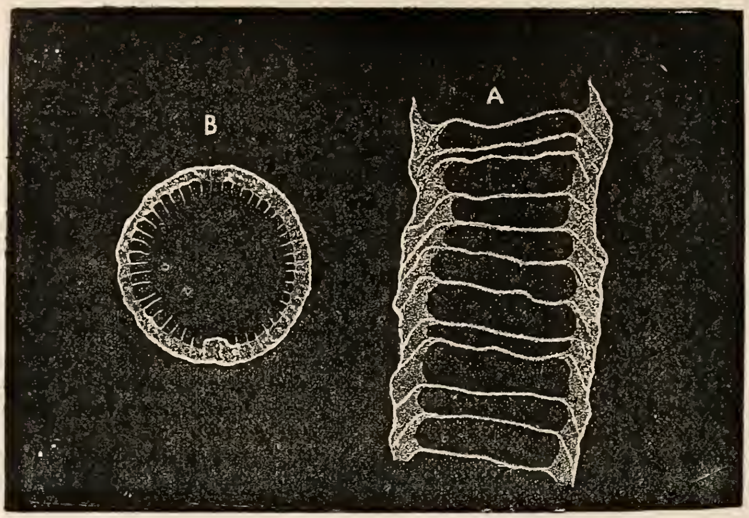


Fig. 168.—Sections of Fossil Carboniferous Corals (*Amplexus coralloides*).

Fig. 169.—Section of Fossil Coral, showing structure.

life to the study of the carboniferous corals of his native country. His industry has been most remarkable, and the results of the highest zoological value. Besides adding and describing many new genera and species to the long list previously known, Mr. Thomson has worked out the life-histories of many forms from the ovum to the adult and even senile

Fig. 170.—*Carcinophyllum Kirsopiana.*

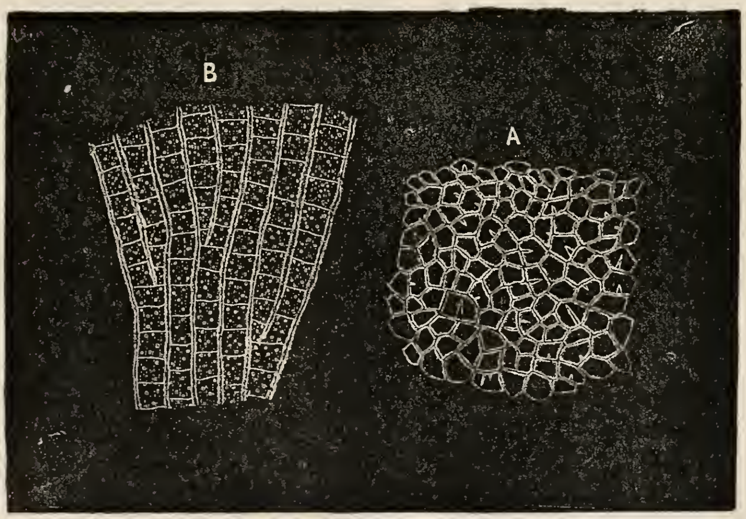


Fig. 171.—Alveolites (enlarged).

state. He has shown how the so-called species and even genera merge imperceptibly one into the other. Indeed, we know of no other series of contributions to invertebrate palæontology which bear out more fully the great doctrine of evolution.

Mr. Thomson's papers are scattered through a large number of magazines, as well as the Transactions, &c., of various learned societies; but we cannot help thinking, that if they could be collected and published (with their abundant and highly-finished plates) in one volume, they would be a great boon to students of this branch of palæontology all over the world. Among the most important of these papers which have appeared within the last five years are the following:—"Description of a New Genus (Kumatiophyllum), and several New Species of Rugose Corals, from the Carboniferous Limestone of Scotland," "On a New Genus (Albertia) of Rugose Corals," from ditto; "Contributions to our Knowledge of the Rugose Corals," from ditto; "On the genera Alveolites, Amplexus, and Zaphrentis," from ditto; "A New Family of Rugose Corals, including the genera Cyclophyllum, Aulophyllum, and on the genus Clisiophyllum" (pp. 81); and last, but largest of all these intensely laboured productions, just issued by the Glasgow Philosophical Society, a paper of two hundred and fifty pages, illustrated with fourteen crowded plates, "On the Development and Generic Relation of the Corals of the Carboniferous System of Scotland." In the latter contribution Mr. Thomson has worked out, with the most admirable detail, the embryological development of each species of coral, and the plates (some of which contain twenty or thirty figures) give both transverse and longitudinal sections, showing gradual differentiation and increasing complexity of structure.

Fig. 172.—Zaphrentis.

Fig. 174.—*Histiophyllum Beithianum.*

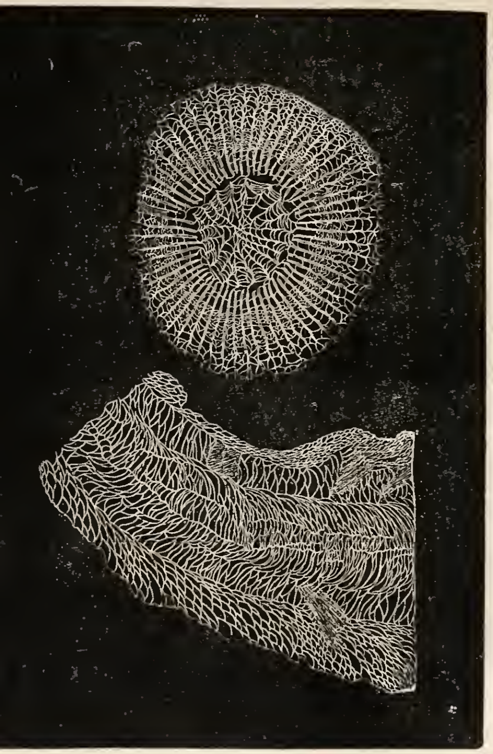


Fig. 173.—*Centrophyllum subcentricum.*

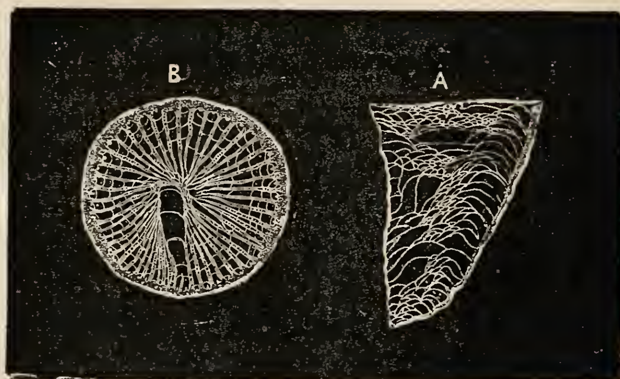


Fig. 175.—*Zaphrentis Bowerbankii.*

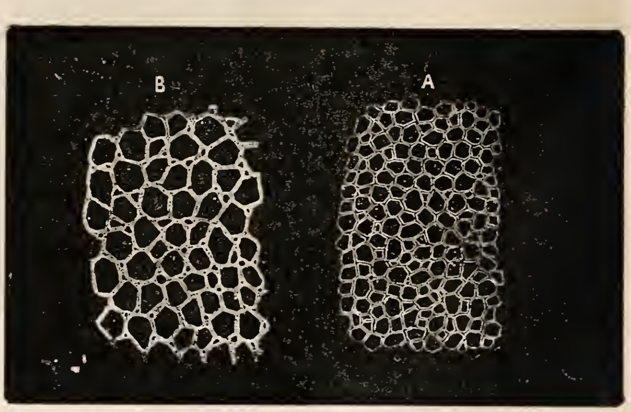


Fig. 176.—A, Favosites; B, Chætotes.

The whole of the herculean task of personally collecting, cutting (or superintending the cutting) of sections of every kind, something like twelve thousand in number, so as to employ the microscope in investigation, has been patiently undertaken and triumphantly concluded by Mr. Thomson alone. Nay, more, it was necessary, to render his labours scientifically valuable, that the structural details of the sections should be engraved. In the old woodcut process this meant the outlay both of time and money. Mr. Thomson set to work to overcome the difficulty, and he did it! Of course his process is his own property, but we cannot but quote from one of his papers in which he gives a short sketch of the various methods attempted to delineate the internal structure of fossil corals, and sets forth his own in the following modest language:—"It would be tedious to enumerate the various other unsuccessful attempts I made in the way of obtaining casts fitted for the accurate reproduction of structural details; but I may say, generally, that these attempts were very numerous, that they occupied a large portion of my leisure time for several years, and that they involved a very considerable amount of expense. Out of these laborious attempts, however, there finally emerged the process which I now employ, and for which I claim the merit of being applicable to the accurate delineation of the minutest detail of coralline structure, and of being comparatively inexpensive."

The illustrations accompanying this notice have been specially obtained from Mr. Thomson in order to show the complete effectiveness of his system above referred to. To bring out this alone would have been sufficient to give a man a decent scientific reputation; but when we remember it is the result of, and due to a preceding difficulty, we are all the more surprised at the perseverance which has so successfully surmounted both!

Fig. 178.—*Cyclophyllum fungites.*

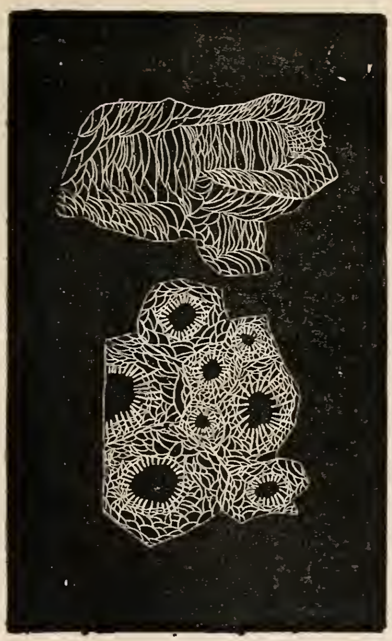


Fig. 177.—*Thysanophyllum orientale.*

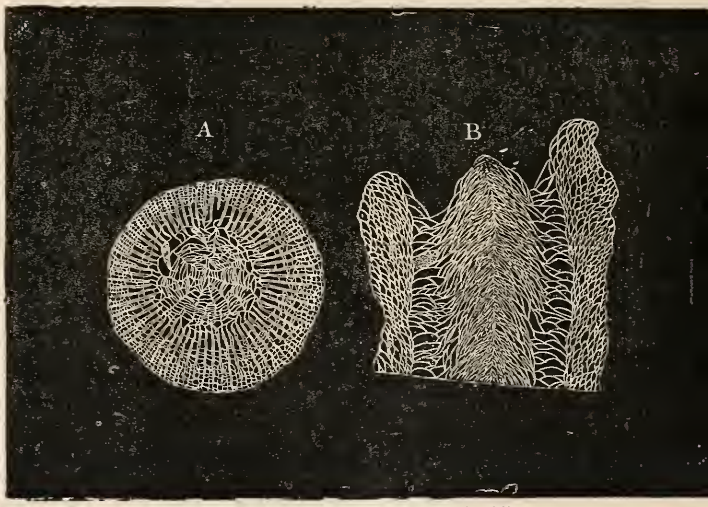


Fig. 179.—*Clisiophyllum Bowerbankii.*

Mr. James Thomson is not a wealthy man. All his life he has had assiduously to follow his business. He never neglected it—he is following it still. But all the above work has been done at the expense of his own time and his own pocket. All honour to such men! It is not without pleasure that we see his work recognised. He has been elected an honorary member of the Royal Ducal Society of Jena, corresponding member of the Royal Society of Science of

Liège; and, what must be much dearer to the heart of so genuine a Scotchman, the Philosophical Society of Glasgow have recently honoured both themselves and him, by electing him President of their Biological section.

We hear of the Government grant of £4000 a year, through the Royal Society, for aid to scientific workers, and of the scramble to get a share. Mr. Thomson has never joined in the scramble; but we think some of such fund would not be unwisely expended in helping him to give his collected papers and their illustrations to geological students in a collected and cheap form.

MICROSCOPY.

Aylward's Pond-Life Apparatus.—Mr. H. P. Aylward, of 15, Cotham Street, Strangeways, Manchester, has recently introduced a set of apparatus for the capture of living organisms from ponds, which is not only novel and effective, but a marvel of cheapness. The capturing apparatus, as such, consists of the following articles. 1. A sharpened recurved hook for detaching vegetable growths. 2. A coiled ring into which an ordinary four-ounce bottle with a wide mouth can be screwed, and the uses of which are obvious. 3. A case for the bottle made of japanned tin provided with a strainer of a novel type. 4. A tin case with tube bottles for holding the collected organisms. The first and second of these pieces are provided with a fixture of stout wire coiled into a conical corkscrew arrangement which permits of their being screwed on to the end of any ordinary walking-stick with the utmost security. The japanned case with strainer consists of a cylindrical box five inches high and two inches diameter; the upper open end of this box is composed for about two inches of a fine wire gauze. When a bottle full of material has been collected, it is emptied into this box, the material settles down, and the vast bulk of the water flows away through the upper gauze portion, leaving the gathering free for examination. What is wanted may thus be picked out and placed in one of the tube-bottles of the storage tin, and the operation continued till all the tube-bottles are filled. A final gathering may then be carried in the collecting bottle, which, after being unscrewed from the walking-stick can be placed in the straining box, and the whole *multum in parvo* apparatus carried in one's coat-pocket without attracting a crowd of admiring country bumpkins on the way home. We have given Mr. Aylward's apparatus the trial of over a month's constant usage, and are more pleased with it than with our more expensive and cumbersome paraphernalia; we therefore strongly recommend it to the notice of our readers.

The Quekett Microscopical Club. — The October number of the Journal contains the following papers:—"List of the principal objects found at Keston, May 19th, 1883," by Dr. M. C. Cooke; "On the Work of the Coast Survey and the Fish Commission of the United States," by Romyn Hitchcock; and the Address of the President (Dr. M. C. Cooke), on "Biological Analogies," a most interesting paper full of original suggestions and side-lights on several well-known objects, and their surroundings and relationships.

How to Prepare Head of Gnat.—I should be glad if anyone will inform me how to prepare and mount the head of a mosquito or gnat, showing labium, mandibles, maxillæ, tongue and labrum. I find, to begin with, great difficulty in separating the different parts without damaging them.—*E. F. B.*

On the Classification and Labelling Microscopical objects.—To the many valuable suggestions by I. C. Thompson in Science-Gossip for November, locality might be added with advantage in the labelling of microscopical objects. To anatomical or structural specimens locality may signify little, but it is a most important consideration in the distribution of species. The omission of name of genus or species may generally be found, but the omission of locality in most cases can seldom or never be obtained.—*D. R.*

"Studies in Microscopical Science."—Nos. 4, 5, and 6, of this welcome serial have been dealing with the morphology, theory, and form of the cell, the blood of frog, all of which have been illustrated by beautifully coloured plates and excellently mounted slides.

A New Morphological Institution.—We understand that a Morphological Laboratory is about to be instituted in London by Mr. John Ernest Ady, whom most of our readers will remember as the author of Vol. i. of the "Studies in Microscopical Science," nominally edited by Mr. Arthur C. Cole, the well-known object mounter, who prepared the slides in illustration of that work. At present the laboratory is limited to the production of microscopical preparations, and especially of rock and mineral sections, in which latter Mr. Ady has the co-operation of perhaps the most efficient preparer in Great Britain, Mr. H. Hensoldt. Messrs. Ady and Hensoldt propose to issue a series of rock sections, with explanatory etched diagrams and letterpress descriptions, early next January. No fewer than twenty-four exquisitely prepared specimens, accompanied with copious notes and sketches, and issued fortnightly, will be furnished to subscribers for a sum of a guinea and a half. As the supply of the work can be but limited to about one hundred copies, we strongly recommend our readers to make an early application. This limitation we hear is compulsory, because the labour requisite for the production of a greater number of specimens cannot be secured. The laboratory will include an educational, and an exchange and mart department. For further information, we refer our readers to 7, Machell Road, Nunhead, London, S.E.

ZOOLOGY.

Setting Board for Lepidoptera, &c.—The setting boards used by most entomologists possess this disadvantage—that they cannot be used for setting insects in the Continental fashion, and in some cases the butterflies must be set at the very bottom of the pin, as the wood at the bottom forms an impassable barrier to pins. The enclosed sketch shows a setting board in which these difficulties are obviated. The grooved cork, A, instead of being glued to one wooden board, is fastened on to the two boards, B B, the groove between them corresponding exactly with the groove in the cork. These in turn are held together by three slips of wood, C C C, to which they are firmly nailed. In setting insects the pin should not be run into the groove just above the slips, C C C. If run into the cork anywhere else, the pin can be pushed through to any depth required, and as a rule the slips, C C C, are so high that when the board is laid down on a table none of the pins touch the table. After setting the insects I cover the wings by pinning down paper, and hang the setting board on the wall in a dry room.—*G. H. Bryan.*

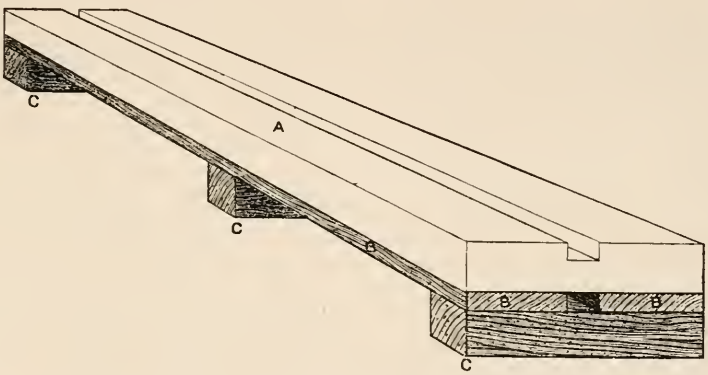


Fig. 180.—Setting Board for Lepidoptera.

Artificial Fertilisation of Oyster Spat.—Mr. J. A. Ryder, the well-known American naturalist, whose telegram to the effect that he had discovered a method for artificially fertilising oysters we have already recorded, gives a full description of his method in the American weekly journal "Science," for October 5th. He there concludes by stating that oyster spat may be reared from artificially fertilised eggs; that such will grow just as fast in enclosures, like that adopted by himself, viz. a pond excavated to the depth of three and a half feet, near the sea, and connected with the latter by a trench two feet wide, and three and a half deep; a wooden diaphragm in a shape of a perforated box, lined with cloth, and filled with clean sand, so that no matter could get to the pond without first filtering through. This was adopted in order to exclude natural fry from the pond. Mr. Ryder shows that food for the oyster spat is rapidly generated in such an enclosure. The density of the water is not materially affected by the rain, and, moreover, ponds may be readily excavated in salt marshes, and can probably be used for fattening oysters for market. In getting the oyster spawn, the right shell of the adult mollusc was removed, and the reproductive organs were stroked with a pipette to force out the eggs and milt. These were mixed together in water, and allowed to stand in pails for a few hours, until the ova had passed on to the swimming stage. The spawn was then distributed in various parts of the pond, and left to take care of itself. Mr. Ryder says that pond culture has the decided advantage of effectually excluding the great enemies of the oyster, whelks and star fish.

Infusoria as "Messmates."—At the recent annual meeting of the American Society of Microscopists, Mr. Kellicott gave an account of some stalked Infusoria, one of which was new to science, and had been named *Cothurnia variabilis*, which were found only in the gill chambers of the crayfish. They were so abundant as to encumber the gills of their host.

"Parrots in Captivity."—By W. T. Greene, M.D., &c. (London: George Bell & Sons.) Part iv. of this work is to hand, treating on the Alexandrine parrakeet (*Psittacus eupatrius*). The ring-necked or Bengal parrakeet (*Psittacus torquatus*), and the blossom-headed parrakeet (*Psittacus cyanocephalus*) All are beautifully illustrated by coloured plates.

"How to Use our Eyes and How to Preserve them"—by John Browning, F.R.A.S. (London: Chatto & Windus.) This is a shilling brochure, written by perhaps the best scientific optician of the day, and illustrated by thirty-seven woodcuts. We sincerely commend its perusal to those of our readers who are in search of spectacles, and strongly advise them to study it before buying a pair, inasmuch as the preservation of good eyesight may depend upon it.

Principal Dawson and Evolution.—This well-known geologist has long been a bitter opponent of Evolution. His latest declaration is that "this evolutionist doctrine is one of the strangest phenomena of humanity!" Dr. Dawson reminds us of the Irish juryman who declared of his fellows that "eleven more obstinate men he never met in all his life!"

Essex and Chelmsford Museum.—The Council of this institution are doing their best to make it attractive by a series of public lectures. Among those for the present session are one by Dr. J. E. Taylor, F.L.S., editor of Science Gossip, on "Coral Animals and the work they do," and by the Rev. S. T. Gibson, B.D., on "The further development of Solar Science."

The Hertfordshire Natural History Society.—The Transactions of this Society for August and October, contain the following papers:—Part v. vol. ii.—"Report of the Council of field meetings," &c. Part vi. vol. ii.—"Windsor Forest and its Famous Trees," by the Rev. Canon Gee, D.D. "Meteorological Observations taken at Wansford House, Watford, during 1882," by John Hopkinson F.L.S. &c. (hon. sec.); "Notes on Birds observed in Hertfordshire during 1882," by John E. Littleboy; "Notes on the Re-introduction of the Beaver into Britain," by A. Hawks; "Some Experiments on the Physics and Chemistry of the sap of Plants," by Professor Attfield, Ph.D., &c.

The Lambeth Field Club.—The Twelfth Annual Soirée and Exhibition of the Lambeth Field Club and Scientific Society will take place on Monday, 7th January, 1884, at St. Philip's School-rooms, Kennington Road, S.E.

Hemel Hempstead Natural History Society.—The following lectures, arranged for by the Council of the Society, have recently been delivered to large audiences in the Town Hall. "On British Birds," by J. E. Harting, F.L.S. &c., editor of the "Zoologist," and on "The Origin of Landscape Scenery" (illustrated by the oxy-hydrogen lantern), by Dr. J. E. Taylor, Editor of Science-Gossip.

BOTANY.

Protoplasmic Continuity in the Florideæ.—In a paper on this subject read before the Biological Section of the British Association at its Southport meeting, Mr. Thomas Hick, B.A., B.Sc., brought forward a number of facts respecting the protoplasmic structures of the Florideæ, which are likely to have an important bearing upon some recent biological speculations. As every botanist knows, the tissues of plants are built up entirely of cells and cell modifications, and the life of the plant is, so to speak, the sum total of the life of the protoplasmic substances contained within the cells. Hitherto it has been the prevalent opinion that the living matter of each cell was more or less independent of that of other cells, each separate portion exhibiting its special vitality, and taking its own course of development, except so far as the influence of the environment prevented it doing so. From the paper referred to, it would seem that in the Florideæ this view can be no longer maintained, inasmuch as the protoplasmic structures of these plants are all inter-connected. A large number of specific forms belonging to the more important genera have been examined by the author, who has found, in every case, protoplasmic threads connecting the contents of contiguous cells. This he found to obtain, not merely in certain parts of the plants, but throughout the whole frond from the point of attachment to the tips of the ultimate branches. The protoplasmic structures are therefore continuous, and instead of the cells being independent of one another, they are united by living bonds in the closest possible manner. The protoplasmic connecting threads retain the power of growth and of giving rise to differentiated structures, just like ordinary protoplasm, so that in the older parts of the fronds they are stouter and less homogeneous than in the younger. It would seem, therefore, that in the Florideæ, each plant constitutes a single organism, whose several parts are organically united together, and are consequently capable of acting and re-acting upon one another. This is found to be the case both with the simple filamentous species and those which become more or less densely corticated. Should similar connections be demonstrated to exist generally in the higher plants—as has already been done in certain special tissues of some of them—we shall be in a position to give a rational and sufficient explanation of several difficulties which have hitherto sorely puzzled the vegetable physiologist. At any rate, there will be no difficulty in explaining the transference of certain crude and elaborated food materials, and the remarkable transmission of motor and other impulses which have long been known to occur in certain plants.

Fasciated Stems.—These are explained by Dr. Maxwell Masters to be called after fascia, a ribbon, and not the fasces of the Roman lictor. I may add to the plants enumerated in your October number, 1883, ash, sycamore, *Cotoneaster microphyllus* (very frequent), hawthorn, holly, mangel wurzel, nasturtium, wall-flower, *Auricula*, *Asparagus*.—*J. Price.*

Unseasonable Foliage.—A row of horse-chestnut trees in the Karls Platz, in Munich, have behaved unusually this autumn. In August, owing to sudden cold weather and biting winds, many horse-chestnuts lost their foliage entirely. The leaves shrivelled up and fell off, leaving the trees naked as in winter. Those in question were left in this plight; but late in September, when the early Munich autumn was far advanced, they put forth fresh leaves as in spring, the new green contrasting cheerfully with the sere boughs of neighbouring trees. Not only so, but blossoms also appeared, which however did not reach perfection. The trees in question are young and vigorous, and it remains to be seen how far their foliage next year will be impoverished by their untimely effort.—*L. S. G.*

Daisy Sleep.—A few months ago an article on this subject appeared in Science-Gossip. The usual and most natural explanation of the phenomenon was given, viz., that the closing of the white rays took place to protect the pollen of the yellow florets. At the time the article appeared I was in the habit of walking in my garden towards evening and was daily observing the behaviour of the well-known Paris daisy (*Chrysanthemum frutescens*) at that hour. No sooner does the sun begin to wester, than the white rays instead of closing, like the daisies on the lawn, droop and droop till they are almost packed out of sight. I went out one night with a lantern about ten o'clock to look at the plant. The rays were tightly packed down, and the disks were wet with dew. There was no fear of the dew injuring the pollen here. I fancied the flowers might perhaps be fertilised by night insects; but I could not detect any small insect on the florets, nor was I able to witness any visits of larger ones. It would be satisfactory to have this phenomenon explained and co-ordinated with the behaviour of *Bellis perennis*.—*William C. Hey.*

Azolla Caroliniana.—This curious little water plant is just now to be seen in a very strange position on a large pond near Pinner, Middlesex: it is a native of Carolina, U.S., and was brought to this country a few years since to be grown in tanks made in greenhouses. In its present position at Pinner it has succeeded in covering the pond, and the effect is very striking, as it overrides the green chickweed; in places its red tint is very curious, and totally unlike any native pond colouring. I have examined several ponds in the immediate vicinity, and have found a small quantity of it growing on them, so that in course of time it will be, no doubt, as common in this neighbourhood as chickweed. As it is grown in private gardens close by, there is no doubt as to its origin where it is now growing.—*T. W. Odell, Pinner.*

A Gossip about Fungi.—The following names of the figures illustrating Mr. George Massee's interesting papers on this subject, in our October and November numbers, will, no doubt, be helpful to young students:— Fig. 138. *Agaricus muscarius*, natural size; *a*, volva; *b b*, warts, which are the remains of that portion of the volva carried up by the growth of the stem, and torn into pieces as the pileus expanded; *c*, annulus, or ring; *e*, pileus; *f*, stem; *g*, lamellæ, or gills. Fig. 148. *Agaricus squamosus*, natural size; *a*, veil; *b*, ring. Fig. 149. *Cortinarius cinnamomeus*, natural size; section showing adnate gills. Fig. 150. *Agaricus cervinus*, natural size; section showing free gills. Fig. 151. *Agaricus pyxidatus*, natural size; section showing decurrent gills. Fig. 134. Portion of hymenium of *Coprinus atramentarius*, magnified 720 times; *a*, basidium, with its four spicules; *b*, spores springing from the spicules, two have been removed; *c*, cystidium. Fig. 137. Ideal tangential section through the pileus and gills of an agaric; *a*, flesh of pileus; *b b*, trama; which is that part of the flesh of the pileus that forms the gills; *c c*, hymenium, or spore-bearing surface covering the gills. Fig. 155. Spores of *Agaricus semiglobatus*, magnified 720 times. Fig. 156. Spores of *Agaricus vaginatus*, magnified 720 times. Fig. 152. Spores of *Boletus edulis*, magnified 720 times. Fig. 153. *Agaricus melleus*, spores magnified 720 times. Fig. 154. Spores of *Agaricus costatus*, magnified 720 times. Fig. 157. *Scleroderma vulgare*; *a*, natural size; *b*, section of same; *c*, peridium; *d*, hymenium. Fig. 159. *Peziza rutilans*, natural size. Fig. 160. *Hypoxylon multiforme*, natural size. Fig. 165. Ascia containing sporidia of *Hypoxylon multiforme*, magnified 720 diameters. Fig. 161. Section through *Hypoxylon multiforme*, magnified 10 times; *a a*, perithecia; *b*, ostiola; *c*, stroma; *d*, matrix (dead wood), on which the plant is growing. Fig. 162. Section of *Peziza scutellata*, magnified 10 times; *a*, hymenium; *b*, cellular cup or receptacle. Fig. 136. Ascus containing thirty-two sporidia and paraphyses from *Ascobolus Pelletieri*, magnified 720 times. Fig. 135. *Mucor fusiger*, magnified 500 times; *a*, sporangium hypothetically transparent to show the indefinite sporidia, *b*; *c*, upper portion of fertile hypha. Fig. 163. Spores of *Helminthosporium folliculatum*, magnified 720 diameters. Fig. 164. Portion of hymenium of *Peziza rutilans*, magnified 720 times; *a*, ascus; *b*, sporidia; *c*, paraphyses.

Bats in the City.—During the evenings of the last week in October, a bat was seen flying up and down Cannon Street, between the Railway Station and King William Street.—*J. D. H.*

GEOLOGY, &c.

The Locomotive Organs of Trilobites.—Many years ago, Dr. Henry Woodward, of the British Museum, argued that the Trilobites, found so abundantly in the Cambrian, Silurian, and Devonian formations, possessed legs. He even figured what he believed were the calcic arches which supported these useful appendages. But geologists entertained the belief that these fossil crustaceans were legless. Now comes from Cincinnati news of the discovery of one well-known genus of Trilobites called Asaphus, a specimen of which shows the fossil legs. It had previously been declared that another genus (Calymene) had been found with similar ambulatory appendages.

Gold in Limestone.—Professor Schaeffer states that gold occurs in a ferruginous cretaceous limestone, in Williamson County, Texas. He thinks it must have originally existed in the limestone in Pyrites, and that the latter was subsequently removed and the gold locally concentrated.

Ireland and its Geology.—It was the late Lord Beaconsfield, we believe, who connected the peculiarity of the Irish temperament with the contiguity of their country to "the melancholy ocean"? A German geologist, Professor Von Lasaulx, has gone further, and in a lecture recently delivered at Heidelberg, he drew an ingenious parallel between Ireland and Sicily, and explained the backward state of the inhabitants of the two islands, and the disorders of which they have been the theatre, by the nature of their geological strata, and the consequent physical formation of their coasts and their positions.

The Geologists' Association. — No. 2 of vol. viii. of the Proceedings of this Society, besides reports of the ordinary meetings, contains papers on "The Diamond Rock of South Africa," by W. H. Hudleston, F.G.S.; and an abstract of the paper, "A Theory of possible causes of the elevation and subsidence of parts of the Earth's Surface," by W. F. Stanley. In addition there are two pleasantly written accounts of excursions, one to the Mineralogist Department of the British Museum, and the other to Hythe.

Scientific Instruments. — We have much pleasure in calling attention to Mr. Charles Coppock's "Illustrated Catalogue of Scientific Instruments." The illustrations are numerous, and all are good. The mere turning over of the pages, 128 in number, shows us at a glance what a multitude of auxiliary instruments are now placed at the service of every department of scientific research.

NOTES AND QUERIES.

Disease of Puss Larvæ.—In reply to Mr. Waters's query—as to whether my larvæ were kept in too confined a space, I assure that gentleman that such was not the case. I have lost larvæ through the above cause, but in this instance there were but a dozen larvæ in all, and they were kept in a large roomy cage, well ventilated.—*W. Finch, jun., Nottingham.*

Descriptions of Caterpillars.—The following descriptions are from "The Larvæ of the British Lepidoptera and their Food-plants," by Owen S. Wilson. *Lycæna arion.*—At eleven days old Mr. Porrit thus describes the caterpillar: "Length about $\frac{1}{6}$ of an inch, stout, but tapering towards the head, which is much smaller than the second segment; general colour dirty pink, the head brown and shining; behind the head is a large, almost plate-like dull black mark, from which extends the rather broad, conspicuous rust-coloured dorsal line; the body is sparingly clothed with light brown hairs."—"Entomologist." Food plant—Wild thyme. Time of appearance for larva May and June. Localities: Bedfordshire, Buckinghamshire, Devonshire, Dorsetshire, Gloucestershire, Hampshire, Herefordshire, Huntingdonshire, Northamptonshire, Somersetshire and Wiltshire. *Nola centonalis.*—No description of the caterpillar. Time of appearance.—Imago, July, and August. Locality: Freshwater, Isle of Wight. *Ennomos alniaria.* About 1 inch, 7 lines long, pale brown, rough, and wrinkled. Rather slender, and tapering from the thirteenth segment to the head. The fourth segment is enlarged ventrally, the sixth has a dorsal enlargement in the form of a transverse rounded ridge; the ninth has a somewhat similar ridge tipped with ochreous; the seventh and eighth have each two small warts on the back, and the seventh a series of four warts placed transversely on the ventral surface; there are also two small black warts on the twelfth; the anal flap terminates in two points directed backwards. Head flat and broad in front. Food plants are, alder, beech, birch, lime, oak, poplar, and sallow. The pupa is spun-up amongst grass, &c., near trees. Time of appearance for larva is June and July. Common in Great Britain and Ireland. No description of larva of *Leucania lorei.* Only two imagines have been taken in England—both in Sussex.—*R. A. R. Bennett, Walton Manor Lodge, Oxford.*

Water Insects.—Can any one tell me through your "Notices to Correspondents," or otherwise, the names of two water-insects found lately in the tank in our green-house? They have eight legs, and are shaped like spiders, very small, about $\frac{1}{8}$ of an inch, of a bright crimson or cochineal colour, one with black spots, like a lady-bird, the other plain. I never saw any insects like them before, and my idea is that they may have been hatched from eggs contained in a bunch of pectora or New Zealand duckweed growing in the tank. I have the insects alive in a globe of water.—*W. R. Tate.*

Early Emergence of Insects.—During the past season I have reared a number of exotic lepidoptera from the egg, amongst others, *Attacus Pernyi* and *Attacus Cynthia* (silk-producing bombyces). These having "laid up," or more properly speaking, spun their cocoons, I was much surprised about three weeks afterwards, at seeing a fine imago (male) of *A. Pernyi* emerge from its cocoon, not having expected it till next May. Two cynthias also have since emerged. Is it usual for them to emerge so soon? The other cocoons of the same batch of larvæ are still in my possession, and there are no signs of the imagines emerging.—*W. Finch, jun., Nottingham.*

May-Flies.—Many years ago, I was curate at Shipton-on-Cherwell. The meadows had been mown some time. The May-fly season over. Walking along the canal with my wife, we noticed thousands of May-flies. "These, said I, are new to science." I rushed back for my scissors-forceps net. Soon had one, held it up in triumph. Wife, "I only see a little yellow thing with no tail:" only too true. I saw the fly trying all he could do to get out, but no tail. Looking more closely I found a long bit of withered grass, about five times the length of my captive. Caught a lot of them. All alike, with their long bit of withered grass clasped in their arms. Showed them to the squire and an old parsonic angling friend. The up and down movement was solemn and sedative, like a poker with wings, not the beautiful abdominal curve of the true May-fly with her three caudal hairs. It was a solemn and grave observance—the purport whereof I fail to understand.—*A. H. B.*

Species of Chrysomela.—The chrysomela which I had hitherto supposed to be *polita* was rather larger than the one described in the July number, and of an uniform brassy colour, the legs inclining to reddish; of this form (*C. staphylaca ?*) I have found specimens at Chislehurst and at Hammersmith. I have also specimens of a larger species of chrysomela (which I take to be *C. violacea*) from Chislehurst and St. Mary Cray, Kent. It is of a bluish-violet colour; its wings are pink. Besides these I have also two other species of chrysomela, one is rather small, and of a grass-green colour; it was found on Hypericum (?) at Chislehurst; the other is larger, its form is not so globular, its wings are rosy-red, and its thorax and elytra are of a brilliant green colour; it was found, I believe, at Constantinople. I shall be much obliged to Mr. Hey if he will kindly name these for me; I should also like to know the name of a curious Longicorne that was brought to me at Beckenham, in May, 1882. I put it into a box, and when I went to kill and set it I found it had escaped through a hole which I had not before noticed. I at once sat down and wrote the following description (which is, I think, correct) from memory. Length about half an inch (perhaps more), thorax wrinkled (?), elytra very curiously marked; nearest the thorax was an umber-brown portion, which was sharply cut off on its lower side by a white line, which, together with that on the other elytron, formed a wedge-shaped mark, the point of which pointed towards the thorax. Below this was another similar line; the rest of the elytron was grey, The grey part, as far as I can remember, comprised about half of the elytron. It was found near an oak-tree, from which, on the same day, I got a larva of *Helida quercana*, but could not find any more specimens of this curious Longicorne.—*T. D. A. Cockerell.*

Entomologising on the Transkei.—The following is an extract from the letter of a naturalist:—"We are going on much as usual here. Our stay down at the sea was very refreshing, and has done us all good, and we all enjoyed it, although our only excitements were bathing and catching butterflies. It was a wonderful year for these, and we did right well. I trust some day to show you the collection we have made here; it is a very good one, and I have no doubt by far the best ever got by one man in South Africa. I think we have nearly 200 sorts. Some of our rounds with various insects have been good and interesting. There is a genus called Nymphalis, the members of which are chiefly large butterflies; by-the-by, Xiphares, you know, who is the largest, but by no means the smartest flier. There is one of them, *Nymphalis Brutus*, who flies as fast as—if he chooses—any swallow, and but seldom comes near the ground, and is generally seen soaring over the highest forest trees. He is a most lovely insect, and my spirit yearned over him and my heart craved to get him within the magic circle of my net. Two years ago I found a place where there were a few of them, but they never came near the ground. I felled the tree over which they frequently flew, and on the trunk, some six feet from the ground, spread sugar and wine, &c., a most succulent mixture. Alas! in vain. I then got honey, and spread that. Bees and inferior butterflies came in swarms and consumed my honey, but Brutus was not to be inveigled. I was in despair; but one morning for breakfast I was consuming some very 'golopshous' greengage jam, and thought I to myself, 'Drat that Brutus; wonder if he'd like greengage jam.' I took the balance of the pot with me and spread it on the tree. In 30 seconds Brutus was there, in 35 he was in my net, and in 60 in my collecting box. Another came and shared a similar fate. I then of course thought I was going to take all the Brutuses (? Bruti or Brutes) in the Transkei, but not another came, and, although I saw many flying over, not a single one came near the jam again. I then of course thought it was a fluke, and that anything else would have done as well as greengage jam, and I mourned for all the wasted pots of that most excellent decoction of turnip, potato, and old plum stones. Well, this visit down to the sea side, Cyril and I found a most charming piece of forest on the banks of the Lora river, a mile or so from our huts, which was a glorious place for butterflies, and here we saw many Bruti soaring about over the trees. We looked at them and admired their splendid plumage and gorgeous array with longing eyes. Again I had recourse to saccharine luxuries; at first honey, secondly a bag wet with sugar straining and redolent of molasses. No go! Brutus still flew about triumphant and jeering, with the end of his off fore leg applied to the end of his proboscis. Dash my buttons! thought I; but I will try the greengage once more. I spread a whole pot of it on the sugar bag, lit my pipe, and sat me down to watch. In less than an hour I had caught four beauties, and so intent were they on consuming the mixture, that, when once settled, I believe I could have taken them with my fingers. Well, again I thought I should catch lots of them. Not a single one settled on the jam again, although I wasted lots of it in trying places where there were many of the desired butterflies. We did by luck catch two more of them, but not a single one settled on the jam after that first hour. We also found a place where a most lovely butterfly delighted to disport himself. This was *Nymphalis Ethalion;* the deepest purple-black all over, except for two or three tiny blue spots on his hind wings, which are adorned with four tails. This pet place of his was about 40 or 50 feet from the ground, on the top of a tree covered with monkey ropes and creepers, uncommonly thorny ones too, worse luck. After much groaning and grunting, tearing of hands, shirt and breeches, I managed to skin up and crawl through the creepers, and wedge myself with my head out atop, butterfly net and pole in hand; the same old salmon rod that you used to use at Fairy Knowe. After a time I had a regular high road up to this place, and used to hip up in a few seconds when I had got the way clear. I think I caught from my point of advantage seven of the beggars; which are a wonderful prize. I used to spend hours up in this place, and got very artful in nailing them. I must say I do delight in bug hunting, and catching a good butterfly causes very much the same sensation that shooting a 'cock' used to do in days gone by. So much for yarns on 'bugs.'"

VARIETY OF HELIX NEMORALIS.—Last spring, I discovered some half-grown specimens of an undescribed variety of *H. nemoralis*. The shells were almost as transparent as glass, of a beautiful lilac colour. I kept them in confinement, and fed them on nettles and coltsfoot. When fully grown the colour was lighter, slightly inclined to brown; one had a few light streaks in the line of growth. Another had broader interruptions of a yellowish tint. Mouth and rib pink with a tinge of lilac, diameter 18 mm. On extracting the animals, I was surprised to find them of a bright yellow colour, except the heads and tips. Specimens of this variety since found, which had come to maturity out of doors were rather larger, duller in colour, and less transparent, with the body of the animal the ordinary colour.—*W. Gain*, *Tuxford.*

A MIDSUMMER RAMBLE OVER THE SURREY DOWNS, &c.—In reading over the above article in SCIENCE-GOSSIP by the author of "Insect Variety," I was much surprised by the following curious incidents your correspondent met with, viz., *Argynnis Euphrosyne*, *Venilia maculata*, "out in gay profusion," and a specimen of *Apatura Iris* (purple emperor) on an oak spray. Is he quite certain as to the latter being that species? as the two former insects are on the wing in May and early part of June, and *A. Iris* makes its first appearance in July, and to meet with three different insects on the wing at the same time is very unusual. Your correspondent also states, "the glare of the sunlight, and perpetual churr of the fern-owl becomes tedious." I have never heard before of this bird churring in the day-time, in sunshine, as this species is on the move only for two hours out of the twenty-four, those being one hour before sunrise, and one after sunset, when it may then be heard churring throughout the twilight. No doubt other readers besides myself would be obliged for further information as to dates, and time of day, the author of "Insect Variety" met with the circumstances mentioned above, which I am sure would be worthy of record.—*Fred. Frohawk.*

THE SUNDEWS.—I have read with much interest your correspondent's letter in the August number of SCIENCE-GOSSIP on Sundew, but I must beg to differ from him on one point, namely that sundew cannot be grown in confinement. About six weeks ago, in the course of a ramble on Dartmoor, I gathered a quantity of *Drosera rotundifolia*, or rather, took it up with its attendant moss. I brought it home and put it in a china dish and kept it moist. It is now flourishing, after nearly seven weeks' separation from its favourite locality. It was in full flower when I first found it, and since then a second crop has blossomed, new leaves and flowers constantly forming. I may mention further, that it has been in a sunny balcony and exposed to every change of our variable climate as when in a wild state. I think the failure in rearing it in confinement is perhaps chiefly attributable to its being thought necessary to force it under glass, &c. I have watched it carefully, but have never noticed any flies on it. One I placed on a very sticky leaf from a spider's web, however, caused the leaf to contract slightly, and in time became absorbed. I am quite of the opinion of your correspondent, E. D. T., that it is not that drosera is rare, but that it requires practice and sharp sight to discover it.—*J. P. Smythe, Devonshire.*

GOLD-FISH.—If Mr. Easton keeps his fish in an aquarium without weeds, &c., the cause of failure is apparent. He should cover the bottom of his aquarium with well-washed gravel and fine sand to the depth of 1½ inch and plant in it plenty of water-weeds, especially *Anacharis alsinastrum*. If this is done, and the aquarium is placed in a light position, but *not* a sunny one, the fishes may be kept a very long time. I generally change the water in my aquarium once a year, as the stones, &c., are apt to get very dirty. The water does not generally need changing even then. This is considerably less trouble than changing the water twice a week! Only a few fish should be kept in a large volume of water. If sticklebacks are kept with them they soon kill them. *R. A. R. Bennett, Oxford.*

NATURE PRINTING.—Many years ago I obtained a stem (?) of *Musa rosacea* (a banana) from the weedings of Liverpool Botanical Garden, and, being struck with the beauty of the cellular structure, as exposed by section, I endeavoured to take facsimile impressions of it by block printing in body colour. I succeeded perfectly, as my only remaining impression still serves to show; and my pictures, though much admired, never suggested, to any one of my scientific friends, the object from which they were taken! The general idea was, that they represented some unknown fossil—a concamerate shell—a gigantic nummulite—*et si qua sunt similia.* I also took care to secure a plaster cast which puzzled the savants, if anything, still more provokingly, to our "artist's" huge delight. I had long forgotten this exploit, when the section of a typha awakened me, by its striking resemblance to the above West Indian relic. I repeated the process with equal success, and then extended it to sparganium, iris, nymphea, and other water plants. A surprising difference of structure is thus exhibited, which generally serves to identify the plant without other evidence, and, if it does no more than this, it furnishes a fresh aid to the botanist, besides an agreeable recreation for all classes. No apparatus is needed but a very sharp thin knife to make clean sections, and a printer's pad to supply the "blocks" with ink or paint of any desired colour, and consistence. Trouble is often saved by taking up the plant by the root, instead of having a section at each end of the block. Agarics, if left long enough, deposit their spores on blotting paper, which, if moistened on the back with weak gum, retains its otherwise pale portraits like an engraving. I long to see Mr. Honywood's method.—*J. Price, Chester.*

THE LEAFING OF ASHES AND OAKS.—Seeing a note referring to the leafing of oaks and ashes, reminds me that I have often heard the same rhyme as is there quoted, but so changed as to have a directly opposite signification.

> When the oak comes out before the ash,
> You'll have a summer of wet and splash.
> When the ash comes out before the oak,
> You'll have a summer of dust and smoke.

This tends to confirm Mr. Green's statement that country people have noted the facts in question, but it does not bear out his other remark, that "they have very sensibly attributed it to its right cause, or at any rate some have not done so." If I understand it aright, the above verse is supposed to embody a prediction of weather to come, rather than a statement of present facts, and if this is so it does not reflect very well the good sense of the people who composed it, as it looks very like superstition to suppose that the dampness or otherwise of the ground previous to the leafing of these trees can be taken as any criterion of the weather during the whole of the succeeding summer.—*H. S. Ward.*

ANECDOTE OF A CAT.—Poor old puss was a queer one. She had lost part of her tail through an accident. When dinner came up—sure enough old Kit was there too. She sat up like an "old man" kangaroo, and if no notice was taken she would put out one little paw (trembling with anxiety) to attract attention and then the other. Her little amiable face with a most pitiful expression, but no mewing. Who could resist this mute appeal? All can remember the severe winters of 1878–9, 1879–80, 1880–81. In the bitter cold weather of 1878–9, coming down into the dining-room we used to find old Kit sitting up before the fire, stretching out first one right little paw (the other carefully tucked under her arm-pit—so to speak), then the left, towards the blaze, "for all the world," as the maid said, "just like a Christian"—many people saw this to their great amusement, visitors, and others. Was this reason or instinct?—*A. H. B.*

LADY BRASSEY'S CLOAK.—The Polynesian cloak referred to lately in SCIENCE-GOSSIP is worthy of remark as opening up the great question of Polynesian migrations, leading up to that other great question, "Whence come the Polynesians of our day?" The distance travelled by this relic—assuming it to be as stated—seems great for canoe-voyagers. And most writers insist, it would seem, upon comparatively short distances as a necessity for early Polynesian migrations. But why? Dr. Lesson, the veteran naturalist, ethnologist, and philologist, has a collection of Hawaian legends—not yet published—but he tells me the oldest and most authentic of these contain legends and tales which belong undoubtedly to the Maoris of New Zealand. If the cloak then travelled from Tahiti to Hawaii, these legends, on Dr. Lesson's authority, travelled very much farther, viz. from New Zealand to Hawaii. Where then was Hawaii the acknowledged cradle of the Polynesian race? Has it not been assumed, on ex parte evidence—a few racial characters, likeness of certain words, and ease of communication, &c., that the Polynesians as a whole must have started from Asia originally? Let me here say, that Dr. Lesson denies the Malay origin of the Polynesians. He says, in a word, that the true cradle of the Polynesian was New Zealand. This is a theory which he believes will in the future be accepted by all competent scientific ethnologists as the real solution of this question. Let me add, for the information of scientific English ethnologists, what Dr. Lesson has done, and is still doing, though at an advanced age and confined to his house. He has published three immense volumes upon "Les Polynésiens, leur origine, leurs migrations, et leur langage"—the fourth is in hand. These volumes contain, it may be said, a collection of all that has been said, found out, or written upon the Polynesians. And this work will be a monument for all time of the amazing skill, industry, and research of perhaps the greatest living authority in these matters. Dr. Lesson began his researches by assisting the great d'Urville in 1826–9 in the Pacific. In 1840 he was engaged in another expedition. And since then, as Médecin en chef, he has spent many years in the Pacific, laying the foundation of that immense edifice which he is now trying to bring to completion, if spared. I thought these few remarks would be acceptable to English ethnologists, as Dr. Lesson has for many years been obliged to live in retirement, and hence deprived of association with English savants. I am authorised by Dr. Lesson to say that, though he cannot enter into lengthy correspondence, he will still be very pleased to receive any communications regarding this great problem, or to receive any notices or papers bearing on Polynesian migrations, especially on any new antiquities recently discovered. His address is—*Rue Lesson, Rochefort-sur-Mer, France.*

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—As we now publish Science-Gossip earlier than heretofore, we cannot possibly insert in the following number any communications which reach us later than the 8th 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.

We request that all exchanges may be signed with name (or initials) and full address at the end.

E. P.—"The Journal of Conchology" is published by David Bogue, 3 St. Martin's Place, Trafalgar Square, and Taylor Bros., St. Ann Street, Leeds.

F. J. C. F.—The "luminous worm" is in reality a centipede, not uncommon in damp hedge-banks at this time of year, called *Geophilus electricus.*

L. Lee.—The "black specks" on the piece of rock sent us are lichens, called *Lecidia punctata.*

T. Richardson.—The reddish-coloured flowering plant is the Lancashire asphodel (*Narthecium ossifragum*) in fruit; the other specimen is a club-moss, *Lycopodium annotinum.*

J. C. White.—The black fungi on the leaf sent are *Melampsora populina.*

J. G.—You will be able to procure entomological pins of any of the dealers who advertise natural history materials in our advertising columns.

H. Searle.—Many thanks for the specimens of *Chara Braunii* and *Caulinia alaganensis.*

W. T. C.—The small red worms you mention are the "blood worm" (*Tubifex rivulorum*), and may be procured of any dealer in aquarium material. Many suppliers of angling tackle also keep them for sale.

C. H. Waddell.—Wash the walls, &c., with a strong solution of carbolic acid. That will probably kill the fungus.

H. M.—Guano is a word used to cover a good many fertilisers. The specimen you sent us appears to be manufactured material. We are not surprised you did not find diatoms in it. Only the genuine guano, obtained in its original state, will be likely to contain them. Ask for Sombrero Guano.

EXCHANGES.

Two thousand well-mounted micro slides for exchange. Send for catalogue to Dr. Moorhead, Errigle, Cootehell, Ireland.

Wanted, Science-Gossip for all or any of the following years, 1868, 69, 70, 71, 72, bound or unbound; first-class micro slides in exchange.—W. H. Harris, 44 Partridge Road, Cardiff.

Wanted, microscopic slides; will exchange microscopic live box and spot lens, and good lancewood bow.—Rev. H. J. Poole, Stowell Rectory, Sherborne.

Wanted, young oysters, *Isthmia enervis*, head Bombylius, butterflies, &c.; offered, slides, micro-fungi, dry plants, &c.—G. H. Bryan, Thornlea, Cambridge.

Puccinia pulverulenta, galiorum, centauriæ, compositarum, lapsanæ, Coleosporium rhinanthaceum, Epichloe typhina, Corticium quercus, in exchange for other fungi; mosses also given in exchange.—J. A. Wheldon, Northallerton, Yorks.

For exchange, gizzard of beetle, mounted in balsam.—John Moore, 86 Porchester Street, Birmingham.

WANTED, a clutch of each of the following: clover, fork-tailed petrel, American billwa, kilden, Bartram's sandpiper, in exchange for emu's eggs.—John Millie, North Queensferry, Fifeshire, Scotland.

WANTED, almost any kinds of Pupæ; offered in exchange, British lepidoptera.—W. K. Mann, Wellington Terrace, Clifton, Bristol.

SOME beautiful varieties of *Helix nemoralis*, *H. hortensis*, *H. arbustorum*, *H. nemoralis* var. *major*, *H. lapicida*, *H. pisana*, *H. virgata*, *H. aspersa*, *H. hispida*, *H. caperata*, &c. What offers in marine shells?—A. J. R. Sclater, 23 Bank Street, Teignmouth, Devon.

FOUR dozen very large *Sagartia troglodytes* from Devon coast. What offers for the same?—A. J. R. Sclater, 23 Bank Street, Teignmouth, Devon.

WANTED, domed foreign nests and British land and fresh-water shells; natural history books, a revised manuscript list of Wakefield shells, or other land and freshwater shells offered. —George Roberts, Loftham.

Ass. Grayana and many foreign shells for North British or foreign species. Lists of duplicates exchanged.—W. E. B., 9 Titchfield Terrace, Regent's Park.

FOR scales of Belone and Labrus send address to D. Sinel, David Place, Jersey.

WANTED, chalk fossils; will give specimens from other formations in exchange. — Edmund Tye, 2, The Drapery, Northampton.

L. C., 5, 59, 181, 216, 270, 273, 338, 350, 351, 394, 894, 1051, 1059*c*, 1060, 1067, 1068, 1128, 1289, 1547, 1607, 1648, 1658, and many others.—G. H. Bryan, Thornlea, Cambridge.

IMPRESSIONS from ancient seals offered in exchange for others, or for anything of antiquarian interest.—W. T., 8 Albert Road, Southsea.

TWELVE to sixteen dozen microscopical slides. Wanted, pocket or portable microscope or tourist photographic camera and apparatus, or offers in cash for twelve dozen at least.—John Alex. Ollard, F.R.M.S., Ye Hermitage, Forty Hill, Enfield, Middlesex.

TWELVE dozen micro slides for exchange. Wanted, works by Darwin, or standard works on microscopy, natural history, or conchology. Slides at 1*s*. each: books at published price.—John Alex. Ollard, F.R.M.S., Ye Hermitage, Forty Hill, Enfield, Middlesex.

A STAG beetle for specimens of equisetum or micro slides of same.—J. D. Bessell, Fremantle Square, Bristol.

FOR exchange, *Planorbis corneus*, *Nitidus contortus*, *L. auricularia*, *stagnalis*, *B. Leachii*, and forty species of British and foreign shells. Wanted, *Balia perversa*, Carychium, Acme, Vertigo, and *A. lacustris*.—A. Jenkins, 36 Amersham Vale, New Cross, London, S E.

WANTED, good slides of *Tingis hystricellus*, head of hunting spider; good exchange in slides or micro material.—G. Ward, Wallwood Nursery, Leytonstone.

WANTED, English and foreign war medals, and soldiers' or sailors' decorations; offer in exchange, fossils, natural curiosities, or antiquities.—F. Stanley, Margate.

WANTED, Bate and Westwood's "Crustacea," Hinck's "Zoophytes," Shuckard's "Bees," and other works on natural history, in exchange for Berkley's "Cryptogamic Botany," "Quekett on the Microscope," Burmeister's "Entomology." SCIENCE-GOSSIP, vols. i.–iv., &c.—C. A. Grimes, Dover.

SEVERAL duplicate slides for exchange of the following: *Gomphonema germinatum*, *Navicula ovalis*, oolitic limestone sections—nearly all of the last-named are mounted on square slips.—F. R. Tennant, Port Hill, Stoke-on-Trent.

BRITISH Lepidoptera — duplicates: Napi, Cardamines, Rhamni, Edusa, Paphia, Euphrosyne, Egeria, Urticæ, Galathea, Pamphilus, Phlœas, Aegon, Alexis, Corydon, Alveolus, Sylvanus; also many species of moths. Desiderata, other Lepidoptera, British or foreign, or offers.—A. H. Shepherd, 4 Cathcart Street, Kentish Town, London.

THE following British Crustaceans, well set and preserved, offered in exchange for others or for British Echinoderms: *Carcinas mænas*, *Hyas coarctatus*, *Polybius Henslowii*, *Pagurus Bernhardus*, *Portunus puber*, *Galathea squamifera*, *Cancer pagurus*, and others.—G. Sherriff Tye, 65 Villa Road, Handsworth, near Birmingham.

WANTED, Bell's stalk-eyed, Spence Bates' sessile-eyed Crustacea, and Baird's Entomostraca. A valuable assortment of Crustacea, Echinodermata, Mollusca, Fishes. Rock specimens or embryological microscopic preparations offered in exchange. —Edward Lovett, 43 Clyde Road, Addiscombe, Croydon.

WANTED, living specimens of *Murex purpurea*, *Physalia pelagica*, and *Aurelia aurita* (German or Baltic Sea) for exchange.—A. Heath, 114 Ebury Street, London.

OFFERED, L. C., 7th ed., 11, 122, 192, 200*d*, 219, 246, 430*b*, 508, 542, 752*b*, 779, 860, 1033, 1189, 1217, 1403. Lists exchanged. —Rev. W. R. Linton, 180 Upper Street, Islington, London.

WOOD'S "Bible Animals," full bound; "Student's Elements of Geology;" "Edinburgh and its Neighbourhood," Hugh Miller; "Insect Hunter's Companion;" Jesse's "Gleanings," 2 vols., full calf; "Glaucus, or Wonders of the Shore," Charles Kingsley; "Journal of a Naturalist;" all in good condition. Wanted to exchange for good micro slides of British and foreign mosses, or offers.—J. R. Murdoch, 24 Blenheim Place, Leeds.

WANTED, lichens and ants, British, localised.—Frederic Bower, 6 Dryden Street, C.-on-M., Manchester.

VARIOUS old historical, religious, and foreign books and pamphlets, in exchange for books on natural history. Lists sent on application.—F. H. Parrott, Walton House, Aylesbury, Bucks.

WILL any conchologist kindly send me examples of *Helix aspersa*, var. *albo-fasciata*, in exchange for other varieties or British or foreign land and freshwater shells?—G. Sherriff Tye, 65 Villa Road, Handsworth, near Birmingham.

FOR slide of *Ceratoneis arcus* (Diatomaceæ), send any good mount, excepting spicules and sections to A. W. Griffin, Saville Row, Bath.

PUPÆ. Furcula, Dromedarius, Hamula, Luna, Machaon, Vinula Jacobæ, Carpidi. Desiderata. Other pupæ.—W. Finch, 158 Arkwright Street, Nottingham.

IN exchange for ½ ounce of diatomaceous earth, I will send 3 or more (according to rarity) slides of the same when cleaned. —E. B. L. Brayley, 13 Burlington Road, Clifton, Bristol.

WANTED, vol. i. of "Northern Microscopist" bound or in numbers. Will exchange in slides.—G. Wilks, 27 Wynford Street, Weaste, Manchester.

WANTED, Geikie's "Great Ice-Age," 2nd edition, Geikie's "Prehistoric Europe," 1881, and Croll's "Climate and Time." Micro-slides, books, or cash in exchange.—A. Alletsee, 7 Glendale, Clifton, Bristol.

FOR exchange, Negretti and Zambra's microscopist's air-pump, to take 3 slides. Cost £1 1*s*., and nearly new. What offers? Mounted slides, natural history specimens, fossils, &c., preferred.—H. E., 9 Eliot Bank, Forest Hill, London, S.E.

OFFERED, L. C., 7th ed., 75, 107, 133, 150, 196, 234, 253, 270, 333, 334, 367*b*, 518, 733, 821, 906, 1040, 1135, 1141, 1292, 1304, 1319, 1327, 1416, 1422, 1449, 1478, 1596, and many others.—A. Waller, 17 Low Ousegate, York.

WANTED, SCIENCE-GOSSIP for the year 1870 to 75 inclusive, in parts, or bound in the publisher's case preferred. Can exchange volume for the years 1867 and 1868, or other books.—W. T. Cooper, 16 Earl's Court Road, Kensington, W.

FOR EXCHANGE.—Sand from the bottom of the Mediterranean Sea containing microscopic shells. The shells are of no use to Conchologists, but form a splendid object for the microscope. —Address, E. C. Stedman, 115 Stepney Green, London, E.

TOBACCO-LEAF from different parts of the world, well mounted in Balsam, will exchange for other objects of interest.—Address, E. C. Stedman, 115 Stepney Green, London, E.

BOOKS, ETC., RECEIVED.

"Smithsonian Report for 1881." Washington: Government Printing Office.

"The Organs of Speech," By G. H. von Meyer. London: Kegan Paul & Co.

"Energy in Nature." By W. Lant Carpenter, B.Sc., &c. London: Cassell & Co.

"Perennial Plants." (Parts.)
"Studies in Microscopical Science," edited by A. C. Cole.
"Journal of Conchology."
"Land and Water."
"The Science Monthly."
"Midland Naturalist."
"Practical Naturalist."
"The Inventor's Record."
"The Medical Student." (New York.)
"Natural History Notes."
"Science."
"American Naturalist."
"Canadian Naturalist."
"American Monthly Microscopical Journal."
"Popular Science News."
"Good Health."
"The Botanical Gazette."
"Revue de Botanique."
"La Feuille des Jeunes Naturalistes."
"Le Monde de la Science."
"Ciel et Terre."
"Cosmos: les Mondes."
&c. &c. &c.

COMMUNICATIONS RECEIVED UP TO 11TH ULT. FROM:— T. H.—W. P. B.—W. K. M.—A. A. F. J. D. H.—A. H. B.—F. F.—W. L. B.—S. R.—E. E.—G. H. B.—J. A. W.—A. P.—M. E. W.—S. P. A.—G. B.—H. J. P.—J. E. W.—E. F. B.—W. H. H.—J. G.—E. P.—W. H. M.—A. J.—F. T. M.—A. H. B. —W. T.—W. F. H.—J. F. C.—H. A. R. B.—J. S.—G. H. B.—B. H.—H. S.—H. A. F.—A. H. W.—W. B.—J. S.—C. D.—G. R.—W. L. W.—Dr. P. Q.—J. C. W.—J. G.—J. M.—H. W. —Dr. A. C. S.—E. T. S.—E. T.—H. W. K.—W. T. H.—J. A. O.—J. B. B.—G. W.—A. A.—W. H. M.—J. F. R.—J. E. A.—H. E.—C. R.—H. C. W.—F. S.—J. F. T.—A. H. S. —G. S. T.—E. L.—E. B. L. B.—L. S. G.—W. H. S.—W. T. C. —G. M.—C. A. G.—A. W. G.—C. H. W.—A. W.—W. F.—A. H.—F. B.—A. M. P.—W. K. L.—J. R. M.—F. H. P.—D. R.—S. L.—L. M.—J. W.—E. F. B.—J. L. S.—H. G. S.—E. E. T.—H. M.—E. T. D.—B. F.—H. H. G.—B. H., &c.

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