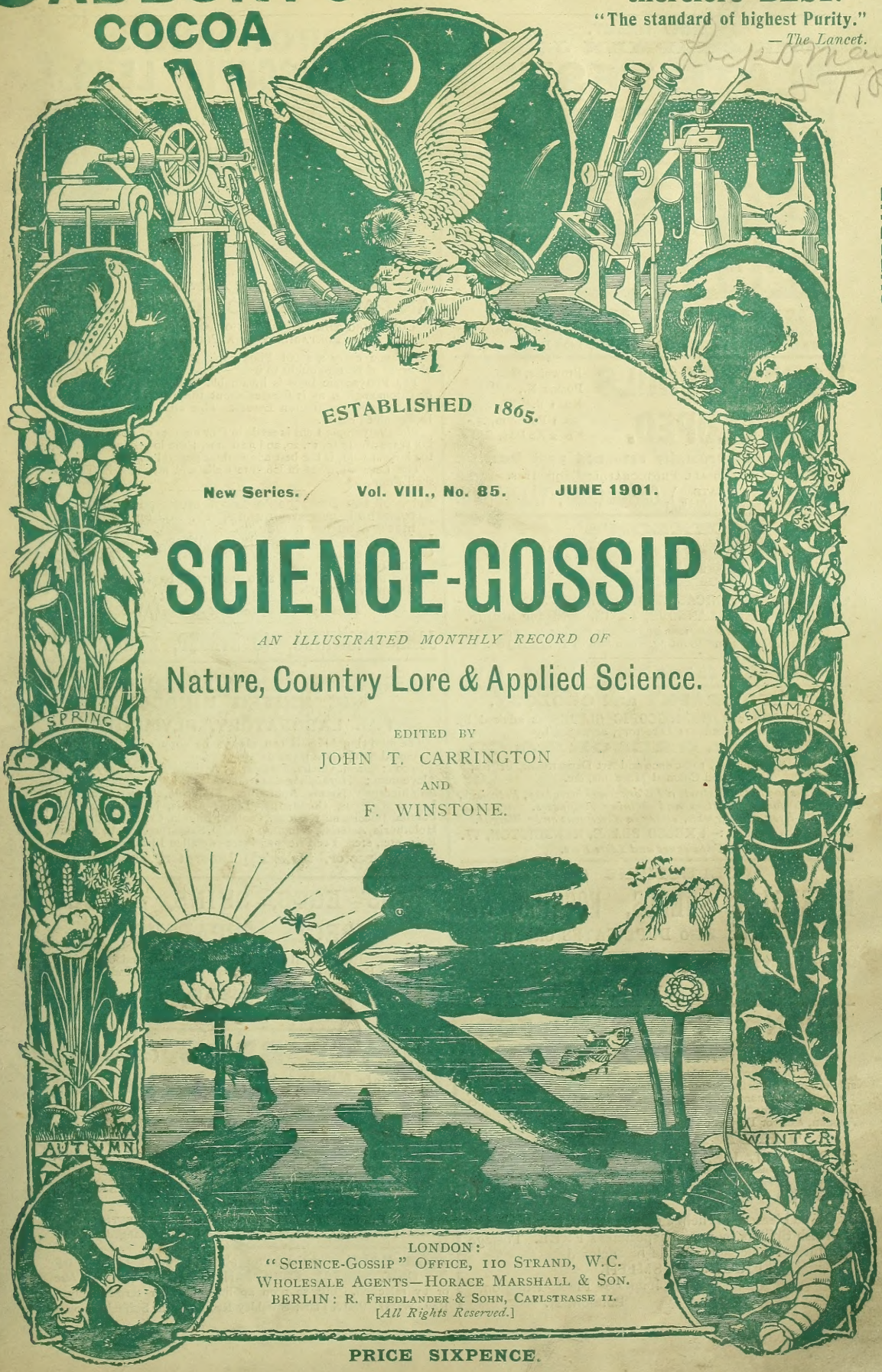

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SCIENCE-GOSSIP

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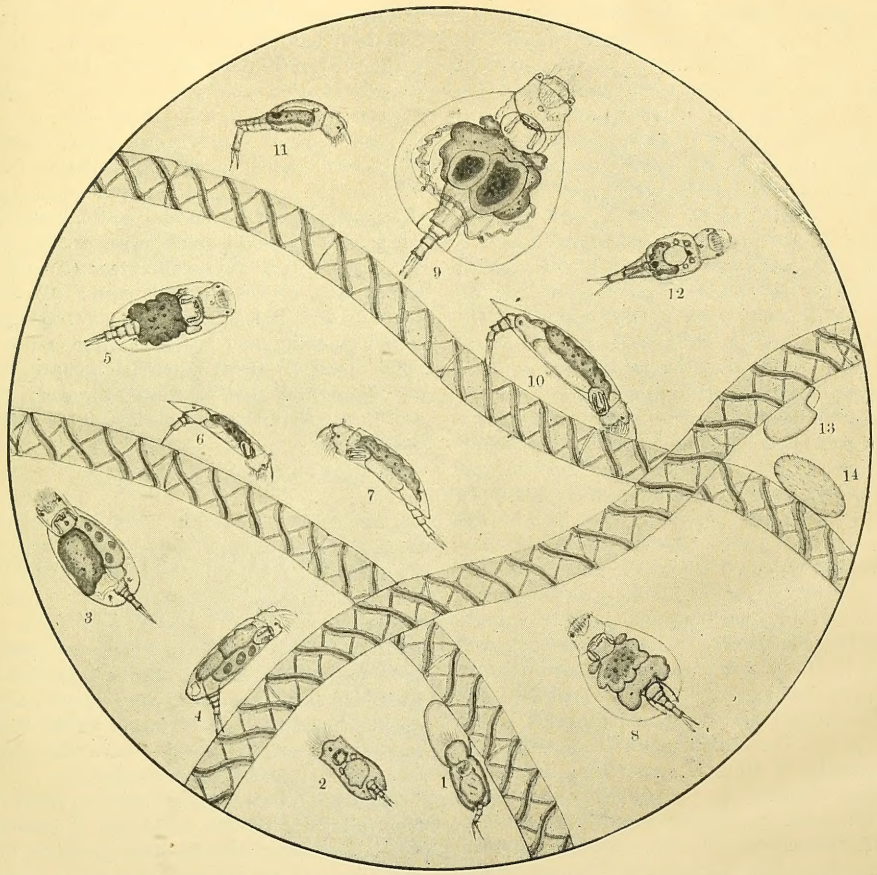
SCIENCE-GOSSIP.

IMMATURE FORMS OF ROTIFER.

By Walter Wesché.

In January, 1901, I obtained some weed from a pond at Golder's Hill, Hampstead. I placed it in tap-water, and on examination I found a number of *Metopidia solidus*. The weed gradually decayed, and as the decay proceeded the number of Metopidiae increased till it positively swarmed with them.

Metopidia is a genus of the family Coluridae, having the body enclosed in a lorica, usually of firm consistence, the head covered with a chitinous plate or hood, and two toes, which are always exposed. It has several well marked species, such as *M. triptera* and *M. oxysternon*, but it is probable that some of the immature forms hereafter



Metopidia solidus, with Male and Immature Forms.

(*Drawn from life by W. Wesché.*)

1, 2, Young one freeing itself from the egg. 3, Conjectural second stage, dorsal view; 4, lateral view. 5, Third form, dorsal view; 6, lateral view. 7, Fourth form, lateral view; 8, ventral view. 9, Fully grown rotifer, dorsal view; 10, lateral view. 11, Male, lateral view; 12, dorsal view. 13, Empty egg. 14, Resting or winter egg. Filaments of Algae, *Spirogyra*.

described have been figured as distinct species, such as possibly *M. rhomboides*, and it is not unlikely that some may consider *M. lepadella* as a variety of *M. solidus*.

I think all the members of the family are vegetable feeders, and may be seen grubbing with the "pick" among Confervae and decaying water-weed. The mastax is also extruded on the ventral surface—there is a bend of the carapace for this purpose—and may sometimes be watched nibbling at the surface of a weed. The cilia as usual are used to create currents, bringing streams of sediment into the mouth, and in swimming.

I kept the water by me, examining it from time to time, always finding fully grown individuals (figs. 9 and 10); but with these were other forms, smaller and of different outline. As time went on some *Philodina* made their appearance, the *Metopidia* decreased in size, then in number, until on the 7th of April, from a dip that would a month previously have produced hundreds, I could only find one, which is of the shape shown in figs. 7 and 8; also five or six *Rotifer vulgaris*, two or three *Philodina citrina*, and several *Monostyla lunaris*. I also found *Callidina parasitica*, which I was puzzled to account for till I observed an *Assellus* creeping among the decaying weed at the bottom of the jar on April 20th. The *Callidina* had left the body of the host, and in their independent state were certainly thriving and many in number.

At first I was inclined to regard the various forms of *Metopidia* as different species, but watching the appearance of a young one from the egg (figs. 1 and 2), I was puzzled by its great difference in outline from the parent species, and by the presence of short spines at the base of the carapace, which I regarded as a specific characteristic. This young one was $\frac{1}{300}$ of an inch in length. It took nearly three-quarters of an hour to wriggle free of the shell. The carapace was not well marked, the body was granular and semi-opaque, and it was decidedly cylindrical in shape. The form that seemed most nearly allied to this is that figured as 3 and 4, which appears not unlike the *M. rhomboides* of Hudson and Gosse. Its length was $\frac{1}{200}$ of an inch. The lateral view shows that the body has not properly developed into the lorica, but still retains much of the shape that characterised the young one when it issued from the egg. There are no signs of the spines at the base of the carapace, they apparently having been absorbed. More plentiful than this form was the oblong one figured as 5 and 6. The length of this was $\frac{1}{200}$ of an inch, but it was exceedingly thin, and consequently very difficult to keep still in a live-box. This possibly may be *Squamella oblonga*.

It was at this stage that the chief difficulty of my investigation commenced. In this, which I conjecture to be the third form, there are no spines at the base of the carapace: they reappear more marked than ever in the fourth, again disappearing in the full-grown rotifer.

The fourth stage is figured as 7 and 8, and has been familiar to me for years. Its length is still $\frac{1}{200}$ of an inch, but it is distinctly more solid. In every detail, with the exception of the base of the carapace, it agrees with the final form (figs. 9 and 10), which has reached a length of $\frac{1}{123}$ of an inch, and is, I understand, to be found still larger. The male made his appearance, after some time, on February 17th (figs. 11 and 12). He was $\frac{1}{225}$ of an inch in length, and, like all male rotifers, very restless and active.

The ordinary egg is quite plain (fig. 13), but after the males had been seen, the "resting egg," or so-called "winter egg," was found covered with minute spines and about $\frac{1}{300}$ of an inch in length.

I am led to think that these are all stages in the growth of the same species, for the following reasons: (1) At one time there were no rotifers present except the fully grown form; (2) the very fairly good though accidental isolation not complete, as the appearance of other genera proves; (3) the known variety of form in the young of this genus; (4) all details, pick, eyes, mastax, place of dorsal and lateral antennae agree; (5) only in the largest size were eggs to be seen; (6) the egg, $\frac{1}{300}$ of an inch in length, is obviously too large for a rotifer $\frac{1}{200}$ of an inch in length, from end of toe to point of hood. Otherwise I should have been inclined to think that fig. 1 was the early form of fig. 7, and that the egg of figs. 3, 5, 9 had not been found.

90 *Belsize Road, London, N.W.*

MOSQUITOES AND MALARIA.

By E. Brunetti.

THE insects popularly known as gnats and mosquitoes, included in the Dipterous family Culicidae, have been receiving especial attention during the past few years, owing to the discovery that several of the species have the ability to transmit malaria to human beings.

There are probably about 300 described species from all parts of the world, but a considerable number of them will doubtless prove to be mere varieties. As an example it may be noted that between thirty and forty "species" of the genus *Culex* have been described from North America, whereas the number of true species is reduced to fourteen only by our latest authority, Mr. L. O. Howard, in his admirable paper published last year on the "Mosquitoes of the United States." Six out of Walker's eleven North American species of *Culex*—mostly from Hudson's Bay—are now reduced to synonymic rank.

The European species of this family have been excellently revised by Ficalbi, who introduces at

least seven species new to science, from Italy alone, in the "Bull. Soc. Ent. Ital.," xxviii. (1896); and the species of two other countries have been brought up to a recent date, viz. those of New South Wales by Skuse in the "Proc. Linn. Soc. N.S. Wales" (2), iii. (1889), and those of Argentina by Arribalzaga in the "Revista del Museo de la Plata" (1891).

The British Museum collection, though very deficient in many sections of the Diptera, contains a good series of a large number of species of Culicidae, including all Walker's types. Mr. Theobald is, I believe, now engaged on revising the Museum material in this group. The study of all species outside Europe and North America would be well repaid by the definite fixing of their synonymy.

The following genera are recognised: *Culex* L., *Megarhinus* St. Farg., *Aedes* Mg., *Anopheles* Mg., which occur, speaking broadly, all over the world; *Mochlonyx* Lw. appears to be confined to Europe; *Psorophora* to North and Central America; *Corethra* Mg. extends from Europe to at least Manila and New Zealand; *Plettusa* Phil. is a genus of several species from Chili; while Arribalzaga's genera *Ochlerotatus*, *Uranotaenia*, *Taeniorhynchus* and *Janthinosoma* occur in South America and Honduras, the remaining genera being *Heteronycha* of Skuse from New South Wales, *Sabethes* of Rob. Desv. from Brazil, and *Haemagogus* of Williston from St. Vincent.

Our British species are few in number, totalling, according to Mr. Verrall, sixteen certainly indigenous, with three additional, requiring further confirmation.

Although European species in general, and British species in particular, cannot compete with those of other countries in point of size and vigour of attack, such as the *Megarhinus ferox* of the West Indies and a gigantic species three-quarters of an inch long in my collection from Natal, the presence of female Culicidae on our shores is often painfully evident. Though the bites are sufficiently irritating to commend any researches that may lead to the limitation of the specimens within reasonable numbers, the discovery of the important part played by many species in the spread of malaria gives a more vital interest to experiments that may suggest means to enable us to hold them in check.

Mr. Nuttall, of Cambridge, has been occupied for some time now in investigating the coincidence of the present localities of *Anopheles* in Britain with the former areas of malaria; and all entomologists might assist to the extent of keeping a casual look-out for this genus, capturing the specimens and recording date and exact habitat, which is usually an outhouse, outdoor closet, or similar place.

In spite of being on the watch during the two months of August and September last year that I spent at Hunstanton in Norfolk, I failed, as I thought, to find a single example; but on disposing of a box of odds and ends found there, one *Anopheles maculipennis* was discovered. It was taken on October 1st, this being my sole capture of a member of the genus.

Anopheles may be recognised from *Culex*, apart from structural differences, by the position of the insect when at rest. In the case of the latter genus the body of the insect is approximately parallel to the surface on which it is resting, the two hind legs being raised above the body, the tibiae and tarsi held straight out behind horizontally, only the four anterior legs touching the resting-place. In *Anopheles* also only the four anterior legs touch, but the head points nearly vertically to the object, as if the proboscis were about to penetrate it, the rest of the body being always in a straight line with the head, and thus at nearly right angles to the resting object. The posterior femora are not raised above the abdomen, as in *Culex*, but lie along its sides, whilst the tibiae and tarsi stick out behind in a curve upwards.

It is, of course, generally known that only the female gnat or mosquito bites, and that this sex may be easily distinguished from the male by the absence of the very feathery antennae which characterise that sex. These organs in the female are only sparsely covered with a few regularly placed long hairs.

The eggs are laid in stagnant water, in which medium the air-breathing larvae live their short lives, and there the pupae also remain, floating on the surface. Several generations occur in a year, and they hibernate as perfect insects.

In Mr. L. O. Howard's valuable paper, before referred to, the life history is given in full of some of the species; but it is evident that in at least some others the economy is of a different nature, as he records that the larvae of *Psorophora ciliata*, a widely distributed and very peculiar North and Central American species, could not be bred to maturity under the same conditions that were favourable to the development of several species of *Culex*.

Protective measures against the attack of mosquitoes seem to have been only partially successful. Most of the species apparently possess, not only considerable vitality, but a kind of special adaptability to widely different environments. The brevity of the life cycle necessitates almost ceaseless continuance of the remedial applications to check abundance, especially in warmer climates, such as in the Southern States of North America, where they are prevalent practically all the year round. Tar, kerosene, salt, petroleum, creosote oils, permanganate of potash, and many other remedies have been adopted in experiments to destroy the larvae; but many of these agents have met with but indifferent success. From the recorded reports,

quoted in Mr. Howard's article, of a long series of experiments of all kinds, it would appear as though the most successful results had been obtained from the use of the heavier grades of kerosene.

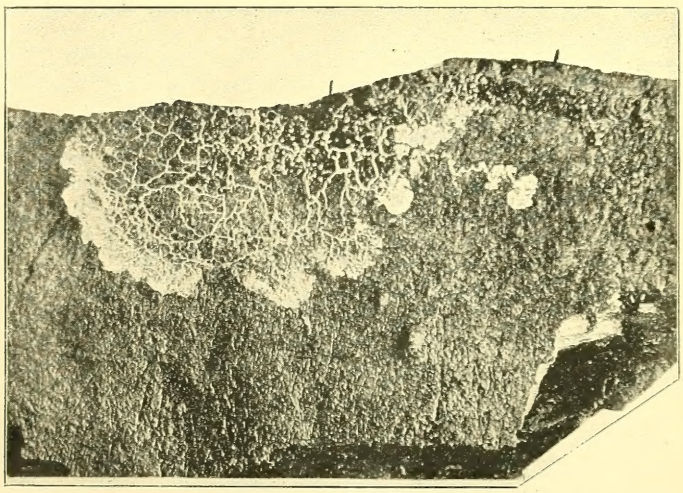
It will be seen that there is yet much to be done in this group respecting, first, the correct classification of the world's species; secondly, the investigation of the life history of the various species, at present only that of perhaps a score being known; and thirdly, the discovery of effective remedies against their undesirable attacks on mankind.

London, May 1901.

THE MYCETOZOA.

By Edgar Saunders.

THE curious group of organisms usually known as Mycetozoa forms one of the numerous links that connect the animal and vegetable kingdoms. They frequently occur as denizens of damp woods, where they creep about during one stage of their existence on rotten logs or fallen branches. They are also to be found on decaying heaps of leaves or straw, especially if such accumulations have been undisturbed for several months. In these situations they are occasionally to be met with in immense quantities, so much so that portions of the heap appear as though covered with hoar-frost, from the numerous calcareous sporangia that have been formed on them.

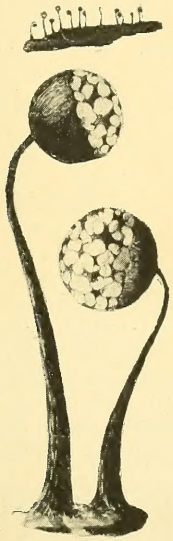


Plasmodium of Chondrioderma radiatum. (*From Nature.*)

The life history of the Mycetozoa presents a series of metamorphoses that are somewhat analogous to those which may be observed in other departments of animated nature. What may be regarded as the initial stage is a spore, always minute and usually spherical. These exist in vast numbers in the atmosphere, and when they fall into favourable situations the minute speck of protoplasm contained has the power of throwing off its cell covering, when it resembles an amoeba. These amoeba-like cells usually contain one or more vacuoles. They can throw out a tail-like process, and also possess the power of locomotion. In this state they are known as swarm-cells, and so simple is their structure that any part of them may become a mouth, a stomach, or a foot. By the coalescence of numbers of these and their increase by partition a mass is formed of wall-less protoplasm varying in dimensions. This is called plasmodium, which like the swarm-cells possesses the powers of locomotion and assimilation. This, the feeding stage, is usually the most fascinating to the observer, as the individuals have the power of moving over a considerable surface in search of food, and in this state exhibit affinities with the animal kingdom.

The plasmodium stage also serves to distinguish this group from the fungi, with which it is usually associated in classification. Having found some decayed wood or living fungi (*Stereum*, etc.) suitable to its wants, it spreads itself over the substance from which it extracts nourishment, and also absorbs any microbes that may be present. By the absorption of these materials it increases in size. In some cases, as in *Craterium*, the plasmodium is of a dirty grey hue, which shade is partly owing to

the particles of dead leaves it has absorbed. It continues in this stage for an indefinite period, sometimes extending to months, according to the species and atmospheric conditions. After having taken sufficient nourishment, it collects itself into small masses that gradually become matured and form sporangia, which are stationary. In some genera the plasmodium forms a compacted mass in which the sporangia may be partially separated



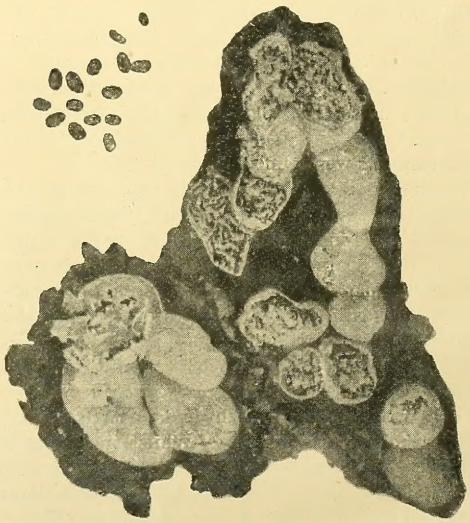
CRIBRARIA VIOLACEA.

(From a drawing by Miss G. Lister.)

at the base, or they may be perfectly united when the walls become obsolete. In this, known as the fruiting, stage the Mycetozoa may be regarded as plants, as they exhibit close affinities with the vegetable kingdom.

The sporangia often contain a delicate mass of hair-like structures, called a capillitium, which is sometimes beautifully ornamented. This, on maturing, may either be contained within the sporangium, as in *Badhamia*, or it may expand considerably in length, as in *Arcyria*, in which case it helps to distribute the spores. The principal agent in the dispersal is the wind, and by its means the spores, as impalpable dust, are carried long distances, traversing oceans and continents.

The matured sporangia are usually well suited for the preparation of cabinet specimens. They may be preserved for years if carefully mounted, and the colours may also be retained if they are kept from the light. It is desirable also to prepare microscopic mounts from correctly named specimens for the purpose of future reference. Reverting, however, to the plasmodium, or feeding, stage of these organisms, perhaps the best known is that of *Badhamia utricularis*, which may be found in almost any damp wood in the autumn, especially if the weather is mild and moist. On moving a decayed log in such situations there may sometimes be observed a yellow mass creeping in fans and veins over the decaying woody fibre or on the living mosses or fungi that may be attached to the log. Care should be exercised in removing it if it is desired to collect a specimen, as it is very sensitive to injury. The plasmodium may be placed on a moistened plate, covered with a glass or an opaque vessel, and kept in a warm room. After a few hours it will commence to throw out a number of fan-shaped processes. If a moistened glass is placed in its path it will probably creep over it, and when a sufficient quantity is thus transferred the slide is ready for microscopic examination. A 1-inch objective should be sufficiently powerful to show a well marked circulation of the granular contents of the veins. The current moves in one direction for about a minute and a half, then pauses, and the flow continues in the opposite direction for a similar period. The reason of these alternating movements is still unknown. If the plasmodium



BADHAMIA OVISPORA.

(From a drawing by Miss G. Lister.)

is supplied with suitable food and kept under proper conditions, it will increase in size until it is ready for the fruiting stage.

An allied species, *Badhamia nitens*, is of less frequent occurrence. It is usually found on fallen oak branches; the plasmodium is greenish-yellow, and is generally in smaller masses than in the preceding species. Until recently it was known to occur only in Britain; but in 1896 it was found in Antigua by Mr. Cran, and there is also a gathering in the British Museum that was obtained in Ceylon.

The plasmodium of *Chondrioderma radiatum* is milky-white, and may be sought for on decayed logs of poplar, etc. It is advisable when immature sporangia are found that they should be allowed to ripen slowly, as otherwise the development is imperfect.

The colours of the matured sporangia vary according to the species. Many of them are chalky-white, others yellow, some are brown, red, pink, or violet; but they are never the green hue of chlorophyll.

The sporangia may be stalked or sessile, and the stalk when present is sometimes extended into the spore case, when it is said to form a columella. In some species the sporangia resemble groups of miniature pine trees, about half an inch high, as in *Stemonitis*, the colour of which is a dusky brown.

The largest Mycetozoon that has come under my notice was on the upturned roots of a fallen elm tree in Luton Hoo Park. Roughly speaking it was about nine inches long by six inches wide, and proved to be a fine growth of *Brefeldia maxima*. For several feet its track was marked on the log by slimy refuse. It had also discoloured some patches of moss where it had crept, and from which it had probably extracted nourishment. It would have been an interesting sight to see the plasmodium in motion, as it must have formed a considerable mass and have been quite conspicuous, the colour being pure white. In singular contrast to this the ripe sporangia (aethalium) and their contents were almost black.

Amongst the rarer species, that known as *Cribraria violacea*, from Ashbridge Woods, Bucks, deserves a passing notice. It grew on the under side of beech bark, and the separate sporangia were so minute that they were only visible in full sunlight. This was the first European record for the species, it having previously been found in Philadelphia, U.S.A. Since then it has been discovered near Lyme Regis and also in Antigua.

One of the most noteworthy finds occurred during a short holiday in N. Wales. Whilst traversing a mountain pass in Merionethshire, and walking over an extensive bog, a mass of brick-red plasmodium was seen emerging from a tuft of bog-moss (*Sphagnum*). A portion was taken carefully away, and fortunately after the journey retained sufficient vigour to develop several small groups of sporangia. Part of the material was forwarded to Mr. A. Lister, who determined it to be *Chondrioderma simplex*, a species which had before been observed only in Silesia. A voucher specimen of the Welsh gathering has been deposited in the British Museum, and the species has also recently been found in Perthshire in a similar situation.

A very beautiful group of sporangia that has come under my notice was found in a small damp wooded hollow near Welwyn, Herts. This was a fine growth of *Physarum citrinum*, which is of a bright yellow colour. It occupied a surface of about eight square inches, partly on a decayed stump and also on the surrounding vegetation. The sporangia could be numbered by hundreds, and although many of them were left to reproduce the species, it has not been again observed up to the date of writing.

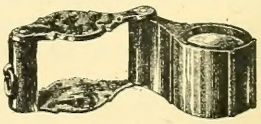
One of the most prolific woods of the midland counties for Mycetozoa is at Flitwick, in Bedfordshire. It is an undrained alder swamp, and in favourable seasons they occur in countless numbers. Up to the present this small wood has yielded sixty species, or nearly half the number of those recorded for the British Isles. Reference has been made to the fact that old straw heaps sometimes yield a copious supply of these organisms. A notable instance is that of *Badhamia ovispora*, which was first found in this country near Luton, in Bedfordshire, and has recently been observed in Buckinghamshire and Hertfordshire. The only previous record for this species is Cracow, in Poland.

In the study of these organisms, the worker would find ample room for original research, and the pursuit would furnish him with agreeable exercise both for the body and mind. It is my pleasing duty to acknowledge the willing assistance of Miss G. Lister, both in naming the more critical species and in making some of the drawings which have been photographed to form illustrations to this article.

(*To be continued.*)

Vatican Observatory.—It is reported that the Pope has been offered, and has accepted, the gift of a telescope larger than that exhibited at the Paris Exhibition last year. The donor is a South American citizen. It will occupy a prominent place among the many valuable instruments of research in the Vatican Observatory. It is just a century ago since Cardinal Zelada gave the then famous Dollond's telescope to this valuable collection.

Platyscopic Lens.—Mr. John Browning, of 63 Strand, London, desires us to draw the attention of our readers who are not already familiar with the advantages of his Platyscopic Pocket Lens, which we here figure about half its actual size. This little instrument combines with the portability and power of the Stanhope and Coddington lenses the important



feature that it focusses at a point three or four times as far away from the object under examination as do those lenses. This permits of the more satisfactory examination of opaque objects, as the lens does not obscure the light in consequence of its nearness. We have long carried one of these instruments and found it invaluable. This lens is made in four powers of magnification, being 10, 15, 20, and 30 diameters, the first being most suitable for general use.

MOSSES NEAR LLANDRINDOD WELLS.

By the Rev. W. H. Painter.

THE mosses mentioned in this paper were gathered by me in July, 1899, when I was staying for a short time at Llandrindod Wells, in Radnorshire, a place which is becoming increasingly famous on account of its medicinal waters. The town stands in a wide upland valley, about 700 feet above the sea-level, whilst the hills on the east side of it rise to an altitude of upwards of 1,000 feet, thus sheltering it from the east winds. The valley is intersected by the river Ithon, which meanders down it, at one time rushing through a rocky gorge and at another spreading out as it flows through meadows. One of these gorges is in the parish of Llanfairfechan, where it is spanned by a picturesque bridge called the Alpine Bridge. Another gorge is at Cefn, where it is crossed by a very primitive suspension bridge, which is well called Shaky Bridge, as when a pedestrian passes over, it shakes considerably.

About sixteen miles from Llandrindod is the Elan Valley, now in course of being converted into a series of reservoirs by the Birmingham Corporation for the purpose of supplying the inhabitants of that city with water. At a distance of nine miles from Llandrindod in another direction are the ruins of Abbey Cwm Hir, where the last Prince of Wales, Llewellyn, is said to have been buried. There is not much remaining of the abbey, but the site is a lovely one, and the drive to it is very picturesque, as the road to it winds about through the hills.

The district is in a good state of cultivation; consequently there is but little bog-land. As the natural result of this, very few of the mosses usually found upon such land were seen. However, upon Llandrindod Common, which has been preserved as a park for the visitors, there is a little swampy ground upon which a *Sphagnum* is growing.

All the mosses found by me in the district have been examined, and in some cases named, by Mr. E. C. Horrell, F.L.S., to whom my best thanks for his kindness are due. Great assistance has also been, as usual, readily given me by my friends Messrs. R. de G. Benson and W. P. Hamilton, of Shrewsbury, which I thus gratefully acknowledge.

The nomenclature and arrangement that I have adopted in the following list is that of Messrs. Dixon and Jameson's "Student's Handbook of the British Mosses."

Sphagnum subsecundum Nees. var. *contortum* Schp., Ridgway Common. ft. Llanyre.

Catharinea undulata W. and M. Llanyre. ft.

Polytrichum aloides Hedw. Llanyre. ft. Llandrindod Wells. ft. *P. urnigerum* L. Abbey Cwm Hir. ft. Llandrindod Wells. ft. *P. juniperinum* Willd. Abbey Cwm Hir. Disserth. Llandrindod Wells. ft. *P. formosum* Hedw. Llanyre. ft. *P. commune* L. Llandrindod Wells. Llanyre.

Ceratodon purpureus Brid. Llandrindod Wells. ft.

Dichodontium pellucidum Schp. Llandrindod Wells.

Dicranella heteromalla Schp. Elan Valley.

Dicranoweeisia cirrata Ldb. Llandrindod Wells, ascending to 1,000 feet.

Dicranum bonjeani De Not. Llanyre. *D. scoparium* Hedw. Abbey Cwm Hir. Llandrindod Wells. ft. var. *spadiceum* Boul. Llanyre. *D. majus* Turn. Disserth.

Fissidens taxifolius Hedw. Llandrindod Wells.

Grimmia apocarpa Hedw. Llandrindod Wells. ft. near Alpine Bridge. var. *pumila* Schp. near rocks, Llandrindod Old Church. var. *rivularis* W. and M. R. Ithon, Disserth. *G. pulvinata* Sm. Near Alpine Bridge. ft. Rocks, Llandrindod Old Church. ft. *G. tricophylla* Grev. Reservoir Hill, Llandrindod Wells, Wales. 1,000 ft.

Rhacomitrium aciculare Brid. Reservoir Hill, Llandrindod Wells. ft. Llanyre. *R. heterostichum* Brid. Llandrindod Old Church. *R. lanuginosum* Brid. Walls, Llandrindod. 1,000 ft. *R. canescens* Brid. Llandrindod Common.

Hedwigia ciliata Ehrh. Lovers' Leap, Llandrindod Wells.

Tortula muralis Hedw. Rhayader. ft. Alpine Bridge. ft. *T. intermedia* Berk. Abbey Cwm Hir. *T. ruralis* Ehrh. Llandrindod Old Church.

Barbula rubella Mitt. Alpine Bridge. ft. Walls, Llandrindod Wells. 1,000 ft. *B. fallax* Hedw. Llandrindod Wells. *B. unguiculata* Hedw. Abbey Cwm Hir.

Weisia rupestris C. M. Alpine Bridge.

Aulacomnium palustre Schwgr. Marshy ground, Llandrindod.

Bartramia pomiformis Hedw. Llandrindod Wells. ft.

Webera albicans Schp. Llandrindod.

Bryum pendulum Schp. Alpine Bridge. ft. *B. capillare* L. Llandrindod Old Church. ft. Abbey Cwm Hir.

Mnium undulatum L. Disserth. *M. hornum* L. Llandrindod Wells. *M. punctatum* L. Llandrindod Wells.

Fontinalis antipyretica L. Shaky Bridge, Cefn.

Thuidium tamariscinum B. and S. Llandrindod Wells.

Climacium dendroides W. and M. Llandrindod.

Isothecium myurum Brid. Lovers' Leap and Lane, Llandrindod Wells.

Pleuropus sericeus Dixon. Llandrindod Wells. ft.

Brachythecium rutabulum B. and S. Llandrindod Wells. ft. *B. rivulare* B. and S. R. Ithon, Llandrindod Wells. *B. purum* Dixon. Llanyre.

Eurhynchium praelongum B. and S. Abbey Cwm Hir. Llandrindod. *E. myosuroides* Schp. Llandrindod Wells. *E. striatum* B. and S. Llandrindod. *E. rusciforme* Milde. Lovers' Leap. ft. R. Ithon, Disserth, Abbey Cwm Hir.

Plagiothecium borrerianum Spr. Llandrindod Wells. *P. denticulatum* B. and S. Llandrindod Wells. ft. *P. undulatum* B. and S. Llandrindod Wells.

Amblystegium irriguum B. and S. Llandrindod Wells.

Hypnum cupressiforme L. Llandrindod Wells. Abbey Cwm Hir. var. *filiforme* Brid. Orchard, Llandrindod Wells. var. *ericetorum* B. and S., near Llanyre. *H. cuspidatum* L. Llandrindod Wells and near Old Church. *H. schreberi* Willd. Llanyre.

Hylocomium splendens B. and S. Shaky Bridge, Cefn. *H. brevirostre* B. and S. Llandrindod Wells. *H. squarrosum* B. and S. Llandrindod Wells. *H. triquetrum* B. and S. Llandrindod Wells.

I found also two Hepatics—viz. *Chiloscyphus polyanthos* L. and *Diplophyllum albicans* L. Both at Llandrindod Wells.

Stirchley Rectory, Shifnal, Salop.

AN INTRODUCTION TO BRITISH SPIDERS.

By Frank Percy Smith.

(*Continued from Vol. VII., page* 360.)

GENUS *THYREOSTHENIUS* SIM.

Eyes very small, the intervals between the posteriors exceeding three times their diameter.

Thyreosthenius biovatus Cb.

This most curious species may be at once distinguished by the form of the caput, and also by the smallness of the eyes. It should be looked for in the nests of red ants (*Formica rufa*). Although it has only recently been added to the British list, there is every possibility of its being found in many places, if systematic search be made. The localities at present recorded are Hastings, Sussex, and Oxshott, Surrey.

In the ten following genera the posterior eyes form a straight or slightly curved line, this characteristic separating them from many of the preceding.

GENUS *DISMODICUS* SIM.

Anterior row of eyes straight. Posterior row, viewed from above, slightly recurved, having the convexity of the curve directed forward. The four central eyes form a quadrilateral much longer than wide. Tarsi shorter than metatarsi.

Dismodicus bifrons Bl. (*Walckenaera bifrons* in "Spiders of Dorset.")

Length. Male 2 mm., female 2.25 mm.

Cephalo-thorax brown. Legs reddish-yellow. Abdomen almost black.

The caput is considerably raised, the elevation having at its summit a distinct longitudinal cleft. This species is rare.

GENUS *TYPHOCHRESTUS* SIM.

Central eyes of the anterior row very close together. Laterals of posterior row removed from centrals by more than twice their diameter. Tarsi as long as metatarsi.

Typhocrestus dorsuosus Cb. (*T. dorsuosus* × *T. digitatus* Cb.)

Length. Male 1.5 mm., female 1.75 mm.

GENUS *DICYPHUS* MENGE.

Anterior row of eyes slightly procurved, having its convexity directed backwards. Four central eyes forming a quadrilateral whose length and breadth are practically equal. Tarsi shorter than the metatarsi. Tibial spines very small, shorter than the diameter of the joint.

Dicyphus cornutus Bl. (*Neriene cornuta* in "Spiders of Dorset.")

Length. Male 2.25 mm., female 2.75 mm.

The caput of the male is furnished with two prominent longitudinal protuberances directly in front of which the eyes are placed. These protuberances are only just visible in the female. The colour of the cephalo-thorax is dark brown. A common species.

Dicyphus bituberculatus Wid. (*Neriene bituberculata* in "Spiders of Dorset.")

Length. Male 2.5 mm., female 3 mm.

Very similar to the last species. It is considerably larger, however, and the cephalo-thorax is of a reddish yellow colour.

This species is commonly found in marshes, and in meadows by the side of rivers, being especially abundant amongst flood refuse.

GENUS *NERIENE* BL.

The spiders included in this genus are very similar in many respects to those of the genus *Dicyphus*.

Each anterior tibia, however, is greatly swollen upon the underside towards its extremity, this portion being furnished with numerous rather long hairs. The form of the caput also is very different from that of *Dicyphus*.

Neriene rubens Bl.

Length. Male 2.75 mm., female 3 mm.

The colour of the whole spider is yellowish-red, the abdomen sometimes being of a rather darker tint. The humeral joint of the male palpus has, towards its anterior extremity, a very distinct apophysis and

Fig. 1. British Spiders.

a. Neriene rubens, male. *b. Gongylidium dentatum*, male cephalo-thorax, viewed from above. *c.* Palpus of *G. dentatum*. *d.* Profile of *G. dentatum*. *e.* Eyes and falces of *G. dentatum*, viewed from in front.

and also a number of very short dark-coloured denticulations.

This species is commonly beaten from bushes during the early summer.

The spider described as *Neriene bifida* Cb. is apparently only an abnormal specimen of this species.

Neriene rubella Bl. (*Neriene isabellina* in "Spiders of Dorset.")

Length. Male 2.75 mm., female 3 mm.

This species is very similar to *N. rubens* Bl. The caput of the male, however, is slightly less elevated; and the cubital joint of the palpus is in that sex greatly swollen. It is a fairly common species.

GENUS *DICYMBIUM* MENGE.

The general characteristics of this genus are very similar to those of *Dismodicus*, but in the present group the posterior row of eyes is slightly procurved.

Dicymbium nigrum Bl. (*Neriene nigra* in "Spiders of Dorset.")

Length. Male 2.25 mm., female 2.5 mm. The body is almost black, and the legs are of a dark-brown colour, with a tinge of red. A fairly common species.

Dicymbium tibiale Bl. (*Neriene tibialis* in "Spiders of Dorset.")

Length. Male 2.75 mm.

This uncommon species may be distinguished from *D. nigrum* by the swollen form of the anterior tibiae.

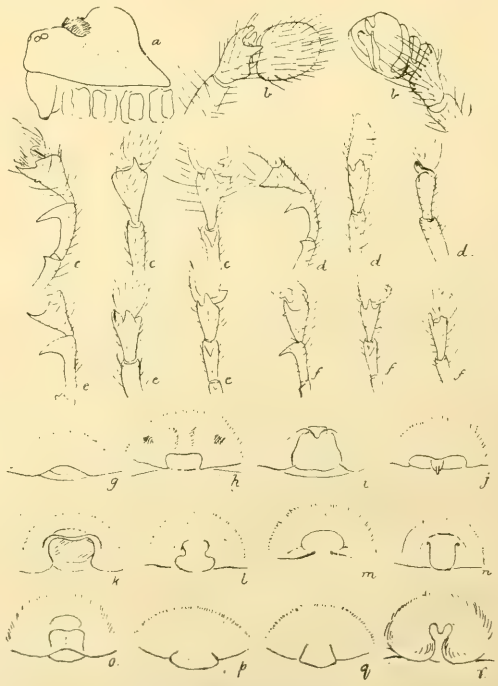


Fig. 2. British Spiders.

a. Cephalo-thorax of *Gongylidium gibbosum*. *b.* Palpus of *G. gibbosum* in two positions. *c.* Parts of palpus of *Erigone dentipalpis* in three positions; *d.* of *E. atra* in three positions; *e.* of *E. longipalpis* in three positions; *f.* of *E. promiscua* in three positions. *g.* Vulva of *Ceratinella scabrosa*; *h.* of *Tapinocyba pallens*; *i.* of *T. beckii*; *j.* of *Gongylidiellum murcidum*; *k.* of *Lophomma herbigradum*; *l.* of *Troxochrus scabriculus*; *m.* of *Cnephalocotes obscurus*; *n.* of *Pocadicnemis pumila*; *o.* of *Cnephalocotes laesus*; *p.* of *Lophocarenum nemorale*; *q.* of *L. parallelum*; *r.* of *Minyriolus pusillus*.

GENUS *LOPHOMMA* MENGE.

This genus may be distinguished from the last by the lower clypeus, by the posterior eyes forming an almost straight line, and by the anterior tarsi being practically as long as the metatarsi.

Lophomma punctatum Bl. (*Walckenaera punctata* in "Spiders of Dorset.")

Length. Male 2.5 mm., female 2.75 mm.

The cephalo-thorax is dark brown and marked with numerous very distinct punctures, especially upon the margins, and forming lines towards the thoracic indentation. The sternum is similarly punctured. The legs are of a reddish tint and the abdomen is black. This is not a common species.

Lophomma herbigradum Bl. (*Neriene herbigrada* in "Spiders of Dorset.")

Length. Male 2 mm., female 2.5 mm.

This species may be distinguished from *L. punctatum* by the absence of the punctures. The radial joint is furnished with a distinct apophysis.

Lophomma laudatum Cb. (*Walckenaera laudata* in "Spiders of Dorset.")

Length. Male 2 mm., female 2.25 mm.

This species is very similar to *L. herbigradum*, but the radial joint, although somewhat produced, has no distinct apophysis.

L. curtipes Cb. (*Neriene curtipes* in "Spiders Dorset.")

Length. Male 2 mm.

This very rare species, whose systematic position is somewhat doubtful, is believed by Rev. O. P. Cambridge to be referable to this genus. It has been taken in Berwickshire.

GENUS *ERIGONE* AUD.

The spiders which compose this genus are very similar in structure to those of *Dicyphus*, but the following details will separate them. The palpi are usually very long. The falces are armed on both sides of the fang groove with a row of strong teeth; and each falx has upon its external surface a number of small denticulations.

Erigone longipalpis Sund. (*Neriene longipalpis* in "Spiders of Dorset.")

Length. Male 2.75 mm., female 3 mm.

Cephalo-thorax very dark brown. Legs rather paler, with a reddish tinge. Abdomen black. The radial joint is somewhat produced on its upper side, this part being rather pointed. It is not a very common species.

Erigone promiscua Cb. (*Neriene promiscua* in "Spiders of Dorset.")

Length. Male 2.25 mm.

This species may be distinguished from *E. longipalpis* by the form of the radial joint of the male palpus. This joint when viewed in profile is seen to be furnished with a small denticulation upon its lower surface. It is a rare spider, but must not be confounded with the next species, to which it bears a very strong resemblance.

Erigone dentipalpis Wid. (*Neriene dentipalpis* in "Spiders of Dorset.")

Length. Male 2.5 mm., female 2.75 mm.

The radial joint is wider than that of *E. promiscua*, but is also furnished with a denticulation upon its lower surface. This is a common spider. It occurs in great abundance in "The Green Park," Westminster, where, in February, any number of both sexes may be found by carefully examining the grass, especially that in the vicinity of trees.

Erigone atra Bl. (*Neriene atra* in "Spiders of Dorset"; *Neriene longipalpis* Bl. in "Spiders of Great Britain and Ireland.")

Length. Male 2.5 mm., female 2.75 mm.

This spider bears a very close resemblance to *E. longipalpis*, but may be distinguished by the produced portion of the radial joint of the male palpus being of a much more obtuse form.

Erigone pascalis Cb. (*Neriene pascalis* in "Spiders of Dorset.")

Length. Male 2.1 mm.

Cephalo-thorax and legs yellowish-brown with a greenish tinge. Abdomen black. The systematic position of this very rare spider is doubtful, but it probably belongs to this genus.

(*To be continued.*)

THE NEW F.R.S. - The fifteen candidates selected by the Council of the Royal Society for election this year are:—Major ALFRED WILLIAM ALCOCK, I.M.S., M.B., C.M.Z.S., Superintendent of the Indian Museum, Professor of Zoology in Medical College, Calcutta; FRANK WATSON DYSON, M.A., Chief Assistant Royal Observatory, Greenwich, Secretary of Royal Astronomical Society; ARTHUR JOHN EVANS, M.A., Vice-President of the Society of Antiquaries, Keeper of the Ashmolean Museum, Oxford, Archaeologist and Anthropologist; JOHN WALTER GREGORY, D.Sc., F.G.S., Professor of Geology in the University of Melbourne, Explorer and appointed Scientific Leader of British Antarctic Expedition (since resigned); Captain HENRY BRADWARDINE JACKSON, R.N., Naval Attaché to British Embassy, Paris, Naval Inventor, Investigator of Electrical Phenomena; HECTOR MUNRO MACDONALD, M.A., University Lecturer in Mathematics, Cambridge; JAMES MANSERGH, President of the Institution of Civil Engineers, Student of Hydrostatics and Water Supply; CHARLES JAMES MARTIN, M.B., D.Sc. (Lond.), Professor of Physiology in the University of Melbourne, Investigator of Chemistry and Physiological Action of Snake Vemon; Major RONALD ROSS, I.M.S., M.R.C.S., D.P.H., Pathological Investigator into Malaria, Tropical Hygiene, and Parasitology; WILLIAM SCHLICK, Ph.D., C.I.E., Professor of Forestry at the Royal Engineering College, Coopers Hill, and late Conservator of Forests in Sind, Bengal, and the Punjaub; ARTHUR SMITHELLS, B.Sc., F.C.S., Professor of Chemistry in the Yorkshire College, Leeds; M. R. OLDFIELD THOMAS, F.Z.S., F.R.G.S., M. Anthrop. Inst., Senior Assistant Zoological Department, British Museum; WILLIAM WATSON, B.Sc., Assistant Professor of Physics at Royal College of Science, London; WILLIAM CECIL DAMPIER WHETHAM, M.A., Lecturer in Physics at Cambridge; ARTHUR SMITH WOODWARD, F.G.S., F.L.S., F.Z.S., F.R.G.S., Assistant Keeper of Geology, British Museum of Natural History.

CLASSIFICATION OF BRITISH TICKS.

By Edward G. Wheler.

(*Continued from page* 365.)

Classification.

THE family of the Ixodidae are broadly divided by Professor Neumann into two sub-families —I. Argasinae; II. Ixodinae.

I.—THE ARGASINAE.

The Argasinae are plainly distinguishable from the Ixodinae by the absence of either dorsal or ventral shields in either sex, also by the situation of the rostrum, this being placed beneath the cephalothorax, covering it as with a hood; except in the larval state, when it is often terminal. In the pupal state it often partially projects. The palpi are plain, cylindrical, and the joints differ little from each other. Legs nearly equal in length. Colour varying from earthy yellow, or red, to dark brown. Sexual orifice situated between the two first pairs of legs. In general dimensions the male is smaller than the female.

The genera of the Argasinae are (*a*) *Argas*; (*b*) *Ornithodorus*.

Genus *ARGAS* Latreille 1796.

RHYNCHOPRION Hermann 1804.

Body flat, general contour round or oval: narrower in front than behind, and larger behind the haunches of the fourth pair of legs. The sides of the body thin, or slightly thickened like a cushion.

Fig. 2. *Argas reflexus.* Male.

Tegument of body finely shragreened, except in certain spots which are covered with thin roundish discs, more or less numerous and variously situated: the most important always forming a radiating series, of which the central one is longest both on the back and beneath. Eyes absent.

Of this genus M. Neumann describes eleven species, some of which are doubtful. Of these *Argas reflexus* and *A. vespertilionis* have both been found in England.

Fig. 3. *Argas reflexus.* Female.

Argas reflexus Fabricius.

Synonyms: *Acarus reflexus* Fabricius, 1794; *Acarus marginatus* Fabricius, 1794; *Argas reflexus* Latreille, 1796; *Rhynchoprion columbae* Herm. 1804.

Adults: length, female from 5 mm. fasting, to 8 mm. when distended, fig. 3; male, 4 mm. fig. 2. The thin tegument of the female allows the brown or dark violet tint of the digestive organs to be seen, the margin always remaining yellowish (*marginatus*) and a little raised (*reflexus*) when fasting. The male is uniformly brown. The tarsi of all the legs have a prominent dorsal knob at the extremity. The hypostome is rounded at the end, and often a little dilated in the middle. Dorsal surface of the body finely shagreened. The discs are larger towards the centre and smaller and more numerous within the margin. The latter is finely and evenly folded, or wrinkled all round the body. Two

of these, which are large, oval, and divergent in front, are situated near the middle line, about one-fourth of the distance from the front. They are surrounded by an interrupted circle of smaller ones. Posteriorly are others radiating from the centre, with one long middle line of this series, which almost reaches to the centre. On the ventral face is a similar well defined radiating series. The male closely resembles the female, but the former is more narrow in front.

The nymph resembles the male, but is without the sexual organ.

The larva is round, 2 mm. in length, and has the rostrum terminal. The three pairs of legs relatively long.

In this country this species has only been found in Canterbury Cathedral, but is common abroad (6). It is parasitical on fowls and pigeons, which it only attacks by night, hiding itself in daytime.

Argas vespertilionis Latreille.

Synonyms.—*Carios vespertilionis* Latreille, 1796. *Caris vespertilionis* Latreille, 1804. *Argas fischeri* Audouin, 1827. *Argas pipistrellae* Audouin, 1832. *Caris vespertilionis* Gervais, 1844. *Caris elliptica* Kolenati, 1857. *Caris longimana* Kolenati, 1857. *Caris decussata* Kolenati, 1857. *Caris inermis* Kolenati, 1857. *Argas fischeri* George, 1876. *Argas pipistrellae* Westwood, 1877.

Adult. Length, 3·70 mm. by 3·78 mm. wide.

Dorsal surface surrounded by a margin formed of somewhat regular folds, and shagreened within. A deep transverse integumental fold behind the anus,

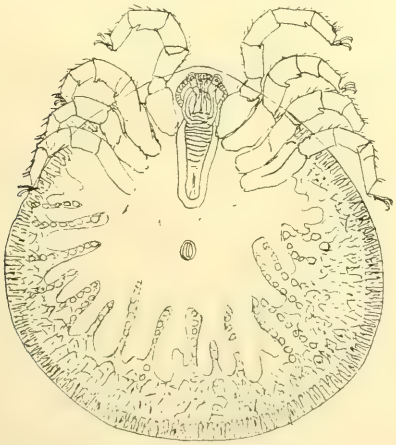


FIG. 4. *Argas vespertilionis.* Nymph.

which is situated about the centre of the body. Rostrum covered by the hood. Hypostome with four rows of teeth, and about six in each row. Palpi claviform. Legs thick, cylindrical; tarsi truncate; coxae in contact with each other (fig. 4).

Nymph. Rostrum fully exposed, and no trace of sexual orifice. Length, 4·95 mm. by 4·37 mm. Neumann gives the measurements of the nymph as 2·40 by 2·10 mm.

The above description is taken from two mounted specimens kindly lent to me by Mr. H. E. Freeman, being some of the original individuals found at Blyborough in 1877 when removing the church roof, and described in SCIENCE-GOSSIP (O.S. vol. xiii. p. 104), and in the "Quekett Micros. Journal," vol. iv. p. 223. It is parasitical on bats.

GENUS *ORNITHODORUS.*

Body with thick sides, often densely covered with small round shining granules in various patterns, some deep furrows beneath. Eyes sometimes present (?).

No indigenous British species, but the following has been imported:

Ornithodorus megnini Dugés.

Synonyms. *Argas megnini* Dugés. *Rhynchoprion spinosum* Marx.

Nymph. Length, 3 mm. to 4 mm. fasting to 9 mm. when replete.

Body brown, diamond-shaped, and with the rostrum exposed before repletion. Rostrum beneath body, and the latter squarer after distension. Palpi filiform. Legs far apart, and coxae almost entirely concealed beneath the skin. Surface of anterior half of body covered with small brown spines, replaced by whitish hairs posteriorly, which are specially numerous in the hinder margin. The stigmata are placed above, instead of behind, the fourth pair of legs. These differ entirely from the stigmal plates and peritremes usually present, and consist of cone-like projections pointing backwards. The top is truncate, and perforated by an orifice. Through this is a jointed organ, somewhat resembling the terminal joints of the palpi, which partially fills the orifice, and is furnished with three hairs at the end. It can be projected and withdrawn with rapidity. Its use is unknown. This peculiar feature, which, according to Neumann, is absent in the adult, may suffice to cause this species to be relegated to a separate genus.

The female is stated by Neumann to differ greatly from the nymph, which latter attains dimensions at least as large as the mature adult. It is in this state that it acquires most of the reserves of blood, which the female utilises to form its eggs.

Two specimens in the nymphal state were taken from the ear of an American visitor to Cambridge by Dr. J. Christian Simpson. They were supposed to have entered the ear when the American was camping out in Arizona. This species is well known in the States as infesting the ears of children and animals. (7)

(6) Science-Gossip (Old Series), vol. x. 1874.

(7) See "New York Ent. Soc. Journal" for 1893, pp. 49 to 52.

(*To be continued.*)

BUTTERFLIES OF THE PALAEARCTIC REGION.

By Henry Charles Lang, M.D., M.R.C.S., L.R.C.P. Lond., F.E.S.

(*Continued from Vol. VII., p.* 362.)

Genus *COLIAS* (*continued*).

18. **C. lada** Gr.-Gr.

40—50 mm.

♂ very much like *C. hecla*, but larger and lighter. Disc. spot f.w. very slight, on h.w. nearly absent. This species is in Leech's Collection, but only ♂ is represented.

Hab. Sinin Alps, Central Asia.

19. **C. hecla.** Lef. Ann. S. Fr. 1836, p.1383, pl. 9. Lg. B. E. p. 55, pl. xiii. fig. 1.

36—46 mm.

♂ Colour of wings clear orange yellow, of a tone something between that of *C. myrmidone* and *C. edusa*, rather brighter than the latter, and yellower than the former. Out. marginal band broader on both f. and h.w. proportionally than those of *C. myrmidone*, dusted with yellow usually on f.w., and sometimes on h.w., veined with yellow. Disc. spot f.w. variable, never anything more than a black linear dash, often almost absent; that of h.w. fairly well marked, but not large, and of a bright orange. Nervures light. Fringes light yellow, with very little mixture of red. ♀ Larger than ♂. Ground colour varies from bright orange, like that of *C. myrmidone*, to a dull ochreous orange. The brighter specimens show violet reflections as in the ♂. Marginal borders broad, spots large and well defined, light yellow, very regularly disposed, especially on h.w.; disc. spot f.w. generally as large as in the ♀ of the allied species, but sometimes with a light centre; that of h.w. large and bright. Neuration of f.w. blackish. Fringes entirely rosy red, without any mixture of yellow. U.s. f.w. bright orange. Out. marg. broadly yellowish green. Disc. spot small and light-centred. In ♀ there is an ante-marginal row of spots not seen in ♂. H.w. dark green, with a basal shading of bluish-green, especially in ♀. Marginal band lighter and yellower. Disc. spot deep crimson, with a pearly centre.

Hab. Tromsö, etc., in Norway, Lapland, Lulea, Tornea, etc., in Sweden. VII.—VIII.

a. var. *groenlandica* Lamp. Very much duller as regards the ground colour. Marginal borders in ♂ much narrower and more indented on the inner edge. More distinctly veined with yellow. Disc. spot very indistinct and brownish-red, in place of black. ♀ much duller than in type; spots on marginal borders on both f. and h.w. reduced to two or three very indefinitely marked ones towards the fore part of the band. U.s. darker and more uniform in colour and pattern than in the type. Hab. Labrador, Greenland

b. var. *glacialis* M'Lachlan, Journ. Linn. Soc., vol. xiv. p. 108, a still more dull, darker, and smaller form, found in the high north of Arctic America in 1876 by Captain Fielden and Mr. Hart, between 78° and 83° N. lat.

It will be seen that *Colias hecla* is distributed throughout the Polar regions of Europe and America. The European form is much brighter and more distinctly marked than that found in Polar America.

Some have considered *C. hecla* to be a polar dwarf form of *C. edusa* or of *C. myrmidone*; but admitting as correct the zoological grouping of the genus used herein, this is obviously impossible. It is, however, very probably the Arctic or circumpolar representative of that group of Coliades that seems to centre round the Asiatic *Colias eogene* and branches out into such forms as *C. thisoa*, *C. viluensis*, and perhaps we may also say *C. romanovi*, *C. regia*, etc.

20. **C. boothii** Curtis. Descr. App. Narr., p. 65, pl. A, 3—5. 1834.

42—44 mm.

The following is my own description of this species on page 70, "Butterflies of Europe." It is taken from the specimens in the British Museum Cabinet:—"The fore wings are orange-yellow, shading off along the costa and hind margin into light green; the discoidal spot is small and roundish; the marginal black band is very narrow. The hind wings are greenish, with an orange discoidal spot and a very narrow black hind marginal band. The fringes of all the wings are red."

Hab. Found in Arctic America, in the district known as Boothia Felix, between 70° and 75° N. lat.

"This species," I wrote in the same work, "is quite distinct from *C. hecla*, with which it has been sometimes confounded. The extremely narrow unveined border and the greenish tint of the wings are never found in *C. hecla*, and the discoidal spot in the male of the latter species is never rounded." I have no further information of this species since writing the above, and I do not think any additions have been made to the series in the national collection.

a. ab. *chione* Curtis. In this aberration the disc. spot and marginal borders are almost if not entirely obliterated. Hab. Same as type.

21. **C. chrysotheme** Esp. 65, 3, 4. Lg. B. E. p. 56, pl. xiii. fig. 2.

40—44 mm.

♂ has all the wings pale orange, brightest in the centre, paler and occasionally greenish towards the margins. F.w. with a rather broad black border, nearly the same width throughout: it is crossed by distinct yellow veins; disc. spot black, slightly reddish in the centre. H.w. dusky at base and light yellow along in. marg. Outer marginal border narrow, but distinct and veined with yellow. Disc. spot orange. ♀ generally rather larger than ♂. Black borders of all the wings broader, unstriped, but enclosing a row of large greenish-yellow spots. H.w. greener than in ♂, discoidal spot conspicuously orange. U.s. f.w. light orange at base; greenish along out. marg., parallel to which is a row of black spots; disc. spot white centred. H.w. greenish-yellow. Disc. spot. silvery, surrounded by a dull red ring and having a smaller spot placed above it. At the base is a dull red mark and another on the costa. An indistinct row of spots of the same colour runs parallel to the out. marg. Fringes, head, antennae, and legs red. Thorax and abdomen black above, light yellow beneath.

HAB. S.E. Europe. Austria, near Vienna. VII. e and VII. S. Tyrol, Hungary, Buda-Pesth, etc. S. Russia, Province of Orenburg and Saratowa. V. and VI. Transcaucasia. IV. and VIII.—X. Near Constantinople. V. e. Armenia, Asia Minor, Eastern Siberia.

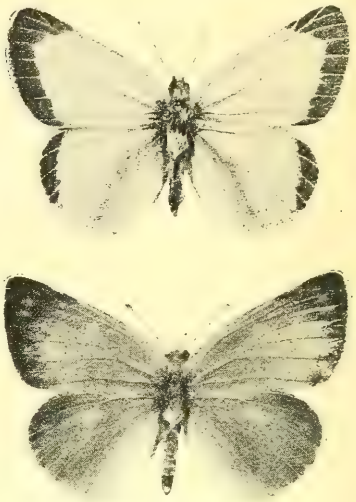
a. ab. ♀ *alba.* There is a white form of the female analogous to *C. edusa* ab. *helice.* Miss Fountaine has taken a specimen of this, I believe, at Modling, near Vienna.

The Nearctic form *C. keewaydin* Edw., with its variety *ariadne* Edw., is very closely allied to *C. chrysotheme.* In all probability they are co-specific with it. They inhabit the Southern and Pacific States of North America.

22. **C. marco-polo** Grum Grshmaillo, "Le Pamir et sa Faune Lépidoptérologique," Rom. Mem. t. iv. 1890.

20—28 mm.

Varies both in colour and markings. ♂ has the borders of the wings narrow and veined with lighter colour as in *C. chrysotheme*, but on f.w. it is not of such uniform width, but is wider at its costal end. F.w. sometimes with a black disc. spot, and sometimes without. Ground colour greenish-yellow, but often of a pale ochre. H.w. with the marginal band reaching only about half the distance of the out. marg.; disc. spot very faint. ♀ has the marg. borders less sharp internally than in ♂: they are not veined, but have five or six ill-defined light-yellowish spots of the same colour as the wings, which are darker than in ♂ and of an ochre-yellow. As in the ♂ the black disc. spot is sometimes quite obsolete; that of the h.w. is more defined than in ♂. Fringes greenish-white or ochre in both sexes. Antennae greyish-yellow in ♂, in ♀ showing a slight trace of red. U.s. f.w. light yellow with a greenish-grey border.



C. marco-polo. Male and Female.

Disc. spot, when present, white centred. H.w. greyish-green, darkest towards base. Disc. spot white.

HAB. Pamir (Turkestan), Hindukusch. VII. At great elevations.

23. **C. palaeno,** "L. Faun. Suec." p. 272 (1761). Lg. B. E. p. 49, pl. xi. fig. 1.

44—59 mm.

♂ wings pale yellow, with black marginal borders, which are sometimes as broad as those in *C. edusa.* In the typical form of the species they are not veined, but are finely powdered with yellow; the basal shading is inappreciable. Disc. spot f.w. varies in size in different specimens, but is always very small. That of the h.w. only just visible, being nearly of the same colour as the central area of the wing. U.s. ground colour of wings deeper yellow than above. Out. margin of f.w. and h.w. shaded with dusty greyish green, disc. spot h.w. pearly white. ♀ marked as in ♂, but the marginal borders are less sharply defined at their inner edge. In some specimens there are slight traces of light spots. Ground colour of all the wings greenish white. Marginal fringes, head, and antennae red in both sexes.

HAB. Moors and mountains in Central Europe, hills in Germany and Belgium, Thuringerwald, Karlsbad, Königsberg, etc. In Switzerland from 5,000 feet, the Jura, Maritime Alps, Basses-Alpes, Vosges, Pyrenees. VII.–VIII.

LARVA. Sea-green, with a dark yellow lateral stripe and spotted on the dorsal surface with black. On *Vaccinium uliginosum* and *Coronilla.* V.

a. var. *europomene* O. IV. 157. Smaller than type, disc. spot on f.w. ♂ obsolete, marginal borders dark and broad. ♀ whiter, marginal borders less defined, and on f.w. with light faint spots of the ground colour, sometimes with light rays.

I took a ♂ specimen at the top of the Furka Pass in Switzerland, in 1871, in which the marginal borders are veined with yellow, as in *C. pelidne.* I have never seen a similarly marked specimen in any collection. HAB. The Alps of Switzerland and Germany.

b. var. *orientalis* Stgr. The Amur form of the species. Smaller than the type, paler in colour in both sexes.

c. var. *lapponica* Stgr. Cat. 1871, p. 5. As a rule, same size as type, but some specimens are larger. Ground colour paler yellow in ♂, that of ♀ nearly white. Disc. spot of f.w. very small in ♂, generally larger and well defined in ♀. Marginal borders sharply defined in ♂, in ♀ with some indistinct white spots on f.w. U.s. greener in tint than in type. HAB. Lapland, North Russia, Norway, near St. Petersburg, VI. m., Charbolova, Lapland. VII.

d. ab. ♀. Werdandi H. S. 41, 42. Ground colour of wings same as in ♂, marginal borders well defined and dark; sometimes with a row of indistinct yellow spots on f.w. U.s. of a brighter yellow tinge than type. HAB. Alps of Switzerland, Engleberg, Albula, Maloya, etc. VII. m.

(*To be continued.*)

PHOTOGRAPHIC RECORDS OF SURGICAL OPERATIONS.

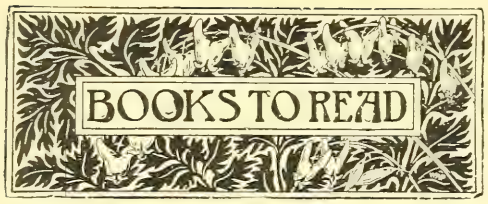
IN no branch of applied science has greater progress been made than in the art of surgery. Many of the elder practitioners now living, and especially those who commenced life in country practices, can remember the hideous state of things that obtained when they were medical students. Most of us can recollect, even in later days, the very large proportion of failures in operations; but under modern conditions the loss of a patient treated for similar afflictions is exceedingly exceptional. The profession of surgery has the high credit of having readily adapted every new scientific discovery to its aid in reducing human and other animal suffering. It has been this enterprise that accounts so largely for the rapid development of surgical science. We must not suppose that we have reached the end of the advantages of an alliance between scientific discovery and the art of surgery. This art is necessarily, like all others, an accumulation of experience in successful operations. At the present time this experience can only be demonstrated to new students during actual operations, or by descriptions given at lectures with the aid of diagrams. Thus it may be that a student may have few, or indeed no actual, opportunities of witnessing some of the rarer object-lessons so necessary to his education. Lectures with diagrams are admirable in themselves, but are, of course, far less satisfactory than actually viewing the operation conducted by one of the leaders of the profession.

Certain eminent French and German surgeons have already grasped the importance of correct photographic records of operations to be used for future demonstration. They have, therefore, adapted the cinematograph as the recording instrument; consequently it is possible to repeat on a screen before a class in any remote part of the world the actions of the operator in London, Paris, or Berlin. Even for the students who were present during the operation a record is of the highest value, for it often happens that the classes are large in number, and some of them are unable to obtain a perfect view of what is proceeding. By the aid of these moving pictures the demonstration may be repeated over and over again, until the professor instructing his class feels that every member of his audience has fully grasped the subject.

Not alone does the advantage of pictorial reproductions of this character appeal to the schools of surgery. Practitioners who have long since severed connection with their Alma Mater, and while practising in remote rural or colonial districts, are apt to become rusty or out of date in their professional knowledge through their isolation and want of touch with modern progress. For these gentlemen a system by which new operations or older ones of consequence may be studied in their own homes through written descriptions illustrated by moving pictures should prove invaluable. It is probable that ere long a system of such object-lessons will be organised on the lines of an ordinary literary circulating library. By that means even practitioners residing in remote parts of the world can keep themselves posted with regard to everything of importance to their professional work.

We are pleased to announce that a new instrument has been invented for this purpose by which the results can be obtained without any troublesome films or other unsatisfactory impedimenta, the transparent pictures forming the record being in spiral arrangement on a circular glass plate, and exhibited with a rotatory movement. We understand also that, including a small lantern for projecting the pictures, the whole set of apparatus will be supplied at a total cost which will be hardly felt by any person in the position of an ordinary practitioner.

Thus again we shall have to thank the union of mechanical science and the healer's art. We believe that this invention will be as important and far-reaching in the profession of surgery, as has been the application of Röntgen's rays and other modern appliances.—*J. T. C.*



Mosses, with a Hand-lens. By A. J. GROUT, Ph.D. x + 74 pp., 8½ in. × 5½ in., with viii plates and 90 other illustrations. (The Author, 360 Lenox Road, Brooklyn, New York. 1900.) 4s. 8d.

"The purpose of this work," writes Dr. Grout in the Preface, "is to give, by drawings and descriptions, the information necessary to enable anyone interested to become acquainted with the more common mosses with the least possible outlay of time, patience and money." The illustrations, which are very numerous, have been drawn by Miss Thayer, without the aid of the compound microscope. The descriptions are based on characters, all of which may be observed "with the aid of an ordinary hand-lens of ten to fifteen diameters' magnifying power." The object and scope of the book is therefore much the same as that of the "Young Collectors' Handbook of Mosses," by Bagnall. It must be confessed that American publishers excel us in the illustration of botanical text-books. The figures accompanying the letterpress here, without being in any way elaborate or highly finished, are real illustrations, and will prove a very practical assistance to the beginner. It may be mentioned that, of about 100 species figured, over three-quarters of the number are British. Accents are given to aid the student in the pronunciation of the Latin names—a very commendable practice, for which he should be grateful. Exception, however, may be taken to Dicrànum, *i.e.*, *a* long and accented. We doubt, too, whether any power on earth will induce a right-minded individual to pronounce Leucobryum (p. 59) with the accent on the short *o*. Perhaps the most noticeable feature of the book to readers on this side of the Atlantic is the use of English names wherever possible, and in some cases, we think, where absolutely impossible. It is most desirable, in a work intended to facilitate and popularise a study, that accepted popular names, where such exist, should be employed in preference to the sesquipedalian nomenclature of science; but it is doubtful whether the wholesale Anglicising of Latin names will ever succeed in creating a popular nomenclature. The "Fallacious Screw-moss" (*Barbula fallax*) and similar products of the earlier bryologists have never taken root here, and we doubt greatly whether the "Woodsy Mnium" (*Mn. sylvaticum*) and the "Fuscous Dicranum" (*D. fuscescens*) have "come to stay," even in the United States. Apart from this, however, there is a general absence of technical terms that is very refreshing; while the student who needs to consult more advanced works will find a full glossary of such terms provided at the end of the work. The price includes postage to this country.—H. N. D.

Journal and Transactions of Leeds Astronomical Society. 122 pp., 8¼ in. × 5½ in., 4 plates and 4 illustrations. (Leeds: R. Jackson & Son.) 2s.

The report of this Society for 1901 is full of interest, particularly the article, by Mr. C. T. Whitmell, on "The Planet Venus as a View Point"; "The Year's Observations," by Mr. H. J. Townshend; "The Total Eclipse of the Sun," from Algiers, by Mr. Henry Wyles; and from Navalmoral in Spain, by Mr. C. T. Whitmell; also an unsigned paper on "The New Star in Perseus." The journal is good, and the Society is evidently "alive." It should receive the support of everyone interested in astronomy in the neighbourhood of Leeds. At present it numbers ninety-eight members, including eight ladies, several of whom are well known workers. The Society is likely to prove of real help to its members.—*F. C. D.*

Stalk-eyed Crustacea. By CHARLES G. YOUNG, M.A., M.D., xix + 514 pp., 8¾ in. × 5½ in., with 7 coloured plates and figures in text. (London: John M. Watkins. 1900.) 12s. 6d.

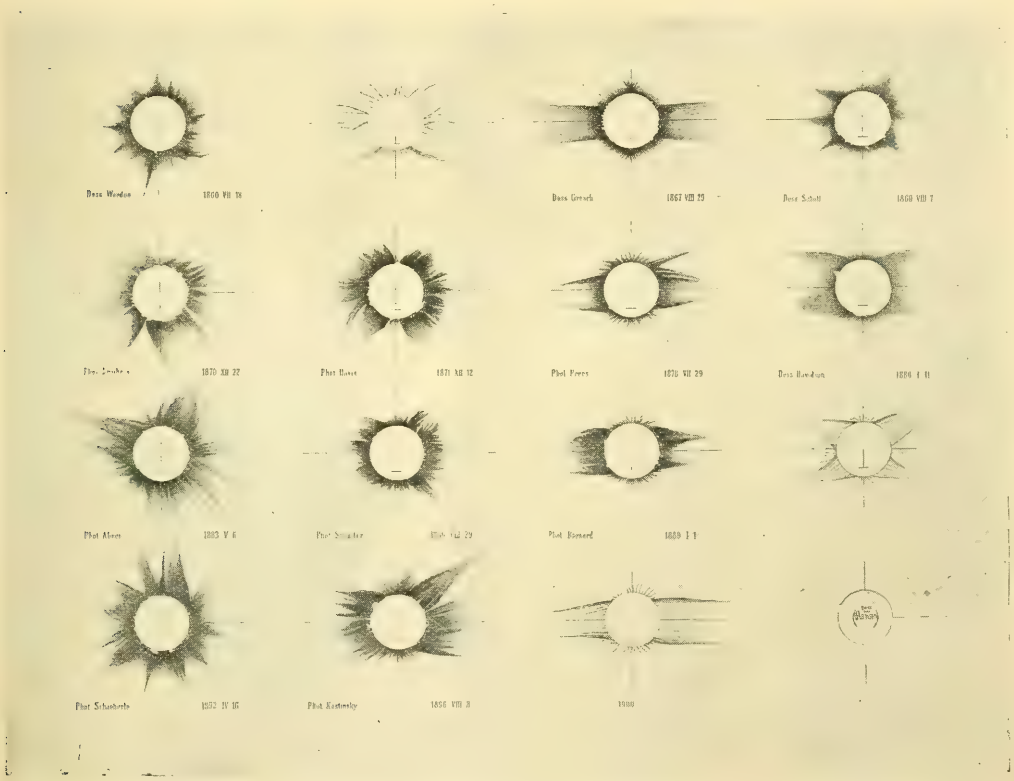
The group of Crustacea included in Dr. Young's work are those inhabiting British Guiana, West Indies, and Bermuda. It is convenient to have what the author calls a "Handlist" of the stalk-eyed crustacea of the western, tropical, and subtropical Atlantic, as the information concerning them was very scattered, in monographs and shorter papers, in periodicals. The author has followed the classification of Mr. H. Milne-Edwards in the case of the larger divisions, but that of Messrs. E. J. Myers and J. S. Kingsley for the tribes of the Brachyura. In his introduction the author wisely gives some explanation of scientific terms, which will be an encouragement to the many persons who, though without the specialist's scientific knowledge, on finding themselves in the geographical district mentioned, would like to know more about the 420 odd species described in this work. Though quite unpretentious, the descriptions will well serve their purpose, especially with the illustrations explaining the synopsis of genera. No attempt is made to overload them with unnecessary terminology; therefore any person of ordinary intelligence will find the book within understanding. The coloured plates will be found useful, and are well executed. There is a valuable bibliography, but in a further edition it would be worth while to insert some instructions for collecting and preserving the larger crustaceae for the advantage and encouragement of those who might be induced to study this order in the regions investigated by Dr. Young.

Vitality. By LIONEL S. BEALE, F.R.S., F.R.C.P. xvi + 78 pp., 7 in. × 5 in. (London: Churchills. 1900.) 6d.

This little pamphlet has been written with the object of emphasising three points: (1) "That ours is the only life-world at this time known"; (2) "that all living matter is, and has ever been, absolutely distinct from all non-living matter"; (3) "that the differences between man and all other organisms in nature are absolute." Though one may differ from Dr. Beale in his conclusions, especially with regard to the last definition, his arguments well repay investigation. He commences with a preface on "Prolegomena, or What is Man?", continuing with short expositions on many subjects connected with life, amongst others being "Laboratory Production of Living Matter," "Man's Organism," "Matter, Ether, and Motion," and concludes with a "Defence of Vitality," defined as a non-physical influence.

The Total Eclipse of May, 1900. Edited by E. WALTER MAUNDER, F.R.A.S. xii + 230 pp., $9\frac{3}{4}$ in. $6\frac{1}{2}$ in., 17 plates and numerous photographs and diagrams. (London: "Knowledge" Office. 1901.) 7s. 6d.

The splendid weather at all the stations occupied by observers of the solar eclipse of May, 1900, notwithstanding the short time of totality, tended to make the records of this among the most interesting yet issued. In the volume before us, forming the report of the expeditions organised by the British Astronomical Association, are to be found contributions from Wadesborough, North Carolina; Colonel E. E. Markwick at sea; Ovar, Portugal; Talavera and Plasencia, Mid-Spain; Manzanares; Elche; and Algiers. Everywhere the time of totality was found to be rather less than was expected. The corona observed was found to agree almost exactly with the form predicted by M. Hansky after his successful expedition to Novaya Zemlaia in 1896, an account of which appeared in SCIENCE-GOSSIP, vol. III. pp. 319–322. M. Hansky's diagram is reproduced by the favour of the publishers, and shows the predicted appearance of the corona at the bottom of the third column, in which appears four types of corona at the time of a minimum of sun-spots. The corona as seen at the maximum period is shown: 1860, July 18th; 1870, December 22nd; 1883, May 6th; and 1893, April 16th. After the maximum is past the corona assumes the form illustrated 1871, December 12th; 1886, August 29th; and 1896, August 9th. The long equatorial extensions at the time of the minimum are aptly displayed 1867, August 20th; 1878, July 29th; 1889, January 1st; and 1900, May 28th; whilst the period following the minimum is shown by the corona of 1869, August 7th, and January 11th, 1880. Several of the observers at the different stations drew the whole or portions of the corona. At Cape Matifou no fewer than eight ladies and four gentlemen were engaged in each drawing a quadrant. The Moon's image in every case was the size of a half-crown. After the drawings were handed in, a resultant tracing was prepared from the whole, and that agrees very fairly with the best photographic results. The position of Mercury a little to the west of the Sun's northern point, 7·3 lunar radii distant from the Moon's centre, was a splendid help in comparing the drawings. Dark markings appear in some of the corona photographs, which are somewhat puzzling in the present state of our knowledge. Some observers set themselves to study the corona by the aid of good telescopes. Mr. W. H. Wesley being allowed to employ the 8-in. equatorial coudé, or elbow telescope, of the Algiers Observatory—undoubtedly the most powerful instrument ever employed for the purpose. The net



At Maximum. After Maximum. At Minimum. After Minimum.

FORMS OF CORONAE AT DIFFERENT EPOCHS.

From "Report on Total Eclipse of 1900."

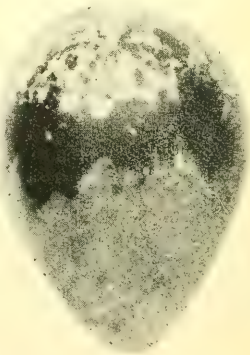
result of this investigation was not great. One of the important objects of study was the shadow bands seen immediately before and after totality. Here some new phenomena were noticed, and also some advance towards the solution of the mystery. Professor M. Moye, at Elche, noticed at first the usual shadow bands, but immediately before totality a second set moving in exactly the opposite direction appeared—one set moving east to west, the other west to east. Captain Carpenter, at Manzanares, also noted a reversal of motion immediately before totality. Mrs. Arthur Brook, at Algiers, just at the end of totality, whilst for some seven or eight seconds the white sheet still looked grey, saw irregularly oval patches, about 9 inches by 6 inches, moving parallel to their lesser diameter; but these quickly gave way to the usual shadow bands. Nearly all the observers agree that the term "bands" is hardly appropriate, "ripple" so much better suggesting the idea of the appearance. The ripples remind one of the shadows of the ripples on its surface seen on the gravel bottom of a clear stream. It seems to be an effect brought about, as suggested by Mr. C. L. Brook, by the narrow crescent of light shining on the little ripples which disturb our own atmosphere. Several of the observers noted the phenomenon known as "Baily's Beads." Although the eclipse was essentially a bright one, seeing that it was at all times possible to tell the time, Mercury and Venus and several of the brighter stars became visible. One of the most frequently used optical instruments was a prism binocular having one of its object-glasses fitted with one of Thorp's diffraction gratings, to which reference was made in a recent number of SCIENCE-GOSSIP. When the crescent became narrow the Fraunhofer lines became visible without a slit, and as the brightness was hidden the reversing layer, as it is called, shone out as a brilliant bright line spectrum. Directly this became visible the signal was given to commence photographic operations on the corona. As the bright lines again made an appearance the signal was given to close the cameras, because they heralded the end of totality. Some of the observers watched the influence of the eclipse on human beings, fowls, insects, and flowers, and the report is very interesting. Fowls, ducks, and pigeons were observed to go to roost, and monkeys sought their sleeping box, bees crowded into the hive, a bat came out, whilst several flowers which close at night closed as the phase of the eclipse increased. It will be gathered from these remarks that this report, edited by Mr. Maunder, contains much information indispensable to amateur astronomers. It is beautifully and copiously illustrated, well printed, and forms a handsome volume, well worth its price. It is interesting from the number of portrait groups and views which are reproduced, besides the more direct scientific matter within its covers.—*F. C. D.*

Homeland Handbooks. 120 pp., 7½ in. × 5 in. Illustrated. (London: St. Bride's Press, Ltd.) 6d.

We have before us two of these very useful and entertaining handbooks. One is entitled "Sunny Days at Hastings and St. Leonards," and the other "Godalming and its Surroundings." They are admirably produced with good local maps and abundant illustration. For the naturalist, pedestrian, or cyclist on exploration bent the "Homeland Handbooks" are invaluable.

MICE EATING LARVAE.—All entomologists know that mice will devour pupae if they have the chance, but that they will indulge in larvae is, I venture to think, of uncommon occurrence. Mr. W. H. Edwards, the curator of the Hastings Museum, Victoria Institute, Worcester, on May 4th last secured over fifty larvae of the large emerald moth (*Geometra papilionaria*). These he intended to sleeve out on growing trees, but owing to the want of suitable sleeves delayed doing so, with the result that a mouse or mice broke into his collection, and the greater part thereof were destroyed.—*Carleton Rea, B.C.L., M.A.*, 34 *Foregate Street, Worcester, May* 13*th*, 1901.

UNUSUAL PLOVER'S EGG.—I send you herewith a photograph of a remarkable egg of a plover which was brought to me last month by the daughter of a keeper on the Cloverley Estate. The smaller end is entirely without markings, and is of a clear pale-brown colour, while the usual dark blotches are massed in a ring round what I



may perhaps be permitted, in humble imitation of "Lewis Carroll," to call "the waist," and the larger end of the egg is normal. As this is the first time I have seen or heard of such a variety, I think it may possibly interest some of your readers.—(*Rev.*) *Chas. F. Thornewill, Calverhall Vicarage, Whitchurch, Salop, May* 13th, 1901.

HABITS OF ANTS.—I wish to draw the attention of your readers to a curious fact that I have noticed here. Ants, being exceedingly numerous, often have need of crossing the tar-pavements which are in vogue in Adelaide. This they do in narrow streams, and I have observed that wherever they have made a path for themselves a distinct dark band is always left. This occurs with at least two species. Is it due to formic acid? Can it be some peculiar exudation which, emanating from each individual, would facilitate recognition? I have not been able to observe how long these dark bands persist after being left by the ants.—*T. Brailsford Robertson, Adelaide, South Australia.*

THE conversazione of the Society of Arts is to be held this year, on June 28th, at the Royal Botanic Gardens, London.

MR. ANDREW CARNEGIE'S magnificent beneficence, in doubling his subscription to the sum of £13,000 to the Iron and Steel Institute Research Fund, has been eclipsed by his unprecedented offer of £2,000,000 sterling for Scotch University education.

THE Admiralty are proceeding energetically with the fitting of "wireless telegraphy" to the ships of the British Navy. They have adopted the "Apps-Newton" coils as the standard pattern, and have placed a large order with Messrs. Newton & Co., of 3 Fleet Street, for coils and transmitters.

IT is greatly to be regretted that the Corporation of London, in advertising for a Public Analyst, should offer terms altogether inadequate for the work required. Considering the responsibility of the post, it is false economy to fix the remuneration at a sum which might prevent the best men from applying.

WITHOUT expressing any opinion on the question of vivisection, we feel that, in justice to our readers, whatever opinions they may hold, we ought to call their attention to the inaccuracies that were stated at the annual meeting of the Anti-Vivisection Society recently held at St. James' Hall. Those who take serious interest in the actual facts are referred to the issue of May 16th of our contemporary "Nature."

AT the meeting of the Royal Meteorological Society on May 15th Mr. Rupert T. Smith read a paper on "The Periodicity of Cyclonic Winds," the result of his own observations made in the neighbourhood of Birmingham during the twenty-six years, 1874–1899. The equinoxes do not appear to be very stormy periods, but from the author's tables it is shown that the greatest frequency and force of cyclonic wind, occurs some two weeks before the spring equinox, and some three weeks after the autumn equinox.

BY his will Mr. G. J. Symons, F.R.S., bequeathed to the Royal Meteorological Society his Cross of the Legion of Honour, the gold Albert Medal awarded to him by the Society of Arts, the testimonial album presented to him in 1879 by the Fellows of the Royal Meteorological Society, and the sum of £200, as well as such of his books, pamphlets, maps, and photographs, of which there was no copy in the Society's library. Mr. Marriott, the secretary, stated that from Mr. Symons's valuable collection he had selected for the Society over 5,000 books and pamphlets and about 900 photographs. A large number of the books were old and rare works, 750 bearing dates previous to 1800, while eight were as early as the fifteenth century. By this noble bequest the Royal Meteorological Society now possesses the most complete and extensive meteorological library in existence.

DR. R. F. SCHARFF records in the "Irish Naturalist" for May a woodlouse (*Armadillidium pulchellum*) new to British fauna. It is a northern form, ranging from Scandinavia to Belgium.

THE number of visitors to the London Zoological Gardens during 1900 was 697,178, being rather more than in the previous year. The captive denizens at the end of December numbered 2,865.

THE "Journal of the Society of Arts" of May 17th contains a reprint of the paper read before the Society on May 15th by M. Marconi, the subject being "Syntonic Wireless Telegraphy." There is also a supplement, consisting of seventeen diagrams, illustrating M. Marconi's method.

WE regret to notice the death of Professor Henry A. Rowland, LL.D., Professor of Physics in the Johns Hopkins University of Baltimore, who died in that city on April 16th last at the age of fifty-two. He was a foreign member of the Royal Society, and was especially devoted to the investigation of spectroscopic phenomena.

THE Wellington College Natural Science Society has published its report of the last year's work. The society is evidently prosperous and doing serious work; this applies especially to the meteorological department, in which there are copious reports. In some of the others, however, comparison shows weakness.

MR. ALEXANDER RAMSAY has in the "Scientific Roll" commenced a systematised bibliography of bacteria. The literature on this subject is so diffused in various languages that the work undertaken is most onerous. He commences in Part I. as early as 1680, and brings the titles of books or scattered papers up to beyond the middle of the nineteenth century.

A ROSIN-CORED solder introduced by the Patent Solder Company, Limited, has been submitted to us. It is in small sticks of from one-sixteenth to one-quarter inch diameter. The advantage in the association of the rosin with the solder, forming the necessary flux, is its cleanliness and convenience. It is admirably suited for the amateur, making or repairing his own instruments.

THE Committee of the Liverpool School of Tropical Medicine proposes to erect brasses in University College, Liverpool, and in the Birmingham University, to the memory of Dr. Walter Myers, who died at Para, on January 20th, from yellow fever, caught while investigating that malady for the School. It was also resolved to found as a permanency at the Liverpool School of Tropical Medicine the Walter Myers Chair of Tropical Medicine, besides a scholarship for the next five years, to be called the "Walter Myers Fellowship of Tropical Medicine."

THE Ealing Natural Science Society might well be copied by similar societies in other districts where men eminent in science have been born. It has formed a committee for the purpose of erecting a memorial in Ealing to the late Professor Huxley. Our readers will remember that Huxley was born in Ealing. The Rev. Professor G. Henslow is the chairman, and the honorary secretary is Mr. B. B. Woodward, 120 The Grove, Ealing. Subscriptions are not confined to the residents of that town. It is expected that a bronze medallion portrait or simple mural tablet will form the monument, according to the amount of funds received.

CONDUCTED BY F. C. DENNETT.

	1901 June	Rises. h.m.	Sets. h.m.	Position at Noon. R.A. h.m. s.	Dec. ° ′ ″
Sun	4	3.48 a.m.	8.8 p.m.	4.46.53	22.23.13 N.
	14	3.44 a.m.	8.16 p.m.	5.28.13	23.14.57 N.
	24	3.45 a.m.	8.19 p.m.	6. 9.48	23.25.52 N.

	June	Rises. h.m.	Souths. h.m.	Sets. h.m.	Age at Noon. d. h.m.
Moon	4	9.45 p.m.	1.18 a.m.	5.36 a.m.	17 6.22
	14	2.4 a.m.	9.55 a.m.	5.56 p.m.	27 6.22
	24	0.59 p.m	6.31 p.m.	11.55 p.m.	7 22.27

	June	Souths. h.m.	Semi-diameter.	Position at Noon. R.A. h.m.s.	Dec. ° ′ ″
Mercury	4	1.29.4 p.m.	3·2″	6.18. 5	25.30.53 N.
	14	1.47·1 p.m.	3·9″	7.15.26	23.32.57 N.
	24	1.38·4 p.m.	4·8″	7.46.17	20.24. 7 N.
Venus	4	0.37·7 p.m.	4·9″	5.26.34	23.42.37 N.
	14	0.52·0 p.m.	5·0″	6.20.16	24.13. 7 N.
	24	1. 6·1 p.m.	5·1″	7.13.50	23.32.15 N.
Mars	14	5.35·2 p.m.	3·3″	11. 4. 4	6.58.56 N.
Jupiter	14	1.17·9 a.m.	21·5″	18.44.18	22.59. 9 S.
Saturn	14	1.36·7 a.m.	8·4″	19. 3.12	22. 9.24 S.
Uranus	14	11.22·7 p.m.	1·9″	16.53. 1	22.34.40 S.
Neptune	14	0.26·0 p.m.	1·2″	5.54.25	22.17.51 N.

MOON'S PHASES.

		h.m.			h.m.
Full	June 2	9.53 a.m.	3rd Qr.	June 9	10. 0 p.m.
New	„ 16	1.33 p.m.	1st Qr.	„ 23	8.59 p.m.

In perigee June 14th at 11 a.m.; and in apogee on 26th at 9 a.m.

METEORS.

			h.m.	°
Apr. 12 to June 30	Coronids	Radiant	R.A. 15.40	Dec. 23 N.
„ 17 to „ 25	β Serpentids	„	„ 15.24	„ 17 N.
May 29 to „ 4	η Pegasids	„	„ 22.12	„ 27 N.
June 10–28	δ Cepheids	„	„ 22.20	„ 57 N.
„ 13 to July 7	Vulpeculids	„	„ 20.8	„ 24 N.

Some large meteors sometimes may be seen apparently radiating from the constellation Scorpio.

CONJUNCTIONS OF PLANETS WITH THE MOON.

				° ′
June 4	Jupiter†	9 p.m.	Planet	3.53 S.
„ 5	Saturn*	5 a.m.	„	3.43 S.
„ 17	Venus*	1 p.m.	„	4.44 N.
„ 18	Mercury*	11 a.m.	„	5. 5 N.
„ 22	Mars†	12 p.m.	„	5.45 N.

* Daylight. † Below English horizon.

OCCULTATIONS.

June	Star.	Magnitude.	Disappears. h.m.	Angle from Vertex. °	Reappears. h.m.	Angle from Vertex. °
1	B.A.C. 5109	5.4	11.49 p.m.	34	0.36 a.m.	319
4	μ Sagittarii	4·1	2. 4 a.m.	104	3.13 a.m.	212
5	B.A.C. 6536	5·5	2.49 a.m.	95	3.59 a.m.	210
8	c^1 Capricorni	5·2	2.59 a.m.	126	3.54 a.m.	208
28	ω^1 Scorpii	4·1	11.15 p.m.	37	0.15 a.m.	291
28	ω^2 Scorpii	4·6	11.30 p.m.	82	0.48 a.m.	240

THE SUN has been very free from disturbances of any kind, but should be watched for the outbreak of spots a long way distant from the equator. Summer is said to commence at 3 a.m. on June 22nd, when the Sun enters the sign Cancer.

MERCURY, as evening star, reaches its greatest eastern elongation, 24° 39′, at 5 a.m. on June 16th, about which time it does not set for more than an hour and three quarters after the Sun. Its nearness to the Moon on 18th should help in finding it above the N.W. horizon.

VENUS is an evening star too near the Sun for good observation.

MARS is apparently too small for useful observation, situated in Leo.

JUPITER coming into opposition at 5 p.m. on June 30th is in the best position for observation during the present year. At the beginning of the month the planet rises just before 10 p.m., and at the end a little after eight. From 11.47 p.m. on June 14th to 2.28 a.m. on June 15th the transit of satellite I. and its shadow may be observed. On June 28th satellite IV. may be seen in transit from 9.47 p.m. until 11.54, the shadow passing off the disc at 11.30. During a considerable portion of the time IV. itself will probably be visible as a dusky spot. The transit of I. and its shadow should be looked for on June 30th, from 10.4 p.m. until 12.21 (see next page).

SATURN is only a few degrees east of Jupiter. It is now a splendid object with widely open rings when the air is good.

URANUS in Ophiuchus comes to the meridian about two hours earlier than the two last mentioned. NEPTUNE being in conjunction with the Sun at 1 a.m. on 21st cannot be observed.

STONYHURST COLLEGE OBSERVATORY.—We have received the "Results of Meteorological and Magnetical Observations, with Report and Notes of the Director, 1900," and have found them to be more than usually interesting. Stonyhurst is celebrated for its excellent work in observing the Sun. An appendix gives the results of the meteorological observations at St. Ignatius' College, Malta.

THE NEW STAR IN PERSEUS continues to decrease in brightness; its fluctuations have been very regular, having a period of between four and five days. Regular variations have, we understand, been observed in its spectrum.

PROFESSOR HENRY AUGUSTUS ROWLAND was born at Honesdale, Pennsylvania, November 27th, 1848. After graduating as a civil engineer, he became instructor in natural science at Wooster University, Ohio. He soon became assistant professor of physics in the Rennselaer Polytechnic Institute, Troy, New York. Our own Clerk-Maxwell was the first to recognise the immense value of his work at Troy. This was in elaborating a system of absolute units for measuring the exact magnetisation produced in iron and nickel by magnetising forces. He also ascertained the mechanical equivalent of heat. He did splendid work in perfecting the screw, which made it possible for him to elaborate the dividing engine, and at the Johns Hopkins University, Baltimore, rule those beautiful diffraction gratings for the study of spectrum analysis. He died April 16th, 1901, a worker who will be missed.

DR. ADOLPH HIRSCH, who had been director of the observatory at Neuchâtel since its foundation in 1859, died April 18th, 1901, aged 71.

VARIABLE MINOR PLANETS.—Reference has already been made on p. 370, vol. vii., to the

variability of Eros. Prof. Max Wolf has noticed variations in others, particularly Tercidina, No. 345, which appears regularly variable in 3 hours 49 minutes.

NEBULAE.—Professor Max Wolf, of Heidelberg, calls attention to a portion of the heavens having an area about equal to that of the Moon, 13′ due west of β Comae Berenices, containing 108 small round nebulae.

GREAT SUNSPOT GROUP.—A fine spot was observed well round the limb on May 19th, after a lapse of about ten weeks without spots on its face. On May 20th and 21st a fine group of small spots followed the large spot, the group having a length of some 90,000 miles.

THE HENRY DRAPER MEDAL has, we are pleased to hear, been awarded by the United States National Academy of Sciences to the distinguished spectroscopist Sir William Huggins, who for the past year has filled the presidential chair of our own Royal Society.

THE TOTAL ECLIPSE OF THE SUN was successfully observed at Mauritius, and a number of photographs taken both of the corona and spectrum. The corona presented the expected minimum form shown on another page, but was less brilliant, yellowish, and not so clearly defined as last year. The observers at Sumatra, from the lower stations, were troubled by cloud, but from the mountains made successful observations.

"CAMBRIAN NATURAL OBSERVER," the organ of the Astronomical Society of Wales, for May, 1901, is to hand, containing much matter about "The New Star," "Meteors," etc. The opening article is on the grave of Rev. T. W. Webb, to whom, more than anyone else, by his papers in the "Intellectual Observer" and "Celestial Objects for Common Telescopes,' is due the great practical interest in astronomical observation now in existence amongst amateurs. Mr. Arthur Mee, the editor of "Cambrian Journal," recently found its inscription already becoming unreadable, and that making no reference to his great astronomical work. There is no tablet to his memory even in his old church. Mr. Mee suggests that those who owe him such a debt of gratitude should raise some more fitting monument to his memory.

THE COMET α 1901 seems to have been observed in several places in Australia on April 23rd, also by Halls at Queenstown in eastern Cape Colony, when it was near Aldebaran. On 25th it is said to have been near μ Piscium. On 26th from Yerkes it is reported to have been 15° north of the Sun. On May 2nd, 3 a.m., Mr. G. F. Chambers, of Eastbourne, his wife and daughters seem to have observed its tail. The next news comes from Arequipa in Peru, where on the evening of May 2nd it was close south of 10 Tauri. On May 4th at 6 h. 28·8 m. its position from the Royal Observatory at the Cape was found to be R.A. 3 h. 54 m. 29 s., Dec. S. 0° 18′ 27″; the daily motion R.A. + 14 m., and Dec. N. 13′. When reported it was so brilliant that its nucleus could be seen with the telescope for some time after sunrise, and it had a triple tail about 10° long; in other words, about as long as from Rigel to Orion's belt. It is now rapidly receding from the Earth, and decreasing in brightness. It is well above the eastern horizon at the time of sunset. On June 1st it will be a little E.N.E. of 17 Monocerotis.

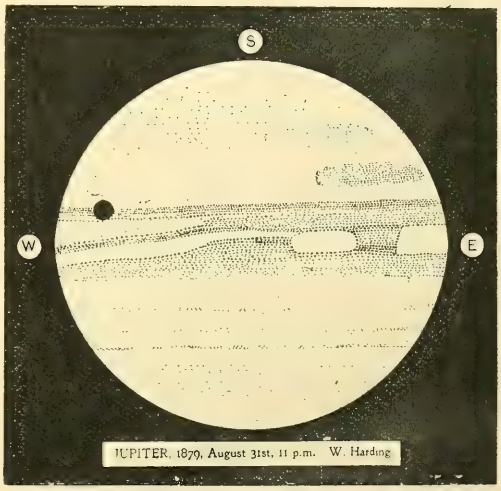
CHAPTERS FOR YOUNG ASTRONOMERS.

By FRANK C. DENNETT.

(*Continued from p. 376.*)

JUPITER'S SATELLITES.

THE equator of Jupiter is only inclined about 3° 5′ to the plane of the ecliptic, therefore it practically has no seasons. The satellites move in orbits almost in the same plane as the planet's equator, with the consequence that, with the exception of IV., they all pass through the cone of shadow which Jupiter throws behind him, and so suffer total eclipse at every revolution and also pass in front of, or transit across the face of the planet. From its greater distance, IV. sometimes escapes both eclipse and transit, but usually follows the same course as the rest. The eclipses are not instantaneous, but the light gradually pales until at last the satellite is lost to view. Before opposition the satellites pass into the cone of shadow away to the west of Jupiter, I. and II. (1) not reappearing until they emerge from behind the



JUPITER, 1879, August 31st, 11 p.m. W. Harding

eastern limb of the planet. After opposition, these two satellites come right up to and pass behind the western edge of the planet, and by-and-by come out of the shadow a little to the east of the planet. Satellites III. and IV. may be seen to pass into and out of the shadow, and then pass behind the planet itself, or *vice versa*. When one of the moons is hidden by the shadow, it is said to be eclipsed, but when by the body of the planet it is called an occultation. These phenomena may be readily observed with small instruments. Sometimes, when satellites were suffering occultation in 1877, Todd and Ringwood, at Adelaide, thought they could see the moons through the limb of the planet. In 1863, on April 26th, Wray, with an 8-inch object-glass, saw II. apparently projected within the limb for about 20 seconds. Revelations of such phenomena as these are perhaps beyond the powers of smaller telescopes.

The most interesting observations, however, are those of the transits of the satellites and their

(1) Just at the time of quadrature—*i.e.*, when the planet is 90° distant from the Sun—II., for a brief interval, reappears between eclipse and occultation.

shadows over the face of the planet. The satellites, when they first enter upon the disc, usually appear as tiny, bright round spots; as they get farther on the disc, very frequently I. and II. seem to disappear altogether, although at times they may be seen bright across the disc, and always appear as such as they near the western limb. III. and IV. usually very soon disappear as bright spots, and then quickly reappear as dark spots, and so cross the planet until they nearly reach the western limb, when they first disappear and then become bright. The shadows, before opposition, cross the planet on the western side of the satellites throwing them, but after opposition they may be seen on the other side. The shadow very often seems larger in diameter than the satellite throwing it, doubtless an effect due to the penumbra or partial shadow surrounding the shadow itself. An ill-defined edge has been observed to these shadows which confirms this explanation. A phenomenon not so easy of explanation has sometimes been observed. A shadow has been seen to be grey instead of black. Likewise when the planet is some three months past opposition the shadows have sometimes been noticed to be somewhat elongated east and west on first entering upon the disc, due to the positions of the Earth and Sun with respect to the planet. Satellites III. and IV. have been seen when in transit to be almost, if not quite, as dark as the shadows they threw, and very occasionally IV. has been seen to enter upon the disc as an almost black spot.

The illustration showing satellite III. and its shadow in transit on August 31st, 1879, is from a drawing by W. Harding, of Bournemouth, as seen with a 3-inch Wray achromatic, and the shadow of II. is also shown just entering on the disc in one of Rev. T. E. R. Phillips' drawings on p. 281, vol. vii. If a transit of one of the satellites occurs when, at the time of opposition, the Earth happens to be nearly in a straight line between the Sun and Jupiter, the Moon may be seen to occult its own shadow. Records of such phenomena occur under the dates of January 14th, 1872, at midnight, when Mr. F. M. Newton saw the shadow of I. reduced to a black crescent; on May 13th, 1876, Mr. G. D. Hirst, of Sydney, Australia, observed the shadow of this same satellite reduced to the form of a crescent. In 1893 Professor Barnard made a very similar observation.

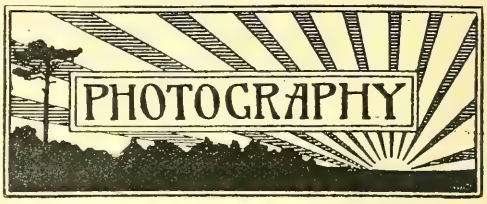
If an observer could be on Jupiter on June 30th, 1901, our Earth would actually appear in transit across the Sun's disc. On that date satellite I., as seen from the Earth, transits over the disc, and will cover the central portion of its own shadow.

Against the date August 30th, 1877, at 8 p.m., I have the note that the shadow of III. was much the larger and blacker, and that of I. seemed to pale and fade away as it drew near the limb. Several observers have fancied the shadow of II. to be often very ill-defined.

The reason of the variations in brightness in the satellites is undoubtedly caused by the presence of spots upon their surfaces, the spots having frequently been drawn by observers using telescopes of considerable aperture. Numbers I. and IV. are sometimes found to have irregular shape.

Very occasionally, as on November 2nd (old style), 1681, and on August 21st, 1867, Jupiter was seen as apparently without satellites, all of them being either in transit or eclipsed.

(*To be continued.*)



CONDUCTED BY B. FOULKES-WINKS, M.R.P.S.

EXPOSURE TABLE FOR JUNE.

The figures in the following table are worked out for plates of about 100 Hurter & Driffield. For plates of lower speed number give more exposure in proportion. Thus plates of 50 H. & D. would require just double the exposure. In the same way, plates of a higher speed number will require proportionately less exposure.

Time, 8 A.M. to 4 P.M.

Between 7 and 8 A.M. and 4 and 5 P.M. double the required exposure. Between 6 and 7 A.M. and 5 and 6 P.M. multiply by 4.

SUBJECT	F. 5·6	F. 8	F. 11	F. 16	F. 22	F. 32	F. 45	F. 64
Sea and Sky..	$\frac{1}{50}$	$\frac{1}{250}$	$\frac{1}{120}$	$\frac{1}{60}$	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$
Open Landscape and Shipping	$\frac{1}{120}$	$\frac{1}{60}$	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	1
Landscape, with dark foreground, Street Scenes, and Groups ..	$\frac{1}{32}$	$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{2}$	1	2	4
Portraits in Rooms ..	2	4	8	16	32	—	—	—
Light Interiors	4	8	16	32	**1**	**2**	**4**	**8**
Dark Interiors	16	32	**1**	**2**	**4**	**8**	**16**	**30**

The small figures represent seconds, large figures minutes. The exposures are calculated for sunshine. If the weather is cloudy, increase the exposure by half as much again; if gloomy, double the exposure.

PLATE TESTER.—We have received a descriptive pamphlet of the new "Chapman-Jones Plate Tester" made by Messrs. Sanger, Shepherd & Co., of 5, 6, and 7 Gray's Inn Passage, Red Lion Street, Holborn, W. The fact of this instrument emanating from such a well-known house is in itself sufficient guarantee of exactness. The object of this apparatus is to provide means of ascertaining, within a sufficient degree of accuracy to be of practical value, the relative working characteristics of photographic plates and films. It consists essentially of a screen plate $4\frac{1}{4}$ inches by $3\frac{1}{4}$ inches, containing:—A series of 25 tints of graduated densities; a series of coloured squares and a strip of neutral grey, all five being of approximately equal luminosity; a series of four squares of special colours, each colour passing light from a definite portion of the spectrum; and a square of a line design over which is superposed a half-tone negative. In order to use the instrument, a quarter-plate of the brand to be tested is simply exposed behind the screen for a few seconds, developed, fixed and washed. An examination of this plate will show sensitiveness, or speed, range of gradation, possible range of exposure, sensitiveness to colour, comparative size of grain of plate, amount of halation, the most suitable light for development. By further exposures, the instru-

ment can be used for testing and adjusting developers, testing media for dark room illumination, examination of light filters, testing plate backings, etc. Although nearly all makers give some indication on their packages with regard to speed and other characteristics of their plates, the conditions under which they make their tests are not uniform. One very great advantage of the little instrument is that it enables the actual user of plates to ascertain quickly, and with a minimum of trouble, the comparative usefulness of the various brands on the market for his own special purpose. The record obtained is a permanent one, always ready for reference. The essential part of the apparatus is a screen plate consisting of a series of 25 tints of graduated densities, each numbered for identification and comparison with each other; also a series of four small coloured squares and a strip of grey numbered 1 to 5, all being approximately the same luminosity and constituting what is known as the "Abney Colour Sensitometer." Then there is a set of four squares of special pure colour, each of which represents a definite portion of the spectrum. These colour squares are for testing the colour sensitiveness of the plate; also to ascertain the most suitable colour for the source of light used for developing. The light adopted for making the test is by standard candle. Full working instructions are sent out with each plate-tester, by the aid of which the youngest amateur should be able to test each batch of plates, and thus to form a far better judgment of required exposure and other points about the plates.

PHOTOGRAPHY FOR BEGINNERS.

By B. Foulkes-Winks, M.R.P.S.

(*Continued from Vol. VII., page* 379.)

Section I. Cameras (*continued*).

In the "Adams" type of camera the bag system employed is that known as the "Yale." By this method the lifter, for lifting the plates, is dispensed with entirely. This is accomplished by a simple device, which raises the front plate automatically, slightly above the rest, thus enabling the operator to take hold of the sheath carrying the plate and lift it into the bag, pressing it down at the back of the box. The simplicity of this changing will be appreciated by referring to fig. 2. This shows a plate in the act of being pressed down into position after having been exposed. A minor point of value in this system is, that the exposed plates are always those which are first taken out of the camera. Thus if only two or three are exposed, the first plates taken out of the camera are the ones exposed. There is in this "Yale" system of changing what is called a dividing sheath. This is made thicker and more narrow than a plate sheath, and is always inserted last. It is used as a guide, as all the exposed plates are those behind this dividing sheath. By feeling through the bag, and counting the number of sheets in the rear, it is always possible to ascertain how many unexposed plates there are in the camera. This sheath is made thick so that it cannot pass the opening through which the plates are lifted into the bag, thus rendering it impossible to twice expose the first plate. It is also very useful when the plates are being developed, as the operator will know that all plates behind this dividing sheath are those that have been exposed. Of the cameras made by this firm the "Yale" is unquestionably the most popular. It is very small and neat in appearance, is fitted with the firm's patent pneumatic regulation shutter working between the lenses, giving a range of speeds varying from $\frac{1}{100}$th to $\frac{1}{2}$ a second, and time. It has two "Adams" Real Image Brilliant View finders, one for each way of the plate. A rising front for both horizontal and vertical pictures, and rackwork focussing. All the lenses are now fitted with Iris diaphragms that work from outside the body of the camera. We show an illustration (fig. 1) of the No. 1 pattern (£5 5s.) fitted with an

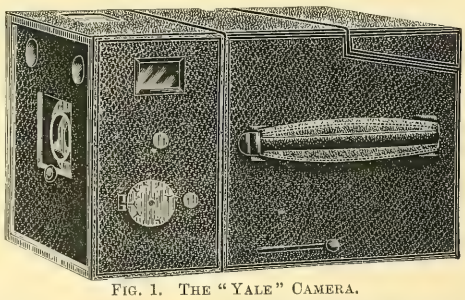


Fig. 1. The "Yale" Camera.

ordinary good class Rapid Rectilinear lens and made for quarter plates. The No. 2 is fitted with "Cooke" lens working at F. 6·3, and is of the new Anastigmat type of lens. The price of this pattern is £10 10s. 0d. No. 3 type costs

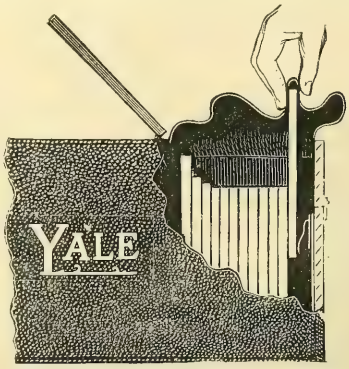
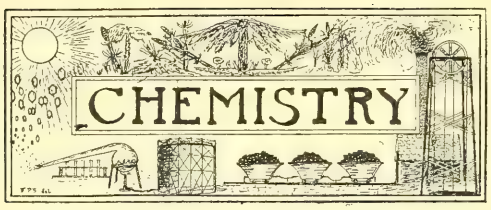


Fig. 2. The "Yale" Changing System.

£15 15s. 0d., made for 5 × 4 plates, and is fitted with a 6-inch Cooke lens F. 6·3. The No. 4 is fitted with a 6-inch rapid rectilinear lens and made to carry 5 × 4 plates, price £7 17s. 6d. In addition to these four patterns the firm also make a stereoscopic Yale camera. This is for plates $6\frac{3}{4} \times 3\frac{1}{4}$, giving two pictures on one plate, each measuring 3 inches square with a quarter of an inch space between. The shutter works on the Adams pneumatic system and exposes both pictures simultaneously: it is fitted with a pair of "Ross" 5-inch Aplanat lenses, working at F. 7·5; price £12 12s. 0d. The same camera may be obtained fitted with a pair of "Ross-Zeiss" $4\frac{1}{8}$-inch convertible Anastigmat lenses at F. 6·3. With these lenses the cost is £22 10s. 0d. All these cameras are constructed to hold twelve plates, but they will carry twenty-four cut films instead if it is desired to work with films.

(*To be continued.*)



CONDUCTED BY C. AINSWORTH MITCHELL, B.A.OXON., F.I.C., F.C.S.

A COFFEE WITHOUT CAFFEINE.—The stimulating properties of tea and coffee are due to the presence of the alkaloid caffeine, which in ordinary coffee-berries amounts to about 1·5 per cent. Bertrand has recently analysed the berries of *C. humblotiana*, which grows in the Comoro Islands, and has found that they are absolutely free from caffeine, and hence he considers that there is no doubt as to this plant being a distinct species.

"FERMENTATIVE" ACTION OF PLATINUM.—Finely divided platinum can convert alcohol into acetic acid by an oxidising process closely resembling the fermentation of wine into vinegar by the acetic bacteria. Bredig has shown that there is a further remarkable resemblance, for many poisons, such as prussic acid, temporarily destroy the "fermentative" power of platinum; whilst iodine is so toxic that the oxidising power is not regained after complete removal of the iodine.

ALCOHOL FROM SAWDUST.—In reference to your note on "Alcohol from Sawdust" in April SCIENCE-GOSSIP, I may mention that the conversion of cellulose into dextrose, capable of fermentation, is not by any means new, though I have not heard of cellulose in the comparatively impure form of sawdust being successfully treated hitherto. By the bye, is the use of the word "invert" justified in this connection? Strong H_2SO_4, with subsequent dilution and boiling, converts dry cellulose first into dextrin and then into dextrose, which may be obtained as a syrup by neutralising with chalk and then filtering. I have in my laboratory a small quantity of dextrose that I made some years ago from Swedish filter paper, the purest form of cellulose known to me, but which I have unfortunately allowed to grow mouldy. The process is, however, not quite as simple as it sounds; but I found the subsequent fermentation into alcohol the most difficult, owing, I believe, to the want of proper "food." I have sometimes thought of digesting sawdust with certain solvents to get rid of the resinous matters, or of experimenting with wood cellulose in the comparatively pure form of sulphite pulp, but anticipate difficulty with the lignin.—*F. Shillington Scales, 7 The Elms, Sunderland.*

[The word "inversion" as applied to starch and cellulose is literally incorrect, but it is a convenient term in common use to describe the hydrolyses effected by acids in the same way as the inversion of cane sugar. The fact that sugar could be obtained by the action of acid on cellulose was recorded in 1819, but the details of any manufacturing processes based on this were kept secret. Dr. Simonsen found that the yield of fermentable sugar that could be obtained from pure sulphite cellulose varied greatly with the strength of acid, pressure and other factors. The most favourable conditions were:—40 grammes of cellulose, with 1,080 c.c. of dilute sulphuric acid, containing 0·45 to 0·6 per cent. of anhydrous acid, and a pressure of 8 to 10 atmospheres. The maximum yield was 43·1 per cent. of sugar on the weight of cellulose taken. —ED. Chemistry, S.-G.]

TRAFALGAR SQUARE WELL WATER.—It is very interesting to compare the results of analyses of the Government well in Trafalgar Square, London, as made by different chemists since 1846. These have been tabulated by Mr. W. W. Fisher, M.A., F.I.C., with the object of showing the variation in the water during the last fifty years. The following tabulation, which is published here with Mr. Fisher's permission, shows the constituents in parts per hundred thousand:

Chemist	Total Solids	Chlorine	Sulphuric Acid SO_3	Carbonic Acid CO_2	Silica SiO_2	Iron & Phosphoric Acid (Fe_2O_3 P_2O_5)	Lime CaO	Magnesia MgO	Soda Na_2O	Potash K_2O
1846 Brande	94·4	22·3	15·9	10·6	1·0	—	2·52	1·66	(54·0	—)
1848 Abel and Rowney Q. J. Chem. Soc. I. 97	99·15	17·39	16·02	14·6	1·3	·9	2·61	1·56	35·9	10·55
1857 Campbell Q. J. Chem. Soc. IX. 22	84·97	16·51	17·19	8·3	·57	·97	2·18	1·40	39·7	1·02
1869 Frankland Riv. Poll. Com. VI. Report	83·40	16·55	—	—	—	—	[5·9 =	Hardness]	—	—
1900 W. W. Fisher ..	85·7	17·0	16·14	11·35	1·0	·40	2·40	1·50	38·0	1·35

It appears that between 1848 and 1857 the water lost 14 per cent. in total saline constituents, but since the latter date its composition has remained practically constant. This loss consisted in the main of potassium oxide and carbonic acid.

TUNG OIL.—This remarkable oil, which is also known as Chinese wood oil, is expressed from the seeds of the *Aleurites cordata*. It is extensively employed in China and Japan in the manufacture of varnish, but recent attempts to introduce it into Europe as a commercial article have met with only partial success. It possesses greater drying properties than any other known oil, far exceeding linseed oil in this respect. On being heated in a vessel from which the air is excluded, it undergoes a curious change, being converted into a solid mass. The purified fresh oil has a not unpleasant odour, but the smell of old or less-refined oil is very disagreeable, and has prevented its general use in the linoleum industry.

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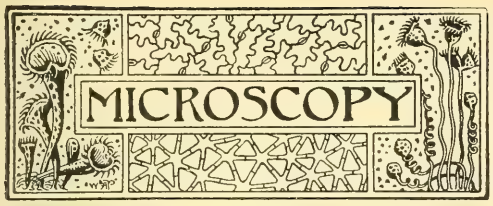


CONDUCTED BY F. SHILLINGTON SCALES, F.R.M.S.

ROYAL MICROSCOPICAL SOCIETY, April 17th, William Carruthers, Esq., F.R.S., President, in the chair.—Mr. Enock being called upon to give his demonstration on the metamorphoses of one of the dragon-flies (*Aeschna cyanea*) said that the slides he was about to exhibit were only obtained after many failures. In his endeavours to obtain a complete set of photographs from life which would show every stage in the metamorphosis of the pupa of the dragon-fly, he had taken over one thousand photographs before he was successful. Those he was about to show were taken from the same individual, and recorded every stage of the process, which occupied a period of six hours only. Considerable patience and constant watching were required, as after the first indication of change was noticed the dragon-fly might emerge at any time in the following three days, and when the process of emergence began it went on rapidly—so rapidly, in fact, that three photographs were taken within the space of six seconds. Mr. Enock then showed on the screen photographs of a nymph to illustrate the remarkable movements of the mask by which the insect was enabled to capture its prey. These were followed by a series of about thirty slides illustrating every stage of the metamorphosis, from the pupa to the perfect insect. Mr. E. M. Nelson exhibited a slide of scales of *Podura* under polarised light.

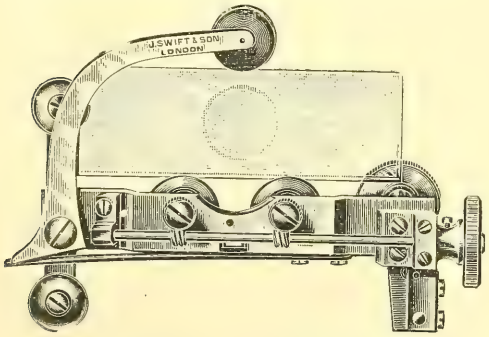
ARACHNOIDISCUS EHRENBERGII.—I have on my microscope stage a slide, mounted by the late Mr. Cole, of the Diatom *Arachnoidiscus ehrenbergii*, consisting of seven valves grouped without crowding, arranged as six valves around a central one. This is an object well known to most readers of SCIENCE-GOSSIP, but the following particulars may be of interest to some of the younger readers who are fond of the wonder-showing instrument. The seven valves about which I am writing have an average of twenty-two rays, reaching from near the centre to the margin, each interspace being divided some distance inwards from the margin by an incomplete secondary ray. The distance between these principal and secondary rays is again divided by marginal lines still shorter, in some cases two and in others three in number, and these latter by still shorter lines or striae which are placed, with the utmost regularity, on the extreme margin. The hyaline centre of the valve is encompassed by a circle of rods, and this circle of rods is again enclosed by a circle of dots, and from this latter proceed the principal rays. The interradial spaces are occupied by dots, or puncta, that are shown under a high power to be compound, and which, with the power I am using, present a notched or emarginate appearance. The spaces between the rays are filled by these secondary markings, but they are by no means crowded. They are in rows, which are longer, and the elements comprising them more numerous as we proceed from the centre to the circumference. I have counted these secondary markings in some two or three valves in different sections, and a fair average number will be 85, which multiplied by 22, the number of interspaces, = 1870. This multiplied by 7, the number of valves, gives a total of 13,090 secondary markings, in addition to the rays, subrays, and the before-mentioned components of each valve. I now arrive at my little demonstration of the wondrous power of the compound microscope to afford never-ending interest and delight to the possessor who knows how to use it intelligently, even though he has no object in view but the pleasurable employment of his leisure hours. The above notes were made with a Swift $\frac{1}{4}$-inch and the No. 1 ocular, and the slide was placed on a card on the stage, through which card I had made a perforation with a fine sewing needle. The hole was sufficiently large to embrace the seven valves, with a considerable margin to spare.—*F. R. Brokenshire, Exeter.*

EPIDERMIS OF LEAF OF AURICULA.—The glandular hairs mentioned on page 246 of the January SCIENCE-GOSSIP are well worth examining. I have never seen them mentioned in any text-books, and I believe they are not at all familiar objects to microscopists. The slide sent round the Postal Microscopical Society by Mr. McGhie was one given to him by me, and I have never before heard of this object being mounted as a micro-slide. The epidermis of the underside has curiously formed hairs, funnel-shaped, with button-like heads on their points, the broad mouth being downwards to the cuticle. It is difficult to get clean away from the underlying tissue; but a soak in dilute nitric acid for twenty-four hours will remove it wholesale, though even then much of the cellular structure beneath is carried away. I have not sufficiently examined these hairs in the fresh state to express much opinion as to their function. I think it is just probable that these leaves, growing near the ground and having to stand through the wet, wintry weather, secrete an oily substance as a protection to their leaves, both for warmth and to aid in throwing off superfluous moisture. The upper side, being somewhat of a leathery texture, is better able to take care of itself. These hairs are very minute, giving a silvery appearance to the underside of the leaf, and require a tolerably powerful hand lens for their recognition as hairs.—*John J. Ward, Lincoln Street, Coventry.*

WATSON & SONS' HOLOSCOPIC OBJECTIVES.—Messrs. Watson & Sons have sent for our inspection two more objectives of their new "Holoscopic" series, concerning one of which, a $\frac{1}{2}$-inch of N.A. ·65, we were able to speak most highly on a previous occasion (S.-G., vol. vi. p. 313). One of the new objectives is a $\frac{1}{6}$-inch, which we found to be an excellent lens; but its aperture did not exceed ·90, and accordingly it did not show as marked a superiority over one or two other achromatics of the same power and approximate aperture known to us as might have been expected from its construction. The other objective was an inch of N.A. ·30. This was a very fine lens, and fully equal to the high standard Messrs. Watson have set themselves for this series. We may remind our readers that these objectives are constructed on an entirely new system, with the

result that spherical aberration is corrected in a manner that is, so far as we are aware, only equalled by the apochromatic lenses. As a consequence these objectives will stand unusually high eyepiecing without giving a "rotten" image. The lenses are under-corrected, and require to be used with over-corrected oculars of the ordinary or of the "Holoscopic" adjustable type. A noticeable feature is the great diameter of the back-lens. The price of the $\frac{1}{6}$-inch is £4 and of the 1-inch £2 5s. The former is constructed for either the short or long tube, but the latter for the long tube only.

Swift's New Portable Microscope.—Messrs. Swift have sent for our examination an improved form of their portable folding microscope, which we noticed last September (*ante*, p. 118). The new model is fitted with a sub-stage focussing adjustment of the now familiar spiral-screw type, and also with a removable mechanical stage. The latter we illustrate herewith, and its mechanism



will be at once apparent. The sides of the microscope stage are provided with parallel grooves, into which the mechanical stage fits, and in which it runs vertically, the movements being dependent upon friction instead of the usual rack and pinion arrangements. It is effective, works smoothly, cannot easily get out of order or wear loose, is instantly attached or removed without the need of any binding screws, and costs only fifty shillings. Of the microscope itself we have previously spoken highly, and we are not surprised to learn that it has already met with a considerable sale, especially for army work and in connection with the study of tropical medicine, for which it is well fitted by its compactness. The addition of the focussing sub-stage, added to its excellent design and workmanship, makes this instrument suitable for almost all classes of serious work. The cost of the latter adjustment is 20s., making the total cost of the microscope, in leather cases, £6, or, with Abbé condenser, iris diaphragm, and blue glass and carrier, £7 10s. The mechanical stage is, of course, an extra.

MEETINGS OF MICROSCOPICAL SOCIETIES.

Royal Microscopical Society, 20 *Hanover Square*. June 19, 8 p.m.

Quekett Microscopical Club, 20 *Hanover Square*. June 7, 21, 8 p.m. June 15, * Surrey Commercial Docks.

[For further articles on Microscopic subjects see pp. 1, 4, 7, 8, and 11, in this number.—Ed. Microscopy, S.-G.]

EXTRACTS FROM POSTAL MICROSCOPICAL SOCIETY'S NOTEBOOKS.

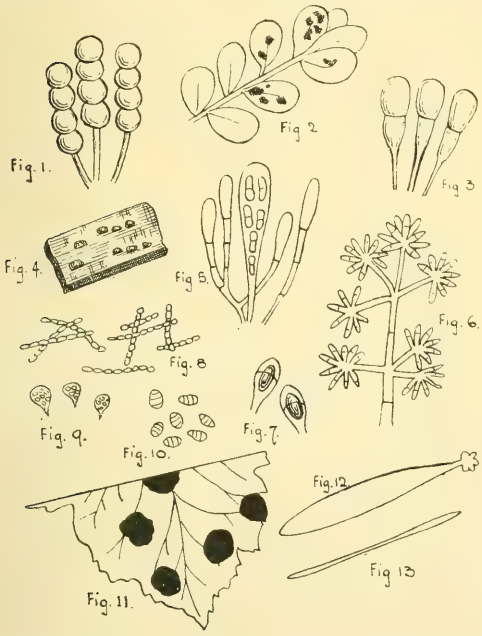
[Beyond necessary editorial revision these extracts are printed as written by the various members.—Ed. Microscopy, S.-G.]

[The following notes by Mr. Lett, though intended to be descriptive only of his own slides as circulated in the P.M.S., are sufficiently suggestive to warrant their reproduction. The study of micro-fungi is most fascinating, and will well repay the attention of any of our readers who may not yet have devoted time to it. Most of the fungi alluded to below are those which make their appearance upon rotting wood or decaying vegetation, but perhaps an even more interesting occupation is to search the leaves and stems of living plants. Especially does this apply to the heteroecious fungi—those which pass a part of their lives upon one plant and the remainder upon another and entirely different plant. The common "rust" of corn, *Puccinia graminis*, forms an instance of this remarkable alternation of generations, passing part of its life-cycle on the haulms of grapes and part on the leaves of the barberry, both hosts being absolutely necessary for its development. Though this fact is now well known, it was formerly so little realised that the fungus, owing to its widely different appearance, received different names according to its period of development, the barberry stage being previously generally known as *Aecidium berberidis*. The process itself is one that can be traced by any observer who will take the trouble to place the spores upon the different host-plants. It is of course necessary to make sure that the spores have not already germinated. We are tempted to give a brief sketch of the life-history of one of these micro-fungi, such as *Puccinia graminis*, above mentioned, if only to explain to those unfamiliar with them the meaning of several of the terms used in the following notes; but limitations of space necessitate our referring our readers to the various botanical text-books. With regard to collecting we may say that, whilst experience saves both time and trouble, the searcher will soon learn to recognise micro-fungi. It may be a discoloured spot upon a leaf, or a red, yellow, black, or brown patch; it may be an appearance like spores on the backs of ferns, or it may be merely a distortion of the stem. A close examination will generally be repaid. In gardens, fields and ditches, on railways, and on the borders of woods, micro-fungi are to be found; the damper the situation the better generally; so that there are few country walks that would not readily yield a dozen and more specimens. This is true throughout the year, though less so in winter. Generally speaking, it may be said that it is better to thoroughly examine a comparatively small portion of ground than to endeavour to cover a wide area. Most of the species will be found on the under-side of leaves, but there is great diversity in their appearance. We need not add to the methods of mounting mentioned below, but would urge that the following out of life-histories, or even careful examination and study under the microscope, is of more importance than the mere collecting of specimens and ascertaining their species. The spores themselves can be sown in water in an excavated cell or an ordinary slide, the slide being of course placed under a small

glass shade, with a receptacle for water to prevent evaporation. The illustrations are from coloured drawings by Mr. Lett, but we regret that the exigencies of reproduction prevent our giving the magnifications.—Ed. Microscopy, S.-G.]

Notes by Rev. H. W. Lett, M.A.

Notes on some Micro-fungi.—*Phragmidium obtusatum* Link. Strawberry brand. Cooke's Handbook, No. 1460. Habitat: on leaves, &c., of barren strawberry (*Potentilla fragariastrum*),

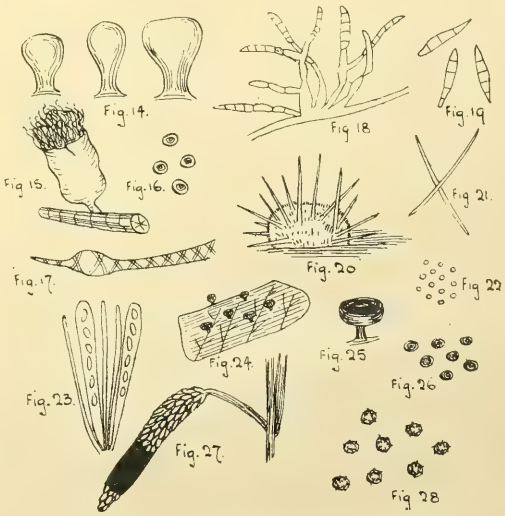


summer and autumn, though I have collected it also in spring. The uredo spores are sub-globose, of an orange colour, and form confluent masses that often surround the petioles and cover the under-side of the leaves. The spots in the earliest stage are yellowish and nearly round. The brand spores (fig. 1) are cylindrical, multiseptate, with the terminal joint obtuse, and borne on a long peduncle. They are scattered in minute tufts. The blunt terminal joint is a distinguishing mark of this species. I have found both brand and uredo states of this micro-fungus mingled together on the same leaf, but only rarely. The synonyms are *Uredo potentillarum*, *Aregma obtusatum*, and *Puccinia potentillae.*

Puccinia buxi D.C. Box brand. Cooke's Handbook, No. 1514. Habitat: on the leaves of box (*Buxus sempervirens*, fig. 2). In spring, summer, and autumn. The uredo spores do not appear to have yet been recognised. The sori of the brand spores grow on both surfaces of the leaves of the box plant. They are somewhat round, convex, and scattered irregularly. The brand spores (fig. 3) of all the Pucciniae have only one division, the upper and lower parts being nearly equal in size. In the box brand the spores are brown, rather strongly constricted at the division, and the lower cell is slightly attenuated. Their form is oblong, cylindrical, and they are borne on a very long peduncle. For convenience of reference I have given the numbers in Cooke's "Handbook of British Fungi," in which each species is described, and from which I have in great part compiled these memoranda.

Nectria cinnabarina Fr. Vermilion Nectria. Cooke's Handbook, No. 2346. Habitat: on dead twigs of all kinds (fig. 4). Very common in winter and spring. The little red dots have probably been noticed by all. When a dead twig or "pea-rod" on which they are seen is examined, two kinds of the red points will be observed. One is of smooth red dots bursting through the outer barks, with a naked margin: these, unless when moist, have a whitish bloom; they are the conidia or early state of the fungus, a section of which shows it to consist of a mass of minute dust-like bodies. The other red points will be found wrinkled and studded with ostiolae, or little raised papilliform mouths. Their colour is a bright vermilion, which at length changes to a brownish hue. In this are the asci, or flask-like vessels which contain uniseptate sporidia (fig. 5). These sporidia are colourless and rather pointed at each end.

Dactylium roseum Berk. Rosy Dactylium. Cooke's Handbook, No. 1827. Habitat: on decaying plants. The flocci, or fertile threads of this



fungus, are erect, jointed, branched, and extremely delicate (fig. 6). I could not manage to secure even one in a perfect condition under the covering glass; they broke up the instant my needle touched them; so that it is loose fruit alone that appear on the slide. The fruit or spores are septate (fig. 7)—uniseptate—oblong in shape, and rose-coloured. The spores in my plant were borne on erect flocci, but owing to their extremely slender nature, there are none actually *in situ* in my present specimen.

Dacryomyces stillatus Nees. Orange Dacryomyces. Cooke's Handbook, No. 1039. Habitat: on pine rails. This is common in damp weather. It is of a firm, gelatinous nature, and of the same character and consistency throughout the whole

mass of the plant. In the first stage of its growth it is of a yellow colour, which with age becomes orange. The orange colour is permanent or persistent, very different from the fugacious orange-yellows of the Uredines, which cannot be preserved in the herbarium. This Dacryomyces looks as bright after having been kept in a dry state for years as it did the day after it was collected. The whole mass of this plant is composed of conidia (fig. 8) disposed in rows. The sporophores, or spore-bearing vessels (fig. 9), are clavate. They are not often found in this fungus, but there were several in the portion I prepared, only they burst in the mounting process. The spores (fig. 10) they contained may be found on the slide by careful search.

Rhytisma acerinum Fr. Sycamore Fungus. Cooke's Handbook, No. 2279. Habitat on sycamore and maple leaves.—Very common. Anyone who has ever looked at a sycamore tree in summer or autumn must have noticed nearly every leaf to have been more or less spotted with black, as if the first few great drops of some thunder shower had been jet-black pitch instead of rain (fig. 11). These are the spermogonia spots of this fungus, and of themselves are well worth being examined under the microscope. What I have prepared and mounted is a bit of the ascophorous state which it assumes during winter and spring, when the black-spotted leaves are lying on the damp ground. The black spots then swell, become wrinkled, and burst by flexuose labiate fissures. The asci (fig. 12) are lanceolate, with the upper part egg-shaped. The sporidia (fig. 13) are very long, thead-like, and flexuose. A full and illustrated account of *R. acerinum*, by Mr. W. B. Grove, is to be found in SCIENCE-GOSSIP, vol. xxii. O.S. p. 228.

Trichia varia P. Variable Trichia. Cooke's Handbook, No. 1188. Habitat on decayed wood.—This is one of the Myxomycetes, or, as they are called in Cooke's Handbook, Myxogastres. The whole plant is at first pulpy or gelatinous, the peridium (figs. 14 and 15) or enclosing skin being at length filled with spiral flocci, or threads (fig. 17), and dust-like spores (fig. 16). This is one of those fungi which when young are mobile, and have a changing form of an amoeboid character. So remarkable is this feature that some would have this and kindred plants reckoned among the animals. I have given drawings of the peridium in various stages of growth. Owing to its dry nature I found it necessary to prepare this fungus for mounting by placing in a mixture of equal parts of glycerine, spirit, and water, and keeping it for some days before mounting finally in glycerine jelly.

Fusisporium roseolum Steph. Potato Fusisporium. Cooke's Handbook, No. 1863. Habitat on decayed potatoes.—This plant is very common on the decayed potatoes found during winter and spring among heaps of this esculent, especially when kept in a dry home. I have also found it on decayed apples kept in a loft near potatoes. It forms thin floccose patches of a delicate rose-red colour (fig. 18). The fertile flocci, or threads, are short, the spores (fig. 19) are curved, elongated, slightly obtuse, three to six septate, and often have slight projections at each dissepiment. I have selected this to show what an interesting, and at the same time beautiful, plant for study or examination with the microscope may be found on even a worthless rotten potato. The more we examine even the commonest things, the more the student and observer is sure to find.

Volutella ciliata Fr. Fringed Volutella. Cooke's Handbook, No. 1667. Habitat on potato.—This is another beautiful fungus to be found on potatoes, most frequently on such as are in an incipient state of decay. It grows in little tufts or cushions which are sub-stipitate. It is at first whitish, which with growth and age becomes rose-coloured. The whole circumference of the plant is fringed or studded with long hyaline bristles which stand erect. These bristles have sharp points, and are evidently septate (fig. 20). The spores (fig. 22) are different, and of a gelatinous character. There is a sort of stroma which Berkeley conjectures to be formed probably from abortive bristles. A synonym for this is *Psilonia rosea*.

Peziza fusarioides Berk. Nettle Peziza. Cooke's Handbook, No. 2114. Habitat on dead nettle stems.—A little attention will not fail to discover this fungus in spring on the dry and bleached nettle stems. The tiny cups are less than a line in diameter, and are so shallow and depressed that they look like red stains on the stem. The colour is really an orange red. The cups are at first almost globose, but they gradually expand, and in maturity have a thick flexuous or even border. The asci (fig. 23) are clavate, each holding eight sporidia. The sporidia are oblong, or oblong spindle-shaped, curved, and marked across the middle with the appearance of a septum or division. The paraphyses (fig. 23) are thread-like and slender, with club-shaped top. It appears from Phillips on the British Discomycetes that this Peziza is now called *Calloria fusarioides*.

Didymium squamulosum A. & S. Scaly Didymium. Cooke's Handbook, No. 1122. Habitat on dead leaves.—I have found this on dead laurel and beech leaves (figs. 24 and 25). It grew in colonies or flocks, which at first glance I thought were the eggs of some snail. But a closer inspection showed they were the fairy puff-balls of a beautiful micro-fungus of the genus *Didymium*. A careful dissection will prove that there is an inner as well as an outer envelope, or peridium, enclosing a mass of spores loosely attached in the early state to a central column, which is the prolongation of the stem or stipe. In this species the outer peridium is globose, depressed, umbilicate beneath, ash-coloured, covered with minute scales of the same colour. The inner peridium is very delicate. The stem is very short, even, and white, whilst the spores (fig. 26) are dark brown.

Ustilago urceolorum Tul. Sedge Smut. Cooke's Handbook, No. 1521. Habitat surrounding the seed of various Carices, as *Carex praecox*, *C. stellata*, *C. recurva*, and *C. pseudo-cyperus* (fig. 27).—It is in some localities rather common in the autumn months. The smuts to which this fungus belongs have no peridium enclosing the spores, and they are all parasitic on living plants. The bunt of wheat (*Tilletia caries*) and the corn smut (*Ustilago carbo*) are, unfortunately, too well known. This sedge smut is produced on the glumes and utricles of the *Carex*. The spores grow in a compact mass, which, when they are ripe, breaks up. The spores are globose, rather large, and granulated (fig. 28). Anyone searching a bed of fading Carices in autumn is almost sure to meet with this parasite. All the foregoing specimens were mounted in glycerine jelly.

FIELD BOTANY.

CONDUCTED BY JAMES SAUNDERS, A.L.S.

GAGEA FASCICULARIS var. LUTEA IN WORCESTERSHIRE.—Mr. R. F. Towndrow, of Malvern Link, has during the last two years, 1900 and 1901, observed this species in fair abundance in a coppice at Leigh Sinton. This was previously only included in the county flora on the borders of Herefordshire at Mathon.—*Carlton Rea, B.C.L., M.A.*, 34 *Foregate Street, Worcester, May* 13, 1901.

COPRINUS SQUAMOSUS Morg.—This pretty and distinct *Coprinus* was found by myself in Hanbury Park near Stoke, Worcestershire, on September 28th, 1900. Previously it had been only recorded from America. It is readily distinguished by its persistent reddish-brown scales upon the pileus and lower part of the stem.—*Carleton Rea, B.C.L., M.A.*, 34 *Foregate Street, Worcester, May* 13, 1901.

SEA BUCKTHORN.—Botanists who are not familiar with the interesting plant (*Hippophae rhamnoides*), or sallow thorn, when grown to perfection cannot do better than spend a few days on the Lincolnshire coast. The seaside town of Skegness is now so accessible by excursion trains, at such remarkably low fares, that a visit is rendered easy. On sandhills to the south the growth is simply magnificent.—*J. T. Carrington.*

CHARACEAE.—Those who desire to take up a subject that is not overworked would do well to turn their attention to the stoneworts. Every real worker in this country during the last two decades has added interesting information as to the distribution of this group. Quite recently Mr. Bullock-Webster has found "a queer *Chara* in Hickling Broad, which seems to be rather a puzzle. Professor Nordstadt cannot assign to it a name. nor can the Messrs. Groves. I make little doubt it is a hybrid, but the parentage is rather a puzzling question" (*in lit.* May 15th, 1901). From this it will be seen that there is still room for original work in this class of plants. It is doubtless known to most readers of SCIENCE-GOSSIP that they are aquatic and submerged, and are to be found in fresh and brackish water.—*J. Saunders.*

LESSER CELANDINE.—At the field meeting near Manchester on May 4th last the members present were greatly interested by certain peculiarities that may be observed in the lesser celandine or pilewort (*Ranunculus ficaria*), to which attention was directed by Mr. C. Bailey. As there were many of these plants growing under the oak tree, beneath which the members were sitting, these points were easily verified. Mr. Bailey regards it as a species on the "downward grade," as its seeds are rarely matured, and it is chiefly propagated by vegetative reproduction—that is, by bulbils at the base of the leaf stalks and by numerous small bulbous roots. The meeting was evidently one that would stimulate inquiry and encourage observation. We would, however, refer the members of the Manchester Field Club to notes on the fruiting of this plant in the last and in this number of SCIENCE-GOSSIP.—*J. Saunders.*

FRITILLARIA MELEAGRIS.—The common fritillary, or snake's head, is now well established in Worcestershire, having migrated north from the adjoining county of Oxford. It was first observed by Professor Poynting in a meadow at Alvechurch a few years ago, and since then Mr. John Humphreys, F.L.S., has seen it in meadows at Tardebigge in some abundance, especially this year.—*Carleton Rea, B.C.L., M.A.*, 34 *Foregate Street, Worcester.*

FRUITING OF LESSER CELANDINE.—I have read with much interest the paper on the above subject by Mr. Britton in the May number of SCIENCE-GOSSIP, and should like to add some of my own observations, which agree closely with his. In Herefordshire the lesser celandine fruits abundantly. The conclusion to which I am led by observing the plant in different habitats is that it fruits freely in fairly dry sunny situations. In that case no axillary bulbils are present, whereas in shady places the latter are formed in nearly every leaf-axil, while mature fruits are less frequent. One reason which partly accounts for the infrequency of fruits is that there is a much smaller production of flowers in such a situation than in an open one. In sunny places the celandine grows more compactly, and is extremely floriferous. These plants are now laden with ripe carpels, fully developed and matured, scarcely any abortive ones being visible. On shady, somewhat moist banks, where no direct sunshine penetrates, the condition of the plant at present shows unopened buds, a few blossoms, and some very miniature carpels, a few of which may ripen, as I can see in some cases one or more ovules slightly larger than the rest. They are straggling plants, weak-stemmed, with long internodes and plenty of bulbils. The underground tubers seem to be equally numerous, whatever the situation. In my herbarium I have specimens gathered quite near to each other on a sloping rocky bank, those from the sunnier spot being fruitful and bulbless, while those which were under the shade of the rocks are few-flowered and bulbiferous. Thus I conclude that exposure to sunshine is of more importance for fruit formation in the lesser celandine than the either damp or dry state of the soil. I certainly find fruit abundant on hedge-banks; neither can I agree with Mr. Britton that the fruit stalks are flaccid. The fruiting peduncles become considerably thickened and strengthened, and are sometimes straight, projecting beyond the leaves, or they are rigidly incurved downwards, and are then more or less concealed beneath leaves and stalks. This habit, and the rapid decay of the plant after fruiting, may account for hasty observers having concluded that fruits do not ripen. On referring to Mr. Burkill's paper, already quoted from by Mr. Britton, I find several statements that, if true for the Yorkshire coast, are certainly not so for this county, which no doubt has a much milder climate. I do not find that the lesser celandine "is so generally infertile," nor that the flowering period is of "short duration," but very much the reverse. I saw the first flower this year on January 20th, and on the same day in 1898, and have noted many intermediate dates between that and March 12th, the latest record. These same plants are still flowering abundantly, and I have

noted blossoms in the first week of June. Mr. Burkill states that they "do not seem to profit by their early flowering." I think, however, that by their early fruiting they gain a whole season, for the ripe fruits are now shedding, and may be germinating, as is the case with willows, this being a fact well known to the raisers of willow hybrids.—*Eleonora Armitage, Dadnor, Ross, Herefordshire, May* 16*th*, 1901.

RICHMOND PARK PLANTS.—This locality will furnish the student of field botany with a few local and interesting plants. About the Pen ponds the shoreweed (*Littorella*) is abundant, and forms a matted growth. Here also grow the lesser water-plantain (*Alisma ranunculoides*), both species of skull-cap, the smaller *Scutellaria minor*, and the more beautiful *S. galericulata*, and with these a minute spike rush (*Eleocharis acicularis*), which is said to flower but little except in dry seasons. It was flowering there last autumn. Chief among the aquatic plants found in the Pen ponds is *Limnanthemum peltatum*. This beautiful plant when found in artificial waters is always subject to the suspicion of having been purposely introduced, and this may have been the case here, though the fringed water-lily is so much at home in the valley of the Thames that this locality may well be a natural habitat. About the Pen ponds and elsewhere may be found large clumps of *Juncus diffusus*, a rush which is of interest as being the hybrid offspring between *J. glaucus* and *J. effusus*. It is of a taller growth than *J. glaucus*, and, moreover, is green in colour. In character it is fairly intermediate between the two parent species, the stems being more distinctly grooved than in *J. effusus*, and less so than *J. glaucus*. Generally the ovary has failed to enlarge, but in some flowers growth has occurred to a small extent, and then ceased, no seeds being perfected. This rush may easily be detected by its sterile condition. Other plants to be found in Richmond Park are *Viola ericetorum* (the dog violet), *Sagina ciliata*, and *Myriophyllum alterniflorum*.—*C. E. Britton*, 35 *Dugdale Street, S.E.*

THE GRASS VETCH.—This interesting and beautiful plant is seldom now met with in the neighbourhood of the metropolis. In some parts of Kent, however, *Lathyrus nissolia* is common, especially near Sevenoaks, where it may be found growing abundantly, for some miles, by the road between Hubbard's Hill and Leigh.—*C. E. Britton*, 35 *Dugdale Street, S.E.*

VIOLA ODORATA × HIRTA.—Is there good evidence that *V. permixta* Jord., and *V. sepincola* Jord., are hybrids? I find the one with pale greyish-blue petals and one with dark blue flowers, perhaps darker than *V. odorata*. Both forms produce freely runners and apetalous flowers.—*Thomas Hilton*, 16 *Kensington Place, Brighton.*

ANSWERS TO CORRESPONDENTS.

HON. MRS. H. (Bletchworth).—The specimen sent for naming is *Allium victorialis*, which belongs to an extensive genus, with a distribution over the northern temperate regions of both hemispheres. Some of the species have expectorant and sedative qualities, but these are reduced to a minimum in *A. victorialis*. The question of commensalism, which you suggest as existing between this and *Ornithogalum umbellatum*, is an interesting one, which would take some years of careful observation to rightly determine.—*J. S.*

STRUCTURAL AND PHYSIOLOGICAL BOTANY.

CONDUCTED BY HAROLD A. HAIG.

RECENT CYTOLOGY.—In the "Journal of Applied Microscopy" for March there is an account of some work by Mr. Timberlake on "The Development of the Cell-plate in Higher Plants," undertaken to determine in detail the exact sequence of events during division of the cell-body. He finds that the chromatin of the nucleus is the real centre for the formation of kinoplasmic fibres, and that after having formed fibres round the nucleus as a centre the kinoplasm takes part in the process of nuclear division, and later divides the cell by a part of the fibres being transformed into a membrane which becomes, in splitting, the plasma-membranes of the daughter-cells. Also, the relation of the carbohydrate substance to the process of division seems to show that the material for the formation of the cell-wall is held in reserve form in the protoplasm before it is actually needed for the process of wall-formation; and there is probably some evidence for the hypothesis that the nucleus forms the cell-wall substance.

VITALITY OF SEEDS.—The much-vexed point with regard to the vitality of seeds is so often made a matter of investigation that one can hardly take up any paper on botanical subjects without coming across something relating to it. There have been some interesting investigations made in connection with the germinating power of seeds which have been kept for a long time under peculiar conditions. It was, for instance, found by the Italian botanist Giglioli that of sixty seeds of lucerne kept from 1878–1894 in absolute alcohol, forty germinated when removed from that liquid and placed under favourable conditions. Moisture was, of course, carefully excluded from the seeds during their preservation. One is almost inclined to think that the hard testa of the lucerne seeds would prevent the alcohol from permeating the whole substance of the seed; but, on the other hand, it is well known that the protoplasm in the cells of the embryo, whilst in the seed, contains very little water, and that probably in the form of water of constitution. The protoplasm of ordinary cells from an adult plant is entirely killed by absolute alcohol; is in fact, as we term it, "fixed," since any proteids present are coagulated; and this fixing having once taken place, no vital phenomena can henceforth continue. It may be different with protoplasm in seeds; but, as was mentioned above, one cannot help thinking that the preservative fluid does not in all cases reach the cells of the embryonic plant. Perhaps some of our readers can give an explanation of this rather interesting point.

MODIFICATIONS OF STRUCTURE BY FREEZING AND PLASMOLYSIS.—By reduction of temperature below 0° C. there is produced in the interior of the nucleus a change resulting in the separation out of two substances, which are respectively the nucleohyaloplasm and the water of constitution. The former takes on the appearance of a wide-meshed network; the latter collects into vesicles which transude ultimately through the nuclear membrane. Plasmolysis brings about exactly the same changes, the water of constitution diffusing out in just the same manner. ("Cosmos," No. 841, p. 315.) Both these processes seem thus to have a disorganising effect upon the nucleus, destroying

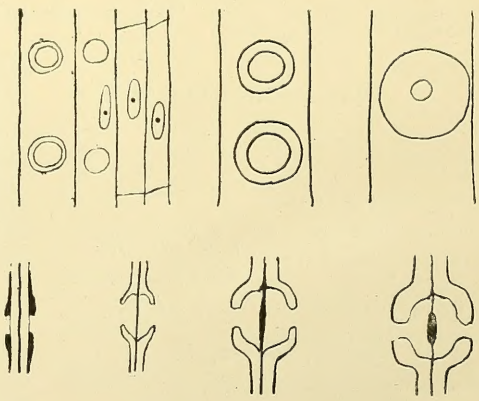
the delicate equilibrium between the nucleohyaloplasm and the water molecule which is held in it in a loose combination, after the manner of water of constitution. It would seem probable that heat would have somewhat the same effect; but the paragraph in question does not touch on this point. On plasmolysing a cell the first effect is upon the peripheral protoplasm, causing it to contract by reason of extraction of water: it would appear that the peripheral protoplasm also was deprived of a certain amount of constitutional water, and not only of that which keeps the whole mass turgid by its existence in the spaces of its meshwork. That this effect extends to the nucleus is interesting from the point of view of nuclear structure, as it shows that the nucleohyaloplasm is more or less comparable with the endoplasm in ultimate constitution.

Tetrad Formation in Ovule of Larix.—Professor Juel finds that, as in the case of the microscope, the megaspore of *Larix* arises by a tetrad division, the lowest of a series of four megaspores germinating and producing a prothallium, the other three presumably undergoing atrophy or absorption. He also finds ("Journal of Applied Microscopy," February 1901, p. 479) that in the Asclepiadaceae and Cyperaceae the pollen mother-cell gives rise to only one pollen-grain.

Investigating Vitality of Seeds by Electricity.—Dr. Waller employs as an indicator of vitality of seeds the phenomenon of the "blaze-current," that is, the galvanometrical token of an explosive change locally excited in living matter, and states ("Proc. Roy. Soc.," April 1901, pp. 79–92), that "if the after-currents aroused by single induction currents in both directions are in the same direction, the object investigated is alive," and if the after-currents are in opposite directions the object investigated is non-living. These "after-currents" are analogous to those existing in the intrapolar region of a nerve after passing a polarising current through it. Dr. Waller finds that beans not giving this so-called blaze-reaction subsequently gave no signs of germination. Fresh and vigorous seeds, on the other hand, manifested a large blaze-response (·05 volt) and germinated strongly. Older seeds manifested a smaller blaze (·01 volt or less) and less active germination. Still older seeds gave only ·001 volt blaze, and finally none at all.

Movements of Particles in Protoplasm of Spirogyra.—In peripheral protoplasm of cells of a *Spirogyra* filament one may observe, just over spots where pyrenoids occur in the chlorophyll band, small particles, presumably of a protoplasmic nature, in a state of rapid to-and-fro vibratory movement. A high power must be employed (magn. 800 diams.), and the light must be so regulated as to give a good definition. After due consideration I have come to the conclusion that we must not identify these movements with the so-called Brownian movement of small particles that one sees so often in Desmids and other Thallophyta. The movements of these particles in *Spirogyra* are arrested on "fixing" the protoplasm, and we know that the Brownian movement is a purely physical phenomenon not necessarily dependent upon the vitality of the protoplasm. The evidence points strongly to the conclusion, which must remain somewhat hypothetical till further investigations have been made, that these particles are intimately connected with the nutrition of the cell; and the fact that their movements are more or less confined to a limited area of the protoplasm, just over the pyrenoids, tends to show that they may, like these bodies, be concerned in starch formation. I have examined a number of species of *Spirogyra* for this phenomenon, and find that it is manifested most strongly in those species that have relatively large pyrenoids in proportion to the body of the cell. For the examination of them careful focussing is required, and, as has been before mentioned, judicious regulation of the light, a sort of neutral tint being perhaps the best for good definition.—*H. A. H.*

Development of Bordered Pits in Pinus sylvestris.—Longitudinal sections taken through young stems of *Pinus*, and carefully stained with methyl-green, will show the cambial layer, and next this on the axial side young rudimentary tracheides that have just arisen from the innermost cells of the cambium. These tracheides show numerous areas, or "pits," in all stages of development. They begin on the radial walls by the formation of areas of thickening at certain spots on either side of the middle lamella. These areas increase in breadth, and in the final stages leave only a small aperture on each side, these being separated by the middle lamella, in the centre of which a thickening of the "torus" has also arisen in the form of a small disc-shaped structure. The edges of the thickened "border" are during these stages raised considerably above the surface of the



radial wall. The figures here shown will give an idea of the several phases. An important point is that the unthickened areas of the adjacent walls enclosed by the borders in the rudimentary stages later on become perforated; the border, however, may go on increasing in extent and thickness long after this has happened.—*H. A. H.*

Electromotive Phenomena in Leaves exposed to Light.—Some interesting experiments upon the electrical effect of light upon green leaves have recently been carried out by Dr. A. D. Waller ("Proc. Roy. Soc." lxvi. pp. 129–137). He finds that in the leaves of *Iris* there are present electromotive effects and after-effects which amount to ·02 volt in the positive or negative direction, in response to illumination. No results were obtained in petals, a fact which

shows that the chloroplasts are essential to the reaction. Similar phenomena have long ago been observed in leaves of *Dionaea* and *Drosera*: a positive current was found to pass from base to apex of the lamina, and it was determined that the seat of origin of the electromotive force giving rise to these currents was in the upper layers of cells of the lamina and midrib. The movements of such leaves are intimately dependent upon the conduction and liberation of any stimulus applied to them, and a distinct alteration in intensity of the current takes place on excitation of the leaf.

Double Impregnation.—Of late some interesting points have been made out in connection with the phenomenon of "double fertilisation" in Angiosperms. Professor Strasburger, who has been for some time working at this subject, finds in all cases that the process is essential to the formation of endosperm. Double fertilisation is effected as follows: The pollen-tube on reaching the apex of the embryo-sac discharges two male cells, one of which fuses with the oosphere, and the other with the so-called "definitive nucleus" that is present in the embryo-sac after all the changes previous to fertilisation have taken place. This latter nucleus after fusion divides and fills the embryo-sac with a mass of endosperm nuclei. The fact that one of the male cells should fuse with the endosperm nucleus is important, as it shows that both the cells produced by the division of the male generative cell in the pollen-tube are functional, and not, as was formerly thought, only the one of them, the other being absorbed. The process has just been shown ("Botanical Gazette," xxx. pp. 252–260) to occur in the Compositae (*Erigeron*).

NOTICES OF SOCIETIES.

*Ordinary meetings are marked †, excursions *; names of persons following excursions are of Conductors. Lantern Illustrations §.*

Geologists' Association.

June 8.—* Cheam and Epsom. W. P. D. Stebbing, F.G.S.
„ 15.—* Prince's Risborough. W. Hill, F.G.S.
„ 22.—* Sections on L. & S. W. Railway.
„ 29.—* Stanmore. Clement Reid, F.R.S., F.G.S.

Lambeth Field Club and Scientific Society.

June 15.—* Kew to Richmond.
„ 22.—* Caterham. Mrs. Rose.

London Geological Field Class.

June 8.—* Crayford to Erith. Professor H. G. Seeley, F.R.S.
„ 15.—* Herne Bay. Professor H. G. Seeley, F.G.S.
„ 22.—* Clandon (for Netley Heath) for Guildford. Professor H. G. Seeley, F.G.S.
„ 29.—* Aylesbury. Professor H. G. Seeley, F.G.S.

Manchester Museum, Owens College.

June 1.—† Recent Archæological Discoveries in Lancashire. Professor W. Boyd Dawkins, F.R.S.

North London Natural History Society.

June 6.—† "Reptiles in Captivity." G. H. Wattson.
„ 8.—* Epping Forest. J. E. Gardner.
„ 20.—† "A Gossip on the Isle of Purbeck." J. Wheeler, M.C.P.
„ 29.—* Oxshott. L. B. Prout, F.E.S.

Nottingham Natural Science Rambling Club.

June 1.—* Hemlock Stone—Geology. J. Shipman, F.G.S.
„ 15.—* Lambley Dumbles—Botany. W. Stafford.
„ 29.—* Kirkly—Geology. J. Shipman, F.G.S.

Royal Institution of Great Britain.

June 1.—† "Epiphytic Plants." Professor J. B. Farmer, M.A. F.R.S.
„ 6.—† "The Chemistry of Carbon." Professor Dewar, M.A., LL.D., F.R.S.
„ 8.—† "Epiphytic Plants." Professor J. B. Farmer, M.A., F.R.S.

Yorkshire Naturalists' Union.

June 22.—* Scarborough, for Bedale and Yedmandale.

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To Correspondents and Exchangers.—Science-Gossip is published on the 25th of each month. All notes or short communications should reach us not later than the 18th of the month for insertion in the following number. No communications can be inserted or noticed without full name and address of writer. Notices of changes of address admitted free.

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Editorial Communications, articles, books for review, instruments for notice, specimens for identification, etc., to be addressed to John T. Carrington, 110 Strand, London, W.C.

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The Editor will be pleased to answer questions and name specimens through the Correspondence column of the magazine. Specimens, in good condition, of not more than three species to be sent at one time, *carriage paid*. Duplicates only to be sent, which will not be returned. The specimens must have identifying numbers attached, together with locality, date, and particulars of capture.

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