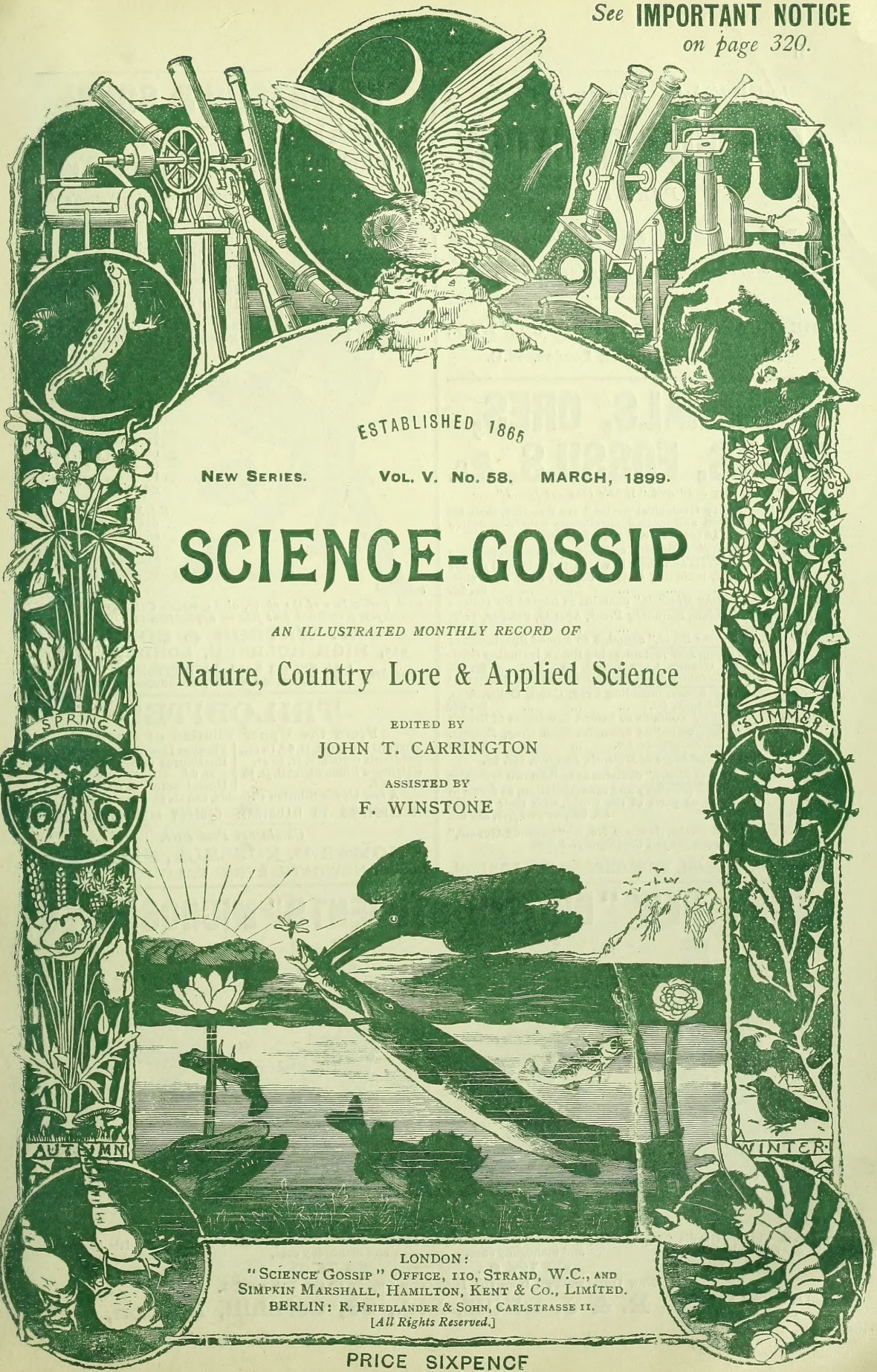
See **IMPORTANT NOTICE** *on page 320.*



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EASTER ENTOMOLOGY ON THE RIVIERA.

By G. H. Bryan, Sc.D., F.R.S.

THE northern shores of the Mediterranean are favourite resorts for the tourist and the pleasure seeker. They offer equal attractions to the entomologist and the botanist. Quite a large proportion of the European insect fauna frequent the south coast of France, which is also favoured by being the habitat of a number of plants peculiar to the district and not found elsewhere. It was with the object of revisiting these hunting-grounds, after many years absence, that we left England on March 22nd, travelling straight through by the Mont Cenis route to Genoa, which we reached the next evening.

Our first collecting began at Finalmarina, a primitive Italian village, where the electric light in the narrow streets looked singularly modern by comparison with the old arched houses. A rock near here is one of the few habitats of the *Campanula isophylla*, of which we now have abundance of plants in our greenhouse. From Finalmarina we proceeded to Alassio, where insects were just beginning to come out. The sands east of the town were tenanted by numbers of beetles of the genus *Pimelia*, and the large *Atenchus sacer* was rolling balls of dung about in every direction; while each step started a swarm of brightly-coloured grasshoppers, with pink or pale-blue wings, only to again settle and close their wings, when they could scarcely be distinguished from little twigs of stick or dry grass. As their resemblance to the surrounding objects when at rest affords these insects protection, may not the protection be further increased by their bright colours when flying, puzzling and even dazzling their enemies, which are thus less able to identify them when they settle? The large carpenter bee (*Xylocopa violacea*) was also abundant.

Among butterflies, *Papilio machaon* and *P. podalirius*, *Anthocharis belia*, *Gonopteryx cleopatra*, the Continental form of *Pararge egeria*, *Lycaena baton*, *Spilothyrus alceae* and a pale form of *Coenonympha pamphilus* were just beginning to come out about the 1st of April. *Colias edusa* and *Pararge megaera* were abundant. At Albenga, we saw one hibernated *Vanessa antiopa* which eluded my net, but we were rewarded with the capture of a remarkably fine *Saturnia carpini* far larger than the British form. Of humming-bird moths (*Macroglossa stellatarum*), hibernated but very rubbed specimens were abundant. A number of different bright little red and black Hemiptera belonging to the family *Lygaeidae* were frequent on plants, and some green locusts occurred on the Capo di Mele.

Among the walks from Alassio, the most interesting are to the ruined chapel and archway of Santa Croce, the promontory of the Capo di Mele, the Madonna della Guardia at the top of the highest hill behind Alassio, and the valley at the rear of Andora to the west, two stations away by train. The latter was a perfect paradise of flowers, *Anemone stellata* and *A. coronaria*, *Narcissus tazzetta*, *Ophrys aranifera* and *O. fusca*, *Tulipa clusiana*, and many others, in some places simply carpeting the ground. In other walks, especially at the Madonna della Guardia, *Anemone hepatica (Hepatica triloba)* was well in flower. *Cistus albidus* was just coming out, as was the tall *Erica arborea*, used for making "briar"-root pipes; "briar" being a corruption of the French "bruyère," or heath. There were also *Lavandula stoechas*, *Allium neapolitanum*, *Muscari comosum*, *Ficaria calthaeifolia*, *Hypecoum procumbens*, *Aceras longibracteata*, *Oxalis libyca*, *Cytisus decumbens*; and hosts of other plants, too numerous to name, all abounded in full flower.

At Mentone a week later *Papilio podalirius* were beginning to emerge from chrysalis, and the brushwood covering the ridges that separate the principal valleys was a favourite resort for such butterflies as *Anthocharis belia*, *Pieris daplidice*, *Thecla rubi*, *Lycaena melanops*, *L. argiolus* and *L. baton*; also specimens of *Polyommatus phlaeas* slightly darker than the English form. In olive and lemon plantations *Leucophasia sinapis*, with varieties, and *Pararge egeria* were common. *Vanessa egea* showed its usual partiality for old walls where it was difficult to capture, and *Gonopteryx cleopatra* occasionally flew past just out of reach. The lovely "Aurore de Provence" (*Anthocharis euphenoïdes*) was to be met with near its food-plant, *Biscutella laevigata*, on the hills near St. Agnese, and up the Berceau; also in the East Bay. In the latter locality, *Lycaena orion*, *L. baton*, *L. icarus* and *Syrichtus alveus* were to be found, the first-named fairly common. I further caught one *Colias hyale*.

Of moths the beautiful Geometer, *Euranthis plumistraria*, was the most conspicuous; and among the beetles we found *Cetonia squalida* on every flower of *Cistus*, *Ateuchus semipunctatus*, *Chrysomela banksii*, *Cicindela campestris*, with *C. sylvicola* and others. Of Hymenoptera, *Meilecta punctata*, *Mutilla europea*, and the ubiquitous *Xylocopa violacea*. Orthoptera were represented by *Mantis empusa*. Among Diptera was a small *Bombylius* hovering round flowers just like a miniature humming-bird moth. One day we saw a pitched battle going on between two small colonies of ants;

one consisting of large ants (*Formica cruentata*), the other being a much smaller species. We watched for some time, but we had a long day's walk ahead, as we were bound for the old ruined castle of St. Agnese, which crowns a high rock overlooking Mentone, some five miles off; and we wanted to collect plants and insects on the way; all of which takes time. We left the ants to their devices, and on our return there were some of the slain lying about, and a few of either colony walking listlessly as though conscious of the terrible calamity that had taken place. This, however, was a comparatively small battle. Many years previously I had seen a wall at Mentone, several yards long, one seething black mass of fighting and dead ants, all of them of the same species, namely, *Formica cruentata*. Among the fighters on that occasion was one ant which had lost its abdomen, carrying a whole ant as prisoner.

At Hyères the insect season was still further advanced. About the third week in April *Thestor ballus* was fairly common but was only out for a short time. The females of *Gonopteryx cleopatra* were out and were shortly followed by an abundance of males, which latter were readily attracted by waving a pale-green muslin net to and fro. After collecting all I wanted, I found it amusing to watch them hovering round the net so soon as it was waved near them. A darker green net failed to attract them. *Melitaea cinxia* came out in profusion a few days later, as did *Anthocharis belia*, including the var. *ausonia*. *A. cardamines*, *A. euphenoïdes*, *Papilio podalirius*, *P. machaon*, *Leucophasia sinapis*, *Pieris daplidice*, *Colias helice*, *Thecla ilicis*, *Lycaena astrarche* and *L. baton*, *Syrichtus sao*, *Procris globulariae* and *Bombyx rubi* were all to be found more or less abundantly. A few hibernated specimens of *Vanessa antiopa* and *V. polychloros* were to be occasionally seen. I caught one *Thais cassandra* on the Pic du Fenouillet on April 24th, and another on the 29th at Cavalaire, a pretty spot on the coast reached by the narrow-gauge railway between Hyères and St Raphael Here too I found a couple of *Lycaena baetica*, and the pretty tiger-beetles *Cicindela littoralis* were plentiful. The "bee beetle" (*Trichius fasciatus*) also occurred. The views along the coast-line are exquisitely charming; but the train does not hurry, it travels at about twelve miles an hour, and when it stops at the stations often allows sufficient time for botanizing. At one stoppage I was fortunate enough to gather flowers of the rare *Echium creticum*.

An evening's stroll with a net around the electric arc lamps which illuminate the principal palm avenue leading out of Hyères, resulted in the capture of two fine and perfect *Saturnia pyri*, four water-beetles (*Hydrophilus piceus*) and very battered specimens of the moths *Arctia villica* and *Smerinthus tiliae*. Just before we left Hyères, about May 1st, the last butterflies to appear were *Limenitis camilla* and *Melanargia syllius*; the latter becomes abundant at Hyères a little later.

A small black fly (*Anthrax*) and the pretty, ubiquitous little *Bombylius* were the most conspicuous of the Diptera; and of beetles, *Trichodes alvearius*, *Anthaxia cyanicornis*, and a small *Clythra* were frequent. Of Orthoptera, a number of brightly-coloured grasshoppers, as well as *Mantis empusa*, were found. A trap-door spider (*Nemesia congener*) is peculiar to the Hyères district, though other forms of trap-door spiders abound at Mentone and elsewhere.

The environs of Hyères are noted for snakes, and it is at first rather alarming to see and hear a large dark snake gliding through the brushwood just in front of one. These snakes, however, are harmless, being devoid of poison fangs; they are known in France as the "Couleuvre de Montpellier." A lovely emerald-green lizard occasionally darts up a cork tree, and if one whistles gently it sometimes stops and listens. My allusion to the reptiles would not be complete, without some mention of the nocturnal choruses of green frogs congregated in all the tanks used for irrigation.

Our homeward journey was by way of Arles, with its Roman remains; Nîmes, with its amphitheatre and Maison Carrée; Avignon, and Tarascon. At the last place we saw the "Jardin du Baobab," immortalized by Daudet in his novel "Tartarin." In leaving Hyères we expected to have said good-bye to insect hunting; but a delightful surprise awaited us at the Pont du Gard, which we made the object of an excursion from Avignon. The beautiful valley of the Gard, across which the Romans built this magnificent aqueduct, was simply swarming with butterflies. The "Aurore de Provence" (*Anthocharis euphenoïdes*) were out in hundreds, settling on almost every plant of *Biscutella*; and what with *Colias edusa* and *C. hyale*, *Pieris daplidice* (probably a local variety), *Leucophasia sinapis*, *Papilio machaon*, *Limenitis camilla*, *Polyommatus alciphron*, var. *gordius*, of which I caught my only specimen here, *Lycaena cyllarus*, *L. melanops* and *L. minima*, *Spilothyrus alceae*, *Melitaea cinxia*, *Arctia hebe*, and others, one's net was kept pretty well plied; and it was small wonder that the two miles' walk from Remoulins station to the Pont du Gard and the walk back took up the whole day. Nor was the excursion less successful from a botanical point of view. As for the bridge itself, with its three tiers of arches spanning the box-grown valley, all seen beneath a truly Provençal cloudless sky and baking sun, no words can describe it. What a contrast to cold, windy, dusty Paris, with a leaden sky overhead, whither the "Rapide" train whirled us next morning!

Bangor, N. Wales.

THE PRESERVATION OF WICKEN FEN.

By Herbert Goss, F.L.S.

WITH the exception of scattered portions of marsh and swamp in the Norfolk Broads district, and a few narrow strips by the side of the Great Northern Railway Company's line between Holme and Yaxley in Huntingdonshire, no part of the great Fenland of Lincolnshire, Norfolk, Cambridgeshire and Huntingdonshire now remains in its primeval state, but the few hundred acres of undrained and uncultivated land known as Wicken Fen, Cambridgeshire. This last fragment of virgin Fen is situated about ten or eleven miles north-east of Cambridge, some six miles south-east of Ely, and three miles south-west of Soham. The Fens have, like the chalk district in that county, undergone great changes since the beginning of the century. The late Professor Babington in his "Flora of Cambridgeshire," published in 1860, remarks that "The employment of steam has made the removal of the water so certain that nearly the whole level may be cited as a pattern in farming. With the water many of the most interesting and characteristic plants have disappeared, or are become so exceedingly rare that the discovery of single individuals of them is a subject for wonder and congratulation. There is scarcely a spot remaining (I only know of one near Wicken) in which the ancient vegetation continues undisturbed, and the land is sufficiently wet to allow of its coming to perfection."

Not only has the drainage of the Fens destroyed, or rendered very scarce, many of the birds and plants of the district, but certain insects which occurred in no other parts of the United Kingdom have become extinct or extremely rare. With the reclaiming, or rather destruction, of Whittlesea Mere, Yaxley, and Holme Fens, that brilliant butterfly, the large copper (*Polyommatus dispar*) disappeared, no specimens having, it is believed, been taken since 1847 or 1848. The loss of this species is the more to be regretted as the Continental form is not identical with it. Since Burwell Fen, adjoining Wicken, has been drained, one of the most local British moths, *Orgyia coenosa*, has become extinct, or so rare as to render its present existence questionable; and the Fen orchis (*Sturmia loeselii*), according to the late Professor Babington, has not been found there since 1836. It still occurs in a swamp on private property, known only to a few persons, not many miles distant, and also in the Norfolk Broads. The grandest of all British butterflies, the swallow-tail (*Papilio machaon*), occurred in profusion over the whole district before the drainage and consequent destruction of its principal food-plant, milk-parsley (*Peucedanum palustre*). The detached portions of Fens in the Norfolk Broads still afford protection to the swallow-tail, where it occurs, somewhat sparingly, over a wide area. Wicken Fen, however, is certainly its head-quarters in England, and this noble insect may be seen there throughout the summer, most plentifully about the end of May and beginning of June, soaring over the sedge, or sailing up and down the grassy roads, or "droves"—as they are termed locally,—in the Fen.

The drainage of this Fen and its subsequent cultivation would not only be the destruction of the headquarters of this butterfly, but of numerous local moths, and of the distinctive Fen flora. Portions of this Fen are often "in the market" for sale, and the National Trust are desirous of securing a few acres from time to time, when practicable, so that they may be retained in their primeval state, not only for the benefit of zoologists and botanists, but for all members of the public interested in the preservation of this last remnant of the picturesque and characteristic Fenland of East Anglia.

With the drainage of Wicken Fen many local moths would become extinct, or extremely rare, such as the fen-leopard or reed moth (*Macrogaster arundinis*), *Cidaria sagittata*, *Meliana flammea*, *Tapinostola hellmanni*, *Hydrilla palustris*, *Nascia cilialis*, and other interesting species. Many of the typical plants of the district would also disappear from this locality, for instance, the spearwort (*Ranunculus lingua*), *Viola stagnina*, the beautiful marsh vetch (*Lathyrus palustris*), the water-parsnip (*Sium latifolium*), milk-parsley (*Peucedanum palustre*), *Valeriana dioica*, that local thistle, *Carduus pratensis*, the water-violet (*Hottonia palustris*), the common bladder-wort (*Utricularia vulgaris*), *Orchis incarnata*, the fen-fern (*Lastraea thelypteris*), and last, but not least, the sedge (*Cladium mariscus*), which constitutes the mass of the herbage of the Fen, and which was formerly a valuable crop.

Entomological Society, Chandos Street,
Cavendish Square, W.; 17th February, 1899.

[We cordially endorse the proposal for preserving Wicken Fen as a sanctuary for wild animal and plant life natural to the district. Indeed, we have already advocated this reservation in an article on the "Preservation of Our Fauna and Flora" (Science-Gossip, N.S. vol. ii. p. 169, Sept. 1895), wherein Wicken Fen was mentioned. We hope our readers will take up this question, and that Mr. Goss may be as successful in this agitation as he was in a former instance. Much was due to his influence and energy in saving the New Forest for public recreation ground.—Ed. S.-G.]

BRITISH FRESHWATER MITES.

By Charles D. Soar, F.R.M.S.

GENUS *CURVIPES* KOENIKE.

(*Continued from page* 267.)

IV.—*Curvipes fuscatus* Hermann, 1804.

Female: Body.—Rather long and narrow (fig. 19), about 1·30 mm. in length, 1·14 mm. wide. The portion where the eyes are situated projects forward from the marginal line at *a* fig. 19. In colour it is a very dark-brown red, madder brown being the nearest colour which I can use in comparison.

Legs long and thin, otherwise very much the same as the legs of other species of this genus. First leg is about 1·28 mm. in length, and the fourth leg is about 1·44 mm. In colour the legs are much lighter than the body, and more red.

Epimera, arranged about as usual in this genus, but rather small in comparison to size of body,

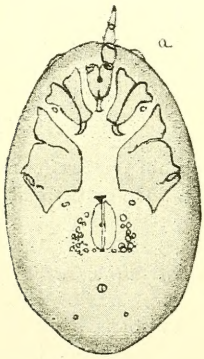

Fig. 19, *C. fuscatus*.—Ventral surface of female.

and placed very forward. Colour, like all the chitinous parts of this Hydrachnid, is red.

Palpi, short and thick on the second joint. Their length is only 0·50 mm. The fig. 20 is from the right-hand palpus drawn from the inner side.

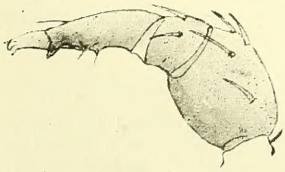

Fig. 20, *C. fuscatus*.—Inside surface of right palpus.

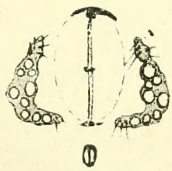

Fig. 21, *C. fuscatus*.—Genital area of female.

Genital Plates are quite different in shape and arrangement from any of those before mentioned (fig. 21). The number of discs also varies as usual. The typical number appears to be nine or ten on each side.

Male.—Smaller and rounder than the female and not quite so dark in colour. Its external structure exhibits much the same differences from the female I have already mentioned in the other

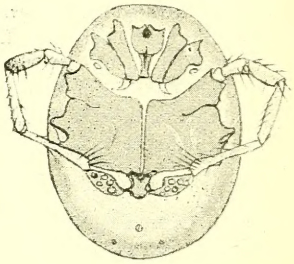

Fig. 22, *C. fuscatus*.—Ventral surface of male.

species. The drawing of the ventral side of the male (fig. 22) is intended to show how the third pair of feet are often found locked in the genital fissure of the male of this genus.

Localities.—*Curvipes fuscatus* is sometimes found in large numbers. In 1895, on Staines Common, in the numerous small ponds there, I took nearly 100 specimens during one afternoon, while there with a Quekett Club excursion. Its beautiful dark colour makes it a very conspicuous object.

Larva (fig. 23).—The drawing of the larval form of this mite is from one hatched out in a tube

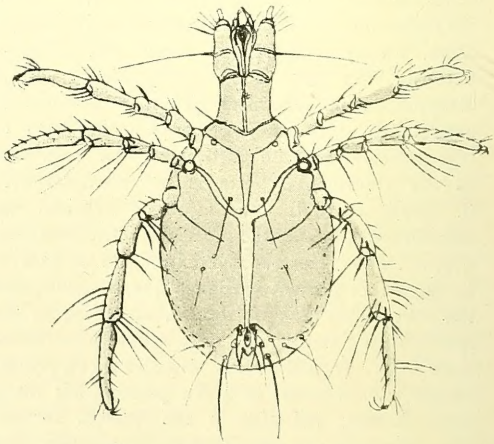

Fig. 23, *C. fuscatus*.—Larval stage.

at home, from ova deposited by an adult female. The time, from the ova being deposited till the

period the larvae were free swimmers, was twelve days. In colour they are yellow, with red markings in the body portion. Length, about 0.48 mm.

V.—*Curvipes rufus* Koch, 1835-41.

FEMALE: BODY.—Very much the same shape as *Curvipes fuscatus* (fig. 19); but much smaller, being only 1·32 mm. long, and 0·86 mm. broad.

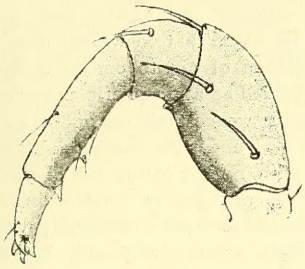

Fig. 24, *C. rufus*.—Inside surface of right palpus.

Colour, a bright scarlet with black markings. The part where the eyes are situated is nearly colourless. I have found another variety of this mite of a pale-blue colour. Piersig has also noticed this, and figures in his great work two varieties, one red and one of a dirty green. Koch had also found the same species of different colours, but gave to each variety a new specific name, which error Piersig has carefully pointed out.

LEGS, a greenish yellow, as are all the chitinous parts of this mite. First leg about 1·04 mm. The fourth leg 1·32 mm. The other legs are in between those lengths.

EPIMERA, small, and arranged in four groups, as is usual in this genus, and similar to those already figured.

PALPI, short (fig. 24), 0·36 mm. in length.

GENITAL PLATES (fig. 25) are different to any of those I have figured before. There are four distinct groups, two on each side of the genital fissure. The smaller ones contain one large disc and have three hairs springing out from the anterior portions. The larger ones contain about nine or ten discs each, and have also three hairs springing out on the posterior ends, near the

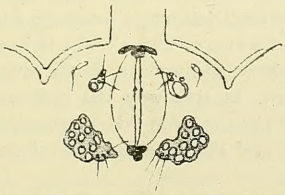

Fig. 25, *C. rufus*.—Genital area of female.

median line. Piersig also figures two or three hairs growing amongst the discs, but I have not yet found any in the few mites of this species I have examined.

MALE.—I have not yet seen a male of this species. Piersig gives a figure of the male, and I hope to meet with it later. It is not a common mite; I have only found the female a few times. The two best specimens were taken during a Quekett Club excursion to Oxshott.

(*To be continued.*)

SEAWATER-MITE FOUND IN FRESH WATER.

HITHERTO, so far as I know or can find out, the Halacaridae have only been found in sea water; but during last autumn I went on an excursion to Weybridge, in Surrey, and made some collections from the canal there and a pond adjoining. I did not examine all my bottles until a few weeks afterwards, when, to

Fig. 1.

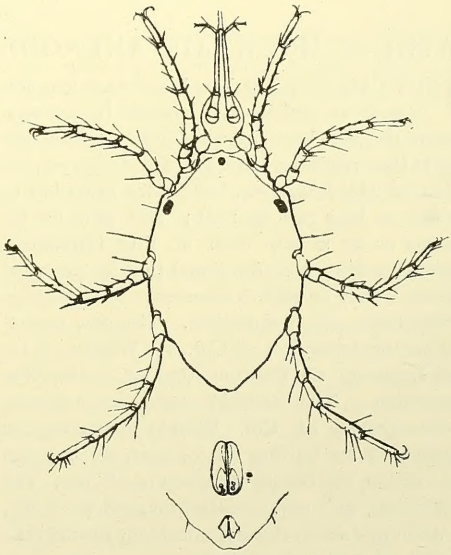

Fig. 2.

Fig. 1, *Raphignathus falcatus* (?), dorsal surface.
Fig. 2, Ventral surface, showing genital plates and anal orifice.

my surprise, I found some strange-looking creatures crawling about on rootlets in the trough that I had taken from either the canal or pond. This is the description of them, the outlines of the creature being shown in the accompanying sketch by Mr. Chas. D. Soar: extreme length, 0·88 mm.; length of palpi, 0·24 mm.; width of body, 0·35 mm.; length of first leg, 0·38 mm.; length of fourth leg, 0.44 mm. Colour, orange-brown; body truncate above insertion of first legs; head forming a broad subtriangular bulbous projection from which stands

out a long slender bifid rostrum; palpi very long and slender, extending beyond the tip of the rostrum and bearing towards the extremities a few fine sitae; legs of moderate and nearly equal length, terminated by two simple claws; eyes three, one behind the base of the head, the others near the origin of the second pair of legs.

I was quite unable to identify it myself. Having found it in fresh water, I did not suspect it to be one of the Halacaridae; so I communicated with Mr. C. D. Soar, and sent some to him for inspection. He has no doubt about it being one of the Halacaridae, and believes it to be *Raphignathus falcatus* Hodge. How it came to be found in fresh water is a puzzle, as the canal has no direct communications with the sea, from which it is far away. I shall be glad to know if any of your numerous readers have found this or other members of the family so situated, or can throw any light on this apparently strange occurrence.

R. MACER, F.R.M.S.

23, *Wingmore Road, Loughboro' Junction, S.E.*

WATKIN'S MOUNTAIN ANEROID.

MOUNTAINEERS and explorers have long felt a want of confidence in aneroid barometers, as even the best have been liable to considerable error in their readings. Mr. Edward Whymper, the celebrated Alpine climber, had drawn attention to this fact so long ago as 1861; and now he introduces us to a new form of this instrument wherein the error is so fractional that for practical purposes it may be said to be correct, as it deviates no more than $\frac{1}{100000}$ of an inch. The new instrument is the invention of Col. H. Watkin, C.B., Chief Inspector of Position Finding in the War Department. This aneroid attains its accuracy in consequence of Col. Watkin designing an arrangement for putting out of gear, or throwing out of action, the barometer when not in use. The result is that, with requisite attention and quick use, Mr. Whymper states that extraordinary results may be obtained with Watkin's Mountain Aneroid in observations made for altitude, and in determining differences of level. Mr. J. J. Hicks, of 8, Hatton Garden, London, makes these new instruments on an especial design for mountain travelling and for survey work in hilly regions. This aneroid, four and a-half inches in diameter, and reading to 0·05 of an inch, the scale being from thirty-one to seventeen inches, with leather case and sling, weighs two and a-half pounds. The usual type of aneroid barometer has often played curious tricks upon mountaineers, and caused them to report altitudes far out of the actual measurements. These errors have extended to as much as 2,000 feet. For scientific research with the aid of balloons, Col. Watkin's instrument will be of immense value.

EXPLOSIVE VALUE OF ACETYLENE.

DURING a series of experiments that have recently been made at Leeds to determine the value of the application of acetylene gas to internal combustion engines, some additions have been made to our knowledge of the explosive properties of acetylene. Mr. Frederick Grover, consulting engineer at Leeds, has published, these (1). He found that no weaker mixture than eighteen volumes of air to one of acetylene gas could be exploded at atmospheric pressure, fifteen to one being the weakest mixture of coal-gas and air that can be fired under the same conditions. The researches with regard to the use of acetylene in engines where coal-gas is now ordinarily used show that it will compete effectually with other methods of obtaining motive-power. The efficiency of acetylene motors, Mr. Grover writes, should be higher than that of any other heat motor. He is of opinion that this will reach thirty-five per cent., chiefly by an increase in the speed of revolution. At a thermal efficiency of thirty per cent., the consumption of gas would be 6·1 cubic feet per horse-power per hour.

The convenient and simple method in which acetylene can be generated, makes it a very valuable agent for propelling light vehicles. A carriage with a load of one ton could run for ten hours on sixty pounds of carbide with about half that weight of water. The space required for storing the carbide would be only 2½ cubic feet, if it were broken into small pieces. Room would be required, also, for about three and a-half gallons of water and a small gas-holder.

The experiments reported by Mr. Grover are undoubtedly of great value, and will clear the way towards the development of an efficient motor. We would, however, like to endorse the warning of the author, that those whose attention is turned in this direction, should remember to make careful tests of the working powers of their motors. The researches into the explosive capabilities of acetylene were carried out by Mr. Grover in the following manner: "A known volume of acetylene gas was admitted to a cylinder, and time allowed for its diffusion therein. The mixture was ignited by electricity, and pressure developed was measured by means of a Crosby indicator, the pencil of which worked upon a drum revolving at a known speed. In this way the proportions of acetylene and air, the time taken to complete the inflammation, and the pressures developed were observed."

110, *Strand, London.* F. WINSTONE.

(1) "Experiments on the Pressure and Explosive Efficiency of Mixtures of Acetylene and Air." By Frederick Grover, A.M. Inst. C.E., etc. 22 pp. 8 in. × 6¼ in. Illustrated. (Leeds: Jowett & Sowry, 1898). 1s.

LAND AND FRESHWATER MOLLUSCA OF ISLE OF WIGHT.

By the late Charles Ashford.

(*Contributed by Professor T. D. A. Cockerell.*)

THE following catalogue was compiled years ago by the late Mr. C. Ashford, and kindly transmitted to me when I was working on the Mollusca of the south-eastern counties. It seems to me to be worth publication, although most of the records have been given already in various places. I leave the nomenclature as written by Mr. Ashford; it will be readily understood by conchologists.

Isle of Wight.

A list by G. Guyon, A. J. Hambrough, F.L.S., F.G.S., and A. G. More, F.L.S., published in "Venable's Guide" (1860?) with additional notes by C. A. (1)

Sphaerium corneum.—Abundant in ditches on Sandown Level; pond near Ryde, A. G. M.

Sphaerium lacustre.—Sandown, A. G. M. The Pond, Bonchurch, G. G. Between Sandown Fort and East Yar Bridge, A. J. H.

Pisidium pusillum.—Abundant, East Yar, Sandown Marshes; also in Medina, A. G. M. Stream near Woolverton, G. G.

Pisidium fontinale.—Pond, Yarmouth, C. A. Var. *cinerea*, pond near the Priory, A. G. M. Var. *pulchellum*, Steephill, A. J. H. Stream at Bonchurch, G. G. River Medina (near Blackwater), East Yar, Sandown Marshes, A. G. M. (2)

Pisidium nitidum.—Ponds near Fivens, St. Helen's, A. G. M.

Pisidium amnicum.—Medina (near Blackwater Mill), and in East Yar (near Sandown Marshes), A. G. M.

Anodonta cygnea.—Common in Sandown Marshes, both in East Yar and ditches, A. G. M.

Valvata piscinalis.—Everywhere in East Yar, from Alverstone to its mouth, A. G. M.

Physa fontinalis.—Ditch between Ventnor and Steephill, Sir W. Jardine. Abundant everywhere in Sandown Level, also near Ryde and in Medina, A. G. M.

Physa hypnorum.—Plentiful in pond in Sandown, and sparingly in ditches near Sandown Fort, A. G. M.

Planorbis albus.—Alverstone, A. J. H. Abundant in Sandown Marshes and in Medina, A. G. M.

Planorbis nautileus.—"Lord Yarborough's Pond," Sir W. Jardine. Westover, A. J. H.

Planorbis carinatus.—Common in ditches, Sandown Marshes, and in East Yar itself, above Yar Bridge, A. G. M.

Planorbis complanatus (*marginatus*).—Rare (?). Pond at St. John's, Ryde, A. G. M. The specimens have been seen by Mr. Alder, who considers them a variety of this species.

Planorbis vortex.—Rare (?). In the pond of the garden at St. John's, Ryde, A. G. M. "This and the preceding species may have been introduced by means of aquatic plants placed here by Dr. Bromfield." Ditches, Yarmouth, C. A.

Planorbis spirorbis.—Common in every pond and stream, and one of the few shells yielded by the Medina, A. G. M. Steephill Pool, G. G. Yarmouth, C. A.

Planorbis contortus.—Westover and Alverstone, A. J. H.

Limnaea peregra.—Of every variety, from the narrow and elongated shell of the East Yar to the broad variety of stagnant water which resembles *L. auric;* fine examples of latter in a small pond, Bonchurch; it is the only one of the Isle of Wight air-breathing Mollusca which I have found in brackish water, A. G. M. Yarmouth, C. A. Approaching var. *acuminata*, Yarmouth, C. A.

Limnaea stagnalis.—Pond near Haven Street, Mr. George.

Limnaea truncatulus.—St. Laurence pond, A. J. H. Abundant at edge of East Yar and Medina, A. G. M. Under stones in marshy spot in Steephill Cove, G. G. Stream near the Priory, A. G. M. Thorley and Norton, near Yarmouth, C. A.

Limnaea palustris.—Ditches near Sandown Fort, in East Yar (near Yar Bridge), and pond near Sandown, but in all localities sparingly, A. G. M.

Ancylus fluviatilis.—On stones under water, Steephill Pool, A. J. H. Abundant in East Yar, also in streams near Ryde, A. G. M.

Arion ater.—Common, G. G. Yarmouth and Totland Bay, C. A.

Arion hortensis.—Under a fallen tree in wood at Bembridge, A. G. M. Common about Ventnor, G. G. Hempstead Hill, near Yarmouth, C.A.

Limax agrestis.—Common; a variety of opaque milky-white occurs, G. G. Ventnor and Yarmouth, C. A.

Limax maximus.—Common, G. G.

Limax arborum.—Steephill, A. J. H. Bembridge, A. G. M. Ryde, W. Thompson, 1841. Thorley, near Yarmouth, C. A. (two).

Limax flavus.—Steephill, A. J. H.

(1) This note is in Charles Ashford's handwriting.—Ed. S.-G.

(2) "The inland specimens are a variety approaching the *Cycl. obtusalis* of Nilsson" (!).

Limax marginatus (*sowerbyi*).—Frequent at Bembridge, A. G. M. Common about Ventnor, G. G.

Limax gagates.—"Isle of Wight," Forbes and Hanley.

Vitrina pellucida.—Among moss, Steephill, A. J. H. Marshcombe Copse, Yaverland, A. G. M. Not uncommon about Ventnor, G. G.

Succinea putris.—Flags and rushes, Alverstone, A. J. H. Centurion's Copse, and in Sandown Marshes, A. G. M. Borders of streams about Ventnor, G. G. Marshy meadows, Yarmouth, C. A. (small).

Zonites cellarius.—Under stones in damp fields, frequent, G. G. Boniface Down, C. A. Also Yarmouth.

Zonites alliarius.—Under damp mossy stones, Steephill, A. J. H. Bembridge, A. G. M.

Zonites nitidulus.—Abundant at Bembridge, more so than *Z. cellarius*, A. G. M. Common under stones in damp situations about Ventnor, G. G. Ventnor and Yarmouth, C. A.

Zonites purus.—In moss, etc., Steephill, where also the dark variety occurs, A. J. H. Abundant in Shanklin Copse, G. G. Centurion's Copse, Bembridge, and Marshcombe Copse, Yaverland, A. G. M.

Zonites radiatulus.—Bembridge, A. G. M. Near Ventnor, G. G. Yarmouth (one), C. A.

Zonites nitidus.—St. Laurence, A. J. H. Lord Yarborough's pond, Sir W. Jardine.

Zonites excavatus.—Apse Woods, and among damp leaves and decayed wood at Alverston, A. J. H.

Zonites fulvus.—Apse Woods, A. J. H. Near Bembridge, A. G. M. Shanklin Copse, G. G. Yarmouth, C. A.

Zonites crystallinus.—In moss, Steephill, A. J. H. Shanklin Copse, frequent, G. G. Centurion's Copse and Marshcombe Copse, with *purus*, but rather more common, A. G. M.

Helix aspersa. — Common everywhere. The monstr. *scalaris*, with elevated spire and looser whorls, has been observed near Ventnor by Dr. Gray. Yarmouth, Norton, Colwell Bay, Freshwater, C. A. Var. *albofasciata*, Carisbrooke, C. A.

Helix arbustorum.—Damp banks and hedges, Steephill and St. Laurence, A. J. H. Pelham Wood, G. G.

Helix cantiana.—Hedges and long grass, mostly on the chalk, also at Ryde and near Bembridge, A. G. M. Yarmouth, abundant on hedges, C. A.

Helix nemoralis (including *hortensis* and *hybrida*). —The var. *hortensis* much more common than *nemoralis*. *H. nemoralis*, Hempstead, Totland Bay, sparingly, C. A. *H. hortensis*, Yarmouth (near Afton Down) and Freshwater, plentiful. Four very large specimens, Yarmouth (·95 inch), C. A. Var. *lutea*, Yarmouth, C. A.

Helix virgata.—Grassy places, Steephill Downs, A. J. H. A small variety at Freshwater, Sir W. Jardine. Common, especially in autumn, when it swarms; of every variety, from plain white to many striped, A. G. M. At Ryde and abundant throughout the Undercliff, G. G. In profusion on Afton Down chalk. On hedges across the island from Afton Down to Yarmouth Tertiaries, C. A. Var. *minor*, Afton Down; var. *carinata*, a cream-coloured bandless shell, near Yarmouth, approaches this variety; var. *nigrescens*, not uncommon on Afton Down; var. *leucozona*, with the last; vars. *subalbida* and *albicans*, near Yarmouth; var. *alba*, near Yarmouth (one); monstr. *sinistrorsum*, near Afton Toll Gate (one); *a depressed form with one zone of spots*, north foot of Afton Down, numerous, but very local, C. A.

Helix caperata.—With the last, and nearly as common. A rather darker variety is abundant in the shingle in Steephill Cove, G. G. Very frequent between Yarmouth and Freshwater, on hedges; on Afton Down, small. Var. *ornata*, fine and frequent, Yarmouth to Freshwater, same place; vars. *obliterata* and *fulva* with the others, C. A.

Helix ericetorum.—Long grass, Steephill, A. J. H. Not common at Brading, A. G. M. Frequent about the cliffs, Ventnor, G. G. Downs above Ventnor, C. A. Freshwater Downs, not very numerous, C. A.

Helix lapicida.—Under stones in damp places; the Landslip, Bonchurch, A. J. H. Pelham Wood, Ventnor, G. G. Appuldurcombe, C. A.

Helix rufescens. — Common everywhere under stones, G. G. Ventnor, mostly light-coloured, C. A. Thorley, plentiful. Var. *alba*, Thorley, C. A.

Helix hispida (includes also *sericea*, *concinna* and *depilata*).—Under stones, Steephill, A. J. H. Abundant about Ventnor. The variety *concinna* in a field at Bank End, and sparingly elsewhere, G. G. Ventnor and Yarmouth, C. A. Var. *nana* frequent on Boniface Down, C. A.

Helix sericea (*granulata*).—Local, under stones at Wroxall, A. J. H.

Helix aculeata. — In moss, etc., Bonchurch, A. J. H., C. A. Centurion's Copse, Bembridge, and Marshcombe Copse, Yaverland, A. G. M. Shanklin Copse, not very abundant, G. G.

Helix pulchella.—Under stones, etc., Bembridge Down, Miss F. M. More. The walls of Quarr Abbey, A. G. M. The ribbed form common about Ventnor, G. G.

Helix rotundata.—Very common under stones and in moss, G. G. Ventnor, C. A. Yarmouth, C. A.

Helix rupestris.—Yaverland, A. G. M. Abundant at Carisbrooke, Mr. Hall. It appears to be scarce in the Isle of Wight, G. G.

Bulimus acutus.—Freshwater Down, near the lighthouse, A. G. M. Between Freshwater and Brook, Mr. W. Thompson, 1841. Afton Down very abundant, C. A. Vars. *alba* and *strigata*, both

on Afton Down, also var. *inflata;* var. *bizona*, a numerous colony on High Down, near Freshwater, C. A.

Bulimus obscurus.—Frequent under stones, G. G. Boniface Down and Steephill Cove, C. A.

Pupa umbilicata.—Steephill, A. J. H. Very common under stones about Ventnor, G. G. St. Helen's Spit, often found in the empty shells of *H. nemoralis* that have been broken by thrushes, A. G. M. Hempstead Hill, C. A. Norton, near Yarmouth, J. H. A.

Pupa marginata.—Bembridge Down, Miss F. M. More. Steephill, A. J. H. Common about Ventnor, but less so than the last species; a toothless variety occurs, G. G. Ventnor and Steephill, C. A. Norton, near Yarmouth, C. A.

Pupa secale.—On limestone rocks; local, but not scarce; Steephill, A. J. H. Near the parsonage, Ventnor, G. G. South face of Boniface Down, abundant, C. A. Chalkpits, Afton Down and Freshwater Down, C. A. Norton, on the blocks of Bembridge limestone, J. H. A.

Vertigo edentula.—A young specimen, named by Mr. Alder, has been taken by Rev. W. E. Hambrough at Alverstone, and another in Steephill quarry.

Vertigo minutissima.—Under stones on the shore, St. Laurence, A. J. H. Steephill (two), C. A., 1866.

Vertigo pygmaea.—Copse between Ventnor and Steephill, Sir W. Jardine. In moss, etc., Steephill Cove, A. J. H. and C. A. Hempstead Hill, under old bricks, C. A.

Vertigo antivertigo.—Upon stones and aquatic plants in marshy places; Steephill and near Woolverton, A. J. H. Colwell Bay, Mr. Alder.

Balea fragilis.—Trunks of trees in woods, Steephill and St. Laurence, A. J. H. Quarr Copse and Centurion's Copse, A. G. M. Copse near Yarmouth, under felled timber.

Clausilia laminata.—In moss about trees, etc., A. J. H. Near Bembridge, A. G. M. Shanklin Copse and Pelham Wood, G. G. Hedge on down above Ventnor, C. A.

Clausilia rugosa.—Common in moss and under stones, G. G. St. Laurence, C. A. Copse near Yarmouth, C. A.

Cochlicopa lubrica.—Frequent in moss and beneath stones; Centurion's Copse and St. Helen's Spit, A. G. M. Steephill, A. J. H. and C. A. The Undercliff generally, G. G. Copse near Yarmouth, C. A.

Carychium minimum.—Frequent in damp moss, etc., Steephill, A. J. H. Marshcombe Copse, Yaverland and Centurion's Copse, Bembridge, A. G. M. Shanklin Copse and mossy stones near a stream, Woolverton, G. G. Hempstead Hill, in damp places, C. A.

Achatina acicula.—Above chalk-pit on Afton Down (two), C. A., July, 1879.

Cyclostoma elegans.—Under stones in damp fields, etc., Steephill, A. J. H. Common near Bembridge, and especially abundant on the chalk, A. G. M. Pelham Wood, the landslip, etc., G. G. Ventnor, C. A. Thorley and Norton (near Yarmouth), around stumps of old trees, C. A.

Sub-fossil.—In a cut path, Orchard Bay, I observed a layer of shells, chiefly *Cyclostoma elegans, Helix aspersa, H. nemoralis, H. virgata, H. caperata*, about twenty inches below surface of the soil.

Fossil.—*Succinea oblonga* rather numerous, and many others in superficial beds at Totland Bay and Freshwater, *vide* Forbes, in Mem. Geol. Survey, pp. 5 and 8.

MICROSCOPIC SLIDE CEMENTS AND VARNISHES.

By Charles F. Rousselet, F.R.M.S.

In the February number of Science-Gossip, Dr. P. Q. Keegan recommends (*ante* p. 286) a new micro cement-varnish, made of Canada balsam and Styrax balsam dissolved in benzol and shellac dissolved in alcohol. I am quite unacquainted with this cement, but should like to make some theoretical remarks on that as well as on some other micro-cements. The first result of mixing the above substances will be, as Dr. Keegan says, to precipitate the shellac as a fine powder, which will then collect in a layer at the bottom of the bottle. On shaking it up, the shellac will be suspended in the solution in isolated solid particles, but will never effect a union with the other substances, and its only result will be a thickening of the balsam solution. The addition of shellac will in no way modify the Canada balsam, which, when exposed to the air, undergoes a double change with age. First the solvent (benzol in this case) evaporates, then some substances contained in the balsam oxidize, and it is gradually converted into a dry powdery resin. This cement may be good and useful for some purposes, but I cannot see how a Canada balsam slide can be protected for long by a cement consisting mainly of the same substance and liable to disintegration.

The office of a good cement-varnish is to permanently prevent the escape of the mounting fluid and to protect it absolutely from evaporation. The correct principle, in my opinion, is to choose a cement, irrespective of its brittleness, which will not affect, nor be affected by, the

preservative fluid used, and then to protect this cement with a reliable varnish. No single cement, therefore, can possibly do for all mounts. Three kinds of cements are available: first, those gums and balsams soluble in the terbene and the mineral naphtha series of solvents (turpentine, benzol, etc,); secondly, those gums and lacs soluble in alcohol and wood naphtha; thirdly, oil varnishes, such as gold size. Each of these three kinds of cement will have to be used according to the nature of the preservative fluid.

Canada balsam and similar mounts can very readily be protected by two or three rings of a solution of shellac in alcohol. Shellac is a hard and stable substance, unalterable in air of ordinary temperature, and will protect the balsam from contact with air, and, therefore, from oxidation and disintegration. Pure shellac, however, is somewhat brittle, but it can be made tough by adding a little castor oil (twenty drops to the ounce of shellac varnish) or Venice turpentine to the solution. Venice turpentine is the resinous exudation of the larch tree, and dissolves in alcohol.

Watery fluid mounts are best secured, first with a coat of a cement made by mixing two-thirds volume of a solution of gum-damar in benzol with one-third volume of best gold size. Gum-damar by itself is a bad and brittle cement, but it has the exceedingly valuable property of sticking firmly to glass, even when moist with water or glycerine. I know of no other substance which will do that so well. When the first coat of the damar-gold size is dry (twenty-four hours) it must be protected by three or four successive layers of pure gold size. Gold size consists mainly of boiled linseed oil combined with a resin dissolved in turpentine. When spread in a thin layer this solvent evaporates, and the oil then hardens, not by evaporation but by oxidation, into a tough, stable substance named linoxine. In order to prevent the complete oxidation of the gold size, I prefer to cover it finally with a protecting layer of some alcoholic cement, such as shellac and Venice turpentine, or Ward's Brown Cement, the basis of which is shellac. It will be observed that in this case I use three separate cements one over the other, having different qualities, and each sealing or protecting the previous layers. In ringing the slide each coat is made to slightly overlap the previous one.

Glycerine is notoriously the most difficult substance to seal securely and permanently. It can be done by closing first with a ring of the above-mentioned damar-gold size cement, then, after washing away every trace of glycerine on the slide, making two or three rings of shellac varnish, then three or four rings of pure gold size, and finally a coat of Ward's Brown Cement. Glycerine mounts closed in this way will not leak. In very deep cells containing much fluid a small air-bubble should be left; this acts as a safety-valve, otherwise the expansion of the fluid in hot weather is liable to force off the cover-glass, however well it may have been sealed.

Dr. Keegan wishes to banish gold size from our cabinets; yet, when of the best quality, this is a first-class oil varnish, and one of the few micro-cements which have well stood the test of time. I have a slide, and know of other similar ones, a thick injected anatomical preparation mounted in in a deep cell with watery fluid, prepared by H. Hett, about 1854, closed with gold size, which is now as good and sound as when it was made forty-five years ago. That is a good record for gold size.

Asphalt varnish, zinc white and similar substances are of little practical use, except as ornamental cements. A complete treatise on the chemistry of micro-cements and varnishes, and how to use them, is very much needed, and should be written by a thoroughly competent chemist, well acquainted with the various gums, resins and lacs, their chemical composition, their qualities, their solvents and diluents, and the changes they undergo under various conditions. Thousands of slides, some of my own included, prepared at great cost of time and labour, have been ruined and lost by using unsuitable cements in closing the mounts. Hardly any trustworthy information can be found on this subject in any book dealing with microscopic mounting and manipulation. I trust, therefore, that a competent man, after a thorough investigation of the subject, will do for microscopists what Prof. A. H. Church has done so well for painters in his "Chemistry of Paints and Painting."

Gt. Castle Street, London, W.

Volcanic Ash in the Yoredale Beds.—On January 4th a paper was read before the Geological Society, by Mr. H. H. Arnold Bemrose, M.A., F.G.S., on the sections exhibited in the cuttings on the Ashbourne and Buxton Branch of the London and North-Western Railway. The southern part of the new railway from Ashbourne through Tissington and Crake Low to Buxton exhibits several sections in Trias, Boulder-clay and Yoredale Beds. Interstratified with the latter is a thick bed of volcanic ash, with thinner intercalations of tuff. Within a mile of Tissington, ash is exhibited four times in the cuttings, and according to the view of the author, substantiated by Dr. Wheelton Hind, it is the same bed repeated by domes and basins, which are sometimes faulted. The ash-bed is 144 feet thick where fully exposed. The ejected blocks in the ash vary from several inches up to one foot in diameter, and are similar to the blocks in the vent at Kniveton. The small lapilli scattered through the limestones are generally converted into calcite or dolomite with oxide of iron.—*Edward A. Martin, 69, Bensham Manor Road, Thornton Heath.*

LEPIDOPTERA IN SOUTH-EAST ESSEX.

By F. G. Whittle.

(*Continued from page* 268.)

Noctuae.

THE following list of 134 species of Noctuae is not by any means to be regarded as full and complete. Indeed, a glance at it will satisfy any practical lepidopterist that there are species of general distribution omitted which must occur with us. It will be noticed that not a single species of the Dianthoeciae is included; neither is there one in Howard Vaughan's list, although doubtless one at least could be found among the "Sweet Williams" in many cottage gardens in the district. The Xanthiae are well represented. All have occurred here with the exception of *X. citrago*, which I have seen in the garden of my kind friend, the Rev. C. R. N. Burrows, vicar of Mucking; but it is omitted from the list for the reason that Mucking is outside the limit imposed by the terms of this article.

Bryophila perla, a frequent visitor at gas-lamps, Southend, is common at Benfleet and Leigh; var. *flavescens* not observed until 1898, when a fine specimen was found in a rain-gully on my house at Southend.

Demas coryli, scarce; one larva only at Hockley.

Acronycta psi, very common all over the district. *A. aceris*, once taken in Southend by the Rev. C. R. N. Burrows. *A. megacephala*, one specimen seen in a small collection of insects formed at Shoeburyness. *A. rumicis*, a common insect on tree trunks.

Diloba caeruleocephala, larvae very common.

Leucania conigera. Benfleet and Southend, common at sugared reeds. *L. lithargyria*, common all over the district; larvae on reeds. *L. obsoleta*, at sugar, Benfleet; but infrequent. Mr. Carrington has taken it not uncommonly at rush flowers at foot of cliffs east of Leigh. *L. impudens*, scarce at Great Wakering. *L. comma*, Benfleet and Great Wakering, frequent. *L. straminea*, common and very variable at sugared reeds at Southend and Benfleet. The elongate and very distinct larva is easily found on reeds at night. In the cabinet the shape of the forewings is very notable, but not so much so on the sugar. Every *Leucania* that visits the sugar during the *straminea* season should be closely examined. *L. favicolor*. This recent addition to the British fauna, described in "Entomologist's Monthly Magazine," vol. xxxii. p. 100, has occurred at Great Wakering. I have only taken one specimen, but it looks very distinct, as will be seen on reference to the centre moth in the accompanying picture; where *L. favicolor* is figured for the first time. The three moths are photographed a fourth larger than natural size, so as to bring out the detail of markings. The portrait of *Nonagria lutosa* is from a small male, for easier comparison. The shape of its superior wings is much as in *straminea* and *N. lutosa*, with a curved, almost complete line of black dots from the costal to the dorsal margin, and a faint indication of the dotted line on the hind wings, usual in *straminea* and *N. lutosa*. The tone of the fore-wings is very nearly that of some reddish ochreous specimens of *lutosa*, quite different from that of any other *Leucania* I possess. The colour of the lower wings is as in *impura*. *L. impura*, very common; the form *punctilinea* occurs; larvae abundant on the river wall at Benfleet in May. *L. pallens* very common and variable.

A, *Leucania straminea*; B, *L. favicolor*; C, *Nonagria lutosa*. These figures are about one-quarter more than natural size, to show detail of markings.

Calamia phragmitidis, common at sugared reeds; quite unlike the red form I have received from Wicken.

Senta maritima, on sugared reeds at Benfleet, but far from common; type and var. *bipunctata* taken. Howard Vaughan got, in addition to the type, the varieties *wismariensis* and *nigrostriata*; but not *bipunctata*.

Tapinostola fulva, once only, on a fence, Southend.

Nonagria geminipuncta, at sugared reeds, Benfleet; larvae in the ditch at the foot of Leigh slopes, north of the railway, Leigh side of the Crow Stone. *N. neurica*, Benfleet, at sugar; two specimens only. *N. lutosa*, Benfleet; abundant and variable in size, colour and markings.

Hydroecia nictitans, forms *lucens* and *paludis*. Some beautiful examples occur. I have bred one or two *paludis* from larvae found at roots of sea-wormwood. *H. micacea*, Benfleet, rather common at gas-lamps, Southend; larvae abundant in roots of dock.

Axylia putris, at sugar, Benfleet; not common.

Xylophasia lithoxylea, very common. *X. monoglypha*, abundant. *X. hepatica*, two or three specimens seen in a small collection formed at Shoeburyness.

Neuronia popularis, at gas-lamps, Southend; not common.

Cerigo matura, common at light, Southend; also at Benfleet.

Luperina testacea seems abundant everywhere. *L. cespitis*, scarce; one fine example at a Southend gas-lamp.

Mamestra abjecta. Benfleet and Shoeburyness; not uncommon. A few of the var. *variegata* taken, I have only once found the larva. *M. sordida*, Benfleet; not common, *M. brassicae*, very common.

Apamea basilinea. Leigh, Southend, Shoeburyness. *A. gemina*, not uncommon at Benfleet. *A. didyma*, abundant, in almost endless variation.

Miana strigilis and *M. fasciuncula*, common and variable. *M. literosa*, Shoeburyness; not common. *M. bicoloria*, all over the marshes in countless numbers; much variation.

Grammesia trigrammica, common at Leigh, Benfleet and Shoeburyness.

Caradrina morpheus, *C. alsines*, *C. taraxaci* and *C. quadripunctata*, generally common.

Agrotis vestigialis, one only, in the day-time, under *Sedum* on the sand-hills near South Shoebury Church. *A. puta*, fairly common at Southend and Benfleet. *A. suffusa*, very common. *A. saucia*, rather common; varies considerably. *A. segetum*, abundant and variable. *A. exclamationis*, very plentiful, with much variation; examples with confluent stigmata not uncommon. *A. corticea*, Benfleet; rare. *A. nigricans*, at sugared ragwort, Benfleet; very variable. *A. tritici*, Benfleet; scarce; fine large form with broad pale costa.

Noctua augur. Leigh and Shoeburyness. *N. c-nigrum*, generally common. *N. triangulum* Southend. *N. festiva*, at sugar, Eastwood. *N. umbrosa*, rather common at Southend and Benfleet. *N. xanthographa*, exceedingly common and variable.

Triphaena ianthina. Prittlewell and Hadleigh; not common. *T. fimbria*, larvae at Eastwood. *T. interjecta*, sugar at Benfleet and Shoeburyness; larvae on reeds. *T. comes* and *T. pronuba*, both very common.

Amphipyra tragopogonis, everywhere common.

Mania typica, larvae abundant. *M. maura*, Shoeburyness.

Pachnobia rubricosa, at sallows, Southend, but not common.

Taeniocampa gothica, abundant at sallows. *T. incerta*, at sallows, Southend; not common. *T. opima*, once bred from a Southend larva; a fine moth found among sea wormwood near Vange Creek. *T. stabilis*, common at sallows, Southend. *T. gracilis*, not uncommon at sallows at Southend. *T. miniosa*, Eastwood, but not common. *T. pulverulenta*, at sallows, Southend; not common.

Orthosia upsilon. Benfleet, at sugar. *O. lota*, rather common at Southend; larvae on sallows at Eastwood. *O. macilenta*, Eastwood; not common.

Anchocelis rufina. Southend; fairly common. *A. pistacina*, abundant; exceedingly variable. *A. lunosa*, Benfleet and Southend; much variation. *A. litura*, very common some seasons.

Cerastis vaccinii. Southend and Eastwood; very common. *C. spadicea*, abundant.

Scopelosoma satellitia. Southend and Eastwood; rather common, though not a single example was seen in 1898.

Xanthia fulvago. Southend; a large number bred from sallow catkins gathered at Eastwood; but only one var., *flavescens*, appeared. *X. flavago*, at sugar, Southend; not common; several bred last year from sallow catkins. *X. aurago*, larva once beaten at Eastwood; two moths at sugar, Southend. *X. gilvago*, at light and sugar, Southend; not common. *X. ocellaris*, one only at sugar, Southend; flies with *gilvago*, but seems very distinct; has pointed wings and white spot at base of reniform. *X. circellaris*, very common at sugar, Southend.

Cirrhoedia xerampelina, near Southend. I have obtained most of my specimens by searching the angles at the roots of ash for the emerging moths in early September; the moths are not often found on the trunks; a few taken at sugar.

Calymnia trapezina. Eastwood and Southend. *C. diffinis*, common on sugared elm. *C. affinis*, Southend and Benfleet, not common.

Eremobia ochroleuca. Benfleet; a few at rest in the evening on sea wormwood growing among cock's-foot grass at Shoeburyness; it would probably be found more freely at flowers of *Centaurea*.

Miselia oxyacanthae, common; var. *capucina* occasionally.

Phlogophora meticulosa, common everywhere.

Aplecta advena. Benfleet; scarce.

Hadena protea. Southend; not common. *H. dentina* and *H. trifolii*, generally distributed. *R. dissimilis*, abundant and variable; larvae as variable as imagines; egg clusters often found on the salt marshes. *H. oleracea*, Southend and Shoeburyness; larvae beaten from *Atriplex*. *H. pisi*,

larvae at Eastwood. *H. genistae*, Southend and Pitsea; not common.

Xylocampa areola. Eastwood; not common.

Calocampa vetusta. Southend; scarce. *C. exoleta*, Southend; not uncommon.

Xylina socia. Southend; very scarce.

Cucullia chamomillae and *C. umbratica*, occasionally on posts and fences.

Gonoptera libatrix, occurs pretty freely; larvae on sallow at Eastwood.

Plusia chrysitis, not common at Southend gas-lamps. *P. festucae*, once only, on sugared reeds at Benfleet. *P. gamma*, abundant.

Heliaca tenebrata, occasionally at Benfleet and Eastwood.

Acontia luctuosa. Eastwood; a very lively example at one of the railway station lamps at Benfleet.

Erastria fasciana, no common at Eastwood.

Phytometra viridaria. Eastwood; not common.

Euclidia mi, very common on the salt marshes; the curious larvae frequently seen. *E. glyphica*, Leigh and Southend slopes; not uncommon.

Catocala nupta, generally distributed and rather common.

Rivula sericealis. Leigh slopes; not uncommon.

Zanclognatha grisealis, rather common at Eastwood. *Z. tarsipennalis*, Eastwood; not common.

Herminia cribralis. Shoebury; common at Benfleet.

Pechypogon barbalis, a very common insect at Eastwood.

Hypena rostralis, at sugar at Southend. *H. proboscidalis*, occasionally at Southend.

Hypenodes costaestrigalis, once only, at Eastwood.

(*To be continued.*)

COLOUR IN NATURE.

By Wilfred Mark Webb, F.L.S.

It is an old cry that the titles of books are often a trifle misleading, and "Colour in Nature" (1), by Marion J. Newbigin, may again call it forth. To one who has borrowed this heading for his talks in lecture form about colour in the landscape, and from an environmental point of view which the words obviously suggest, there is at first a slight disappointment to find that the book in question treats the subject almost entirely from an internal point of view. Indeed it is not until the last chapter is reached that the interesting theories are discussed which explain how colour may come to be useful to its possessors in the struggle for existence. When reading the book, however, any desire that it should be a popular addition to those "which treat of the external aspects of the colours of organisms," fades before the pleasure of finding a solid contribution to science, bringing together the facts and fancies which bear upon "the meaning of colour in the functional economy of the organism," and summarizing what is known about the composition of pigments, as well as the distribution of these and structural colours in the world of life. Such a work must manifestly be a compilation; but all honour is due to conscientious compilers in the field of biology. They bring the results of deep study and a wide grasp of their subject to bear upon the labour they impose upon themselves, labour which is ever increasing until the work is completed. Their reward is usually but the satisfaction of having done their best and made the way of others easier by their task. For such work is often sneered at as "mere compilation"; and as the personal element comes to the fore with some force in the arrangement of material, a built-up book offers a fine field for criticism to those who would have done it differently if they had followed up such an idea, but did not.

The following schemes, giving an idea of the kinds of colour, as also the examples illustrating them, are taken from the opening chapters, in which an interesting paragraph upon the production of light by organisms finds a place.

Structural Colours.

(1) Those not dependent upon the presence of a pigment:—

(*a*) Due to total reflection: white colour of some flowers, some feathers, and of hair.

(*b*) Due to striation of surface or thin plates: iridescence of bristles and cuticle of worms, and of mother-of-pearl.

(2) Those dependent upon the presence of a pigment:—

(*a*) Unchanging in reflected light, and not readily distinguishable from pigmental colours (objective): blue and green appearance of feathers.

(*b*) Changing in tint according to the angle at which they are viewed (subjective): metallic colours of many birds and insects.

The state of our knowledge of the chemical composition or of the physiological function of pigments does not at present allow a classification of them upon either of these bases, and colouring

(1) "Colour in Nature," by Marion J. Newbigin, D.Sc. 5 in. × 7½ in. 337 pp. with 4 figures. (London: John Murray, 50a, Albemarle Street, 1898.) 7s. 6d.

matters are treated under the several headings given below.

PIGMENTS.

(1) Of direct physiological importance:—
Haemoglobin: red colouring matter of the blood, and respiratory in function. *Chlorophyll:* green colouring matter of most plants and contributory to the taking of carbon needed in nutrition from carbonic acid gas.

(2) Derivatives of such pigments:—
(Most are speedily eliminated from animals' bodies.) *Melanin:* this dark pigment, colouring skin or hair in mammals and setting off structural colours in birds, may be derived from haemoglobin, as are probably the colours of birds' eggs.

(3) Waste products:—
Pigments on butterflies' wings, which are modifications of uric acid. *Lepidotic acid.*

(4) Reserve products:—
(?) *Carmine.*

Or, pigments associated with reserve materials:—
Lipochromes (often fat pigments.) *Carotin.*

(5) Introduced pigments:—
Such as chlorophyll derived from food in caterpillars.

One is tempted to consider the class of pigments called "lipochromes" in some detail, and with regard to which many points of interest are scattered through the book. The lipochromes are characterized by their colours varying from yellow to red. When dry they give a blue colour, with concentrated sulphuric or nitric acid [2]; and two series are found in animals which do, or do not, as the case may be, form compounds with caustic alkalies. Only the second occurs in plants. These pigments are widely distributed, and, in the vegetable world, not only do they colour flowers like the narcissus and lily, and fruits like the rose-hip and tomato, but, with other pigments, are associated with chlorophyll: when that colour is lost in autumn they help to give the much-admired tints to many dying leaves. Xanthophyll particularly does this, and may also colour etiolated leaves in which, through the absence of light, no green chlorophyll is produced. It is pointed out that these pigments are very unstable, and several may occur together; so that it is difficult to determine whether xanthophyll and etiolin are one and the same. The anthocyans, another series of pigments, apparently derived from tannins, help in colouring the leaves at the approach of winter, and are found in the petals of bluebells and roses, and the fruits of the grape and blackberry. It has been suggested that colouring matters associated with chlorophyll may help in the work of the latter by absorbing some components of light, as various coloured lights affect the growth of plants for good or evil.

Among other noticeable points are the remarks upon the occurrence of different colours on occasion in different individuals, and constantly in different sexes of the same species, as well as the cropping up of the same colours in members of the same genus. The author says:—

" . . . . It is perhaps universally true that elaborate patterns are dependent, at least in part, upon dark pigments, while bright pigments tend as a rule to be more uniformly distributed. It is difficult to avoid coming to the conclusion that the fact is associated with the insolubility [possibly only due to mordants] of the dark pigments, which will render them on the whole less readily diffused than the more soluble bright-coloured pigments."

Again, it is suggested that unspecialized animals, such as many hen birds, may be coloured with a mixture of melanin and lipochrome, which when separated would give vivid orange and black colours as often seen in male birds.

The arrangement of the many interesting facts that are touched upon under the various headings, based upon the systematic divisions of animals and otherwise, may or may not appear to be erratic, according as the difficulties are appreciated. Weakness is displayed in dealing with theories, especially that of "Natural Selection," which, in the introduction, one is told "is no longer the centre of men's thoughts." There is not the unsatisfactory attitude of non-committal which occurs in Mr. Beddard's "Animal Coloration"; nor is there a stout belief expressed on one side or the other, such as Professor Poulton has accorded to Natural Selection in his "Colours of Animals"; but the keynote that this theory is no longer fashionable, given in the introduction, is followed up throughout "Colour in Nature" by kicks at an idea which is supposed to be down. Thus, when autumn colours are discussed, we are told that they often display "to an extraordinary degree that beauty and perfectness which we [this must mean the laboratory-made naturalists alluded to elsewhere] are accustomed to regard as the result of the action of Natural Selection." In other places we get the expression—the coloration which "is known as protective"; and with regard to the case of the drone-fly and bee, one is told that "this has, of course, been described as protective mimicry," and so on. Even when specific difficulties are brought forward against "the acceptance of Natural Selection as the most important factor in the evolution of colour," the author has no other alternatives to offer but such vague ones as she herself says, "many, perhaps justly, find so unsatisfactory." There is a long list of references, which adds considerably to the value of the book.

2, *The Broadway, Hammersmith, W.*

[2] Bloxam ("Chemistry," p. 666) says if chlorophyll be boiled with alcoholic potash, the solution, when neutralized with hydrochloric acid, gives a yellow precipitate (phylloxanthin), and the solution retains a blue colouring matter (phyllocyanin), which contains nitrogen, The autumnal colour of leaves is perhaps due to the disappearance of the phyllo-cyanin. Green leaves assume an autumnal tint when immersed in chlorine."

SOME NEW PHYSICAL APPARATUS.

By James Quick.

(*Continued from page 279.*)

Cribb's Double Surface Condenser.

Among the advantages claimed for this form of condenser, which has been patented by Mr. Cecil H. Cribb, B.Sc., the great efficiency calls for marked attention. The condensing surfaces are, owing to the double walls, exceptionally large in proportion to the size of the condenser. The capacity of the condensing space is so small that the whole of the vapour in entering comes immediately in contact with the condensing surfaces. Much less cooling water is required, and the condenser is of exceedingly small size and weight.

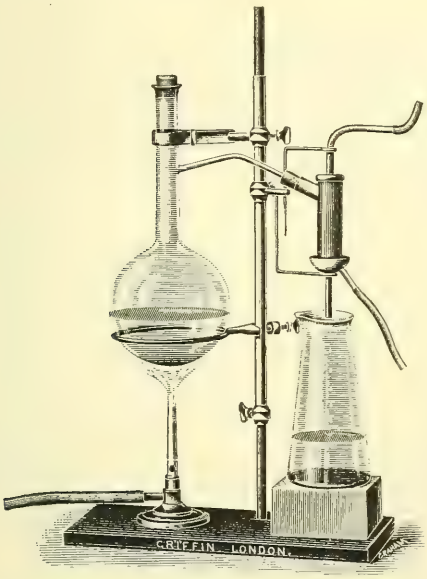

Fig. 1.
Cribb's Double Surface Condenser.

Fig. 2 is a sectional view of the condenser. The vapour enters through the side neck *A* into the condensing space *B*, between the two tubes *C* and *D*; after condensation the distillate passes out through *E*. The cooling water passes down the tube *F* into the interior of *C*, which it fills, and, running over the rim at the top, passes in a thin stream down the outside of *D*, finally flowing away through the escape pipe *G*. When used as a reflux condenser, the vapour of course passes up through *E*. After allowing the liquid to get into full ebullition, so that the air is driven out of the condensing space, the mouth of *A* may be completely closed with a cork, thus avoiding even the possibility of loss with volatile liquids such as ether. The apparatus must obviously always be used in one and the same position, *i.e.* with its axis vertical. This is a distinct advantage, because it is very easily so supported, and because when thus disposed it takes up a minimum of space on the bench. A series of quantitative trials with the condenser gave the following figures:

	Small metal condenser.			Glass condenser.	
Temperature of effluent cooling water	52°C.	65°C.	76°C.	61°C.	47·5°C.
Temperature of distillate ...	48·°C.	60°C.	61°C.	41°C.	35.5°C
C.C. of cooling water used per hour	40,000	40,000	7,200	6,020	2,093
C.C. of distillate per hour ...	2,642	4,128	1,017	765	355
Ratio of quantity of distillate to that of cooling water	$\frac{1}{15·14}$	$\frac{1}{9·69}$	$\frac{1}{7·8}$	$\frac{1}{7·87}$	$\frac{1}{5·9}$

The metal condenser used in the above experiments measured $4\frac{1}{4} \times 1$ inches; the glass condenser $4\frac{3}{4} \times 1\frac{1}{8}$ inches. By comparing efficiencies it will be seen from these measurements that one of these small condensers is equal in condensing power to a Liebig condenser of at least five times its size.

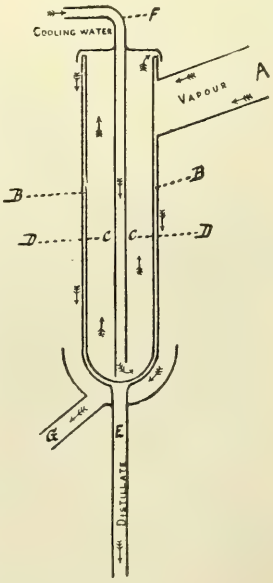

Fig. 2.

The very thin layer into which the water is spread when pouring down the outside of the condenser greatly facilitates evaporation, so that the latent heat of vaporization, which has mainly to be derived from the vapour undergoing condensation, effects a great saving in the cooling water used. This is especially the case with liquids boiling above 100° C., but may be easily shown in the case of water by cutting down the supply of cooling water to a minimum,

when the water at the top of *C* is sometimes as much as 10° hotter than that issuing from *G*.

The support shown in fig. 1 will be found very convenient, as all its parts are adjustable, and as the condenser holder and other fittings are clamped on a tube which slides over the iron rod of the stand, the whole arrangement can be raised or lowered by one operation at the convenience of the operator.

(*To be continued.*)

INSTINCT.

By R. Dickson-Bryson, B.A., F.P.S., F.R As.S.

(*Continued from page 270.*)

BIRDS show in the construction of their nests similar care and skill, and with the same perfect tools. What could be less fitted for building nests, considering their almost endless variety and adaptation, than the beak, feet and body of a bird? Yet in spite of these limited means, the bird sews, weaves, pads and builds. Note too, each species has built on the same uniform plan from immemorial time.

The feathered race is aerial, somewhat as we say fishes are aquatic. The aerial empire is their free and undisputed possession. They are sociable and friendly and appear to exchange greetings with one another. Their sharp eyes enable them to see near and distant objects with marvellous facility. They build their nests at the same time of the year, with nearly similar material and with the same instruments—the beak and claws; yet their nests vary and are characteristic of each species. *Qualis avis, talis nidus.* No one could mistake the swallow's nest (*Hirundo domestica*) for that of the bullfinch (*Pyrrhula*), nor these two for that of the wren (*Troglodytes*), and so with many others. In spite of their inter-related life and habits and similarity of organs they never copy nor borrow from one another. There is among birds, as among beavers, the same immutable, perfect, specific and intransmissible instinct.

No one can have failed to note the skill, energy and patience displayed by swallows in nest building. Soon after their arrival from the South they begin to build their nests and to repair those they occupied the preceding year. A common sympathy appears to lead them to a mutual assistance of one another. Those having fewer demands on their time assist their busier companions.

House-martins having selected sites for their future homes, begin building operations at once. They carry the mud destined for building in their beaks. It is moistened and rendered adhesive by means of the viscid saliva it secretes. To render it more tough when dry it is mixed with pieces of straw and wood, and in fact with anything that will enable the mass to cohere. The first beakfuls are applied to the wall, generally in a corner, and under the eaves; this serves as a foundation. Each new beakful is applied to the other, and so the walls, slightly curving, increase until they meet. The shape is usually hemispherical. At the top a small aperture is left, which serves as an entrance. It is then lined with down and made comfortable and snug for the reception of the young brood.

The tailor bird (*Orthotomus*) is a well-known native of the tropics, and owes its name to its sartorial proclivities. Its curious nest is formed of leaves sewn together. It detaches a leaf from the tree and sews it to another, edge to edge, perforating the leaf with its bill, and inserting the thread, a vegetable fibre which it prepares, into the opening thus made. Between the leaves thus arranged is a small cavity which, when lined with soft fibre and down, constitutes the nest. When complete it is not easily distinguishable among the foliage, and so the tailor bird and family escape from their enemies.

The weaver birds suspend their nests in a curious fashion from the end of flexible branches overhanging rivers and lakes. By this artifice they enjoy a merited immunity from their enemies, such as snakes, squirrels and monkeys. To suspend her nest the weaver bird collects a quantity of grass and vegetable fibre with which it plaits a sort of cord. This it securely fixes to the branch selected, and to the free, pendulous end it weaves its nest. When complete the nest resembles a bottle in shape. The entrance is at the lower end. The nest is suspended like a fruit with a long peduncle. The weaver bird's nest is a marvel of instinctive skill, and its enemies are unable to reach it.

It would be superfluous to multiply examples; we have stated enough to show that each species has its own characteristic type of nest, and that, notwithstanding the identity of materials, organs, and purpose. Instinct, and absolutely nothing of reason, is the dominant factor in nidification. We cannot on any known theory account for the variations arising from climatic, local and other accidental circumstances. These variations bespeak a purposeness behind all, which the superficial philosophy of to-day calmly ignores.

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IMPORTANT NOTICE.

SCIENCE-GOSSIP.

CHANGE OF ADDRESS TO 110, STRAND, LONDON, W.C.

WE have pleasure in informing the readers, subscribers and advertisers in "Science-Gossip" that the proprietor of this Magazine has taken an independent office at 110, Strand, London, W.C., at which editorial and business arrangements will in future be carried on. This places "Science-Gossip" in the unique position of being the only scientific magazine having its own premises.

Would you kindly enter this change in your address-book.

In consequence of the introduction of further capital, and the independent position of the magazine, the readers will in future find considerable improvement and additions in the literary matter. Those departments which in the past have been especially attractive will be further developed. "Science-Gossip" will continue to be the organ of the field-naturalist as hitherto, but full space will be given, as has latterly been the case, to the modern aspects of biology.

More attention will be paid to the physical side of science, including monthly notes, and a series of articles upon new and useful physical apparatus, which have been kindly promised by Mr. James Quick, whose professional position renders him a specialist on the subject.

Under these circumstances we appeal to our present large circle of readers and supporters to assist in this improvement and development of "Science-Gossip," by extending the circulation through new subscribers, or even by mentioning the magazine to friends and acquaintances who do not already take it.

As "Science-Gossip" has now an independent office, the Editor will be glad to make the personal acquaintance of his contributors and subscribers, and will for that purpose set aside the afternoon on Thursdays, from 4 to 6 p.m., at this address, when he will be pleased to see any, especially contributors and readers from the country, who may happen to be in London.

The Editor begs to again remind the readers how valuable to others are short notes upon apparently trivial subjects, for what are familiar matters to the writer are frequently valuable though little-known facts.

The Editor will in future, as during the past two years, have the co-operation in the editorial department of Miss F. Winstone as assistant editor.

110, Strand, London, W.C.
Christmas, 1898.

The golden oriole's nest consists of material borrowed from man. Poucust, with true French facetiousness, asks how the oriole made its nest before man's industry supplied the material it now uses. To this one may reply, the oriole does not think of a particular kind of stuff, whether it be wool, silk or cotton; what it requires is a fibrous material, a long body, suitably flexible and strong enough for its purpose. This it takes whenever and wherever it finds it. These existed and built their nests long before the advent of industrial man, but they always had natural material convenient. In the nest of the modern oriole we fail to see any modification. Nests of the same species in different countries are constructed of the vegetable substances peculiar to the country.

What motive leads the tailor bird to sew leaves together to make a nest? Why does it alone possess that remarkable power or have more foresight than others? I cannot allow the opinion of Milne-Edwards, who thinks instinct is seen in the general fact only and intelligence in the details.

Still less do I agree with Dr. Alfred Wallace, that they have a sort of *bird-intelligence*, a limited rational power. Dr. Wallace conceives that birds undergo a sort of discipline at the hands of the more experienced, that they make use of tradition and so *learn* to build their nests. I entirely repudiate the notion. Observation leads to a contrary opinion. The canary imprisoned in its cage makes a simulacrum of a nest, although it is supplied with one. Beavers removed from the mother as sucklings, before they are able to receive instruction, build huts and store food, although in circumstances widely different from the native condition. Would a child isolated from its parents and removed beyond the pale of civilized influences construct a house, as the beaver its hut? No. The child in these conditions would revert to the savage state of its primitive ancestors. Civilized man is merely an educated savage with an indefinite capacity for self-improvement. The truth of these statements has been demonstrated on several occasions.

I repeat the question—why does each species construct its nest after a unique type? Or, why do various species not imitate one another, and that when they are brought into like conditions, since they employ nearly similar materials and have the same instruments of construction? These are some of the insoluble riddles of natural history.

If there is an animal at all apparently little provided with the organs necessary for the construction of a nest it is a fish. Still, in spite of its apparent impotence, the stickle-back discovers a remarkable ability in that direction. Having selected a suitable place the male stickleback bores itself head-first into the mud till it disappears. It then turns rapidly upon itself and makes a cylinder-shaped cavity. This done, it sets out in quest of blades of grass and other vegetable substances, which it seizes with its mouth, and carries to its dwelling. There it arranges these, secures them by fixing them to the mud with its body. It continues this work until the whole surface is covered, then it completes it by living there and lubricating them with a thick, sticky liquid secreted from its sides. The nest is now finished, but I need not follow it further, that is not my object.

No stickleback, as far as we know, has been found that proceeds differently from the others; and although other fishes witness the labours of the stickleback, no other has been known to imitate them.

The water spider's nest is another of Nature's anomalies. This animal is small, brownish in colour and somewhat velvety in texture. It lives in the water or at the surface of the water among the leaves of aquatic plants. It is an air-breathing creature, and always requires fresh air. If its nest is in the water it displays a marvellous ingenuity in laying up a store of the precious element. How does it do this? It turns on its back and floats face upwards, collecting a quantity of air on the surface of its body, it then dives, and collecting the minute bubbles, makes a single one, which it fixes to some support. It again rises to the surface and repeats the operation until the bubble is of sufficient magnitude. It then spins a web over its surface, the whole being somewhat like a dressmaker's thimble in shape. Small cables connected with the bell and the fixture keep it suspended in the water. The spider then takes up position in its dwelling, when it awaits any insects that chance may lead within its walls. If the bell should by any means be fractured, the spider repairs the part; if the air be vitiated, it is removed by making the bell perform a somersault in the water, and so emptying its contents, it then refills it as before. These interesting creatures were first observed by Lignae in 1744, and since by many other observers. The water spiders so far have not yet changed their habits. Their performances are stamped with the immutable characteristics of instinct.

(*To be continued.*)

Flicker Photometry.—This method of comparing the intensities of two sources of light, due to Mr. O. N. Rood, consists in illuminating the two sides of a white upright right-angled prism with the two lights and rapidly rotating a cylindrical lens placed opposite the angle of the prism. The lens is oscillated horizontally by a toothed-wheel arrangement. By this means the two illuminated sides of the prism are presented rapidly in succession to an eye placed behind an aperture in front of the lens. Accurate results are obtained by this method even by persons not versed in photometric work.—*James Quick, Suffolk House, Dartmouth Park Hill, London, N.W.*

BRITISH INFUSORIA.

By E. H. J. Schuster, F.Z.S.

(*Continued from page* 203.)

Part VI.—Ciliata Peritricha.

THE order Peritricha contains those forms which are characterized by the possession of one or more bands of cilia encircling the body. The Peritricha are sometimes free-swimming, sometimes fixed. In the latter case they generally pass through a free-swimming phase at one period of their life-history. In some instances, however, they can leave their support at any time should danger arise, and swim to some safer place. The sedentary forms may be sessile or stalked, and may have their stalks retractile or non-retractile. They are sometimes solitary, sometimes colonial; the colonies being often large and tree-like.

In Butschli's system of classification the Peritricha constitute a section of his order Trichostomata; but the word is used by him in a narrower sense than by Stein and Saville Kent; for his section does not include many forms (for example, Urocentrum, etc.) which are included by the latter authors in their order. The system given in Saville Kent's "Manual of the Infusoria" will be adhered to here, and his diagnoses of the families will be quoted.

Family Gyrocoridae.—"Animalcules free-swimming; persistent in shape, but not encuirassed, ovate or pyriform; provided with one or more spiral or circular wreaths of cirrose cilia; oral aperture lateral or ventral; anal aperture postero-terminal; the posterior extremity frequently bearing a stylate, more or less flexuose, caudal appendage."

Urocentrum turbo Müller.—The shape of this animal is that of an ellipsoidal piece of india-rubber, round the middle of which fine string has been tightly tied, dividing it into two lobes, anterior and posterior. The mouth is rather large and oval, and lies in the constriction separating the two lobes; the gullet is long and narrow, and provided with a row of thick-set cilia. The ventral surface is somewhat flattened, and a longitudinal groove runs over it from the mouth to the posterior end of the body. The cuticle is thick, and presents a radially striated appearance, due to the presence of trichocysts. The cilia are arranged in two rings, which are easy to see—one encircles the anterior, the other the posterior half of the body. A tail-like structure projects from the hinder end, which sometimes appears to be split up into a number of fibres. The animal is said to anchor itself by this, and thus to assume for a time a sedentary habit. The macronucleus is long and horse-shoe shaped, it lies in the posterior lobe of the body; a small micronucleus is placed by its side. Behind this we find the contractile vacuole, which is a conspicuous feature; it consists of a central chamber from which radiate four lateral chambers, arranged in a plane at right angles to the long axis of the animal, so that only two can be seen in side view. Figures are given to show the successive shapes assumed by this vacuole. In fig. 35*a* we have merely the round central chamber exhibited; in fig. 35*b* two of the lateral chambers have begun to appear, followed in fig. 35*c* by two others; in fig. 35*d* the lateral chambers have increased, the central chamber having, meanwhile, diminished. In fig. 35*e* the

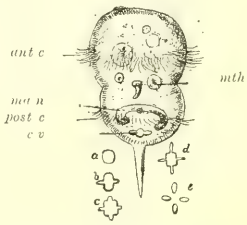


Fig. 35.—*Urocentrum turbo.*

ant c, anterior circlet of cilia; *post c*, posterior circlet of cilia; *ma n*, macronucleus; *mth*, mouth; *cv*, contractile vacuole; *a*, *b*, *c*, *d*, *e*, contractile vacuole in successive stages.

lateral chambers have further increased, and the central chamber diminished. Then the lateral chambers suddenly contract and become lost to sight, as the central chamber again springs into appearance.

This animal is from 30 or 40 to 100 microns in length; it is fairly common. I have found it in large numbers in a stagnant ditch, overhung by trees and a hedge, in the neighbourhood of Oxford. It swims rapidly, rotating on its long axis.

I have found a solution of methylene blue in twenty per cent. alcohol useful in studying it, as it seems to stain, and stop its rapid movements, before absolutely killing it.

Family Vorticellidae.—"Animalcules most highly contractile; ovate, sub-cylindrical or campanulate; sedentary, or temporarily free-swimming; stalked or sessile; solitary, or united in social, dendriform or mucus-immersed colonies; naked, or secreting indurated sheaths or loricae; oral aperture terminal, eccentric, associated with an adoral ciliary spire of one or more convolutions, the right limb of which usually extends into the oral entrance or

vestibulum, the left one being more or less convolute round an elevated and protrusible central area which constitutes the so-called ciliary disc; vestibulum continued backwards into the substance of the body as a conspicuous cleft-like pharynx, and often further prolonged as a narrow tubular oesophagus."

Genus *Vorticella.* — All the species of the genus are sessile; the body is bell-shaped, the broad end of the bell is distal, the narrow proximal end being attached by means of the stalk, down which runs the contractile "muscular band." The distal broad end is probably homologous with the ventral side of other Ciliata. Its edge is raised up all round into a kind of lip—the peristome. Immediately inside the peristome, at one point, is a depression—the vestibulum. From the vestibulum a conspicuous pharynx leads into the body substance; it is continued by a narrow oesophagus which runs still further in. The central part of the distal area is raised into an elevation called the ciliary disc. A groove—the peristomial canal—runs between the disc and the peristome, of which the vestibulum is merely a local enlargement. A band of cilia starts in the pharynx, runs up the pharynx and vestibule, and then turns to the left and runs along the inner side of the peristome; it is further continued round the ciliary disc. The mouth lies at the end of the oesophagus. Ingested particles of food make two complete turns right round the animal and then come out by the anus, which is situated on the wall of the pharynx. The contractile vacuole is spherical, and on contraction sends its contents into an oval reservoir which opens into the pharynx near the anus. The macronucleus is long and band-shaped; a small micronucleus is placed near it. Delicate "myophan" striations radiate from the attachment of the body to the stalk. *Vorticella* is exceeding sensitive, and retracts itself immediately when irritated, and often without any apparent irritation. This retraction is brought about as follows: the muscular band in the stalk mentioned above contracts and draws the stalk down into a tight and regular spiral; the disc is drawn in and the peristome is drawn up over it, all round, so as to completely cover it up and to shut the aperture of vestibule. These sudden contractions are very inconvenient to the microscopist, as the expansion is a comparatively slow process. I have come across *Vorticellae* which seemed to be in a perpetual state of expansion or contraction. They were most distracting.

The reproduction takes place by oblique fission. Under ordinary circumstances, the products of fission consist of a sessile individual and a free-swimming individual. The former resembles the mother animal; the latter is like it also in general structure, but has no stalk, and is girded round its aboral end with a circlet of swimming cilia. When swimming about it keeps its mouth shut, that is to say, the disc is retracted and the peristome drawn over; it can thus take in no nourishment. It soon settles down on its aboral surface, loses its swimming cilia, and develops a stalk, opens its mouth to take in food, and becomes in fact an ordinary *Vorticella* like its parent. In some cases I have observed two free-swimming individuals to result from oblique fission. Conjugation takes place in a peculiar way: an individual divides into two halves, one of these remains on the stalk, the other divides again into from two to eight daughter cells, which resemble in structure the free-swimming form produced by ordinary fission, but are much smaller. These daughter cells swim freely till they come to an ordinary sessile individual, with which they pair. The product of fusion divides immediately, and its activity is in all respects increased.

There are numerous species known of the genus *Vorticella* which agree pretty well with the generic description given above. Three species will be found mentioned here.

Vorticella alba de Fromentel.—The body of this species is about one and a-half times as long as broad. The surface is not marked by any striae. The protoplasm is remarkably clear. The length of the body is about 70 microns; the stalk is about three to five times this length.

I have found this form living in aquatic plants and have also obtained some specimens on *Cyclops*.

Vorticella microstoma Ehrenberg.—The body is very variable, but is generally much the shape of *V. alba*. The cuticle is marked with transverse striae; the stalk runs into a kind of sheath of body substance; the pharynx is longer than usual. The length of the body is from 30 to 100 microns. The stalk is from two to six times as long as this.

The animal may be found growing on weeds in fresh water.

Vorticella nutans Müller.—The peristome in this species is everted, and separated by a constriction from the rest of the body. The cuticle is smooth.

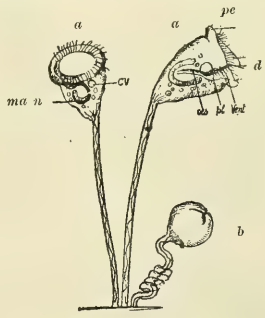


Fig. 36.—*Vorticella nutans.*

pe, peristome; *d*, ciliary disc; *vent*, vestibulum; *ph*, pharynx; *oes*, oesophagus; lettering otherwise the same as in the preceding figure; *aa*, are expanded individuals from two points of view; *b*, a contracted individual.

The body is usually not held in the same straight line as the stalk, but makes an angle with it; to this fact the specific name is due. The length of the body is from 75 to 90 microns. The stalk is three or four times this length.

The animal may usually be found in large clusters growing on algae in stagnant water.

Zoothamnium affine Stein is a colonial form closely allied to *Vorticella*. It consists of a number of individuals, rarely exceeding four,

Fig. 37.—A small colony of *Zoothamnium affine*. Consisting of two individuals. One is shown expanded, the other contracted.

arranged on a dichotomously branching stalk. The individuals are ovate in shape, about one and a-half to twice as long as broad, resembling structurally a *Vorticella* with an exceedingly thick peristome. The stalk is highly retractile and has a muscle band running continuously through it. It is very thick and its surface is marked with a number of transverse folds. The length of the body is about 90 microns. The stalk is twice or three times this length.

Colonies of *Zoothamnium* often infest the legs of *Gammarus pulex*. I have found them in this position on specimens of *Gammarus* taken near Oxford.

Epistylis anastatica Linnæus.—The genus *Epistylis* is also colonial. It differs from *Zoothamnium* in

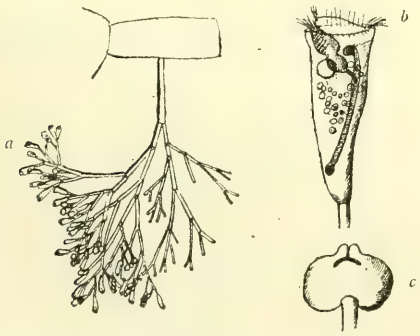


Fig. 38.—*Epistylis anastatica*.
a, a colony. One half of the colony is shown bare of individuals; *b*, individual expanded; *c*, contracted individual.

the nature of the stalk, which is non-retractile in the former and retractile in the latter. The colonies of *E. anastatica* consist, when fairly old, of a large number, usually from one hundred to two hundred, of individuals growing on a dichotomously branched stalk; the primary branches of this are greater in diameter than the secondary branches, and the secondary than the tertiary, and so on. Each individual resembles *Vorticella* fairly well in general structure. The body is sub-conical when fully expanded, and three or four times as long as broad. It is very retractile, and is drawn back and shut up into a sub-spherical body whose diameter is about one third of the length of the expanded individual. The cuticular surface is marked, particularly distinctly in individuals of young colonies, with transverse striae set closely together. The macronucleus is very long and band-like, stretching almost throughout the whole animal, the micronucleus is small and lies by it. The length of the body when expanded is from 80 to about 130 microns.

I have found this species to occur in great profusion on *Cyclops*. It can be easily recognised with the naked eye.

I cannot conclude this series of articles without acknowledging an obligation to Mr. Saville Kent's monumental work "The Manual of the Infusoria." The existence of a treatise so useful to all interested in Protozoa is admirable, and the fact that it is written in English adds to its value among workers speaking that language.

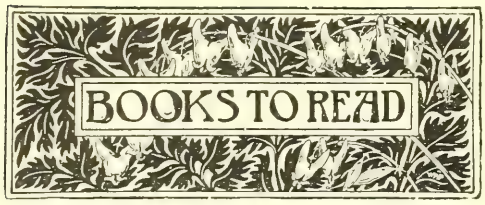
New College, Oxford.

Permanent Stain for Starch.—Mr. J. H Schaffner, writing in the "Journal of Applied Microscopy," states that a good and durable stain for starch may be obtained by the use of aniline-safranine and gentian-violet. (1) Aniline-safranine: alcoholic fifty per cent. solution prepared by combining equal parts of aniline water and a saturated alcoholic ninety-five per cent. solution of safranine. (2) Gentian-violet: a two per cent. aqueous solution. Stain from two to four hours in the safranine, and from two to eight minutes in the gentian-violet. The slide should be taken through the alcohols quite rapidly, or too much of the stains will be washed out. Mr. Schaffner has tried this on several kinds of starch, always with good results. Some slides with sections of the corms of *Erythronium*, which were stained over two years ago, are still of the same colour and intensity as they were the day they were mounted. The stain is a clear purplish red, and makes a good object for demonstration purposes. Paraffin sections of the young corms of *Erythronium* are especially favourable objects for showing the position of starch in cells, and by using the above method of staining the cells will look perfectly clear filled with the coloured starch grains.

MEDICAL IMPORTANCE OF BRITISH PLANTS.—At the meeting of Section D. of the Leicester Literary and Philosophical Society, held October 19th, 1898, Mr. Mott exhibited *Ricciocarpus natans* var. *Serrestris*, a rather rare hepatic, in fact not found before in the county; and Miss Hottinger, having showed many interesting dried plants, Dr. Charles Lakin, L.R.C.P., read a very instructive paper on "The Medicinal Plants of Leicestershire." He said Nature prepares in her own laboratory medicines of the greatest use and importance, and those are growing at our doors which, though so very simple, did we but know their use, would relieve many a sick bed and soothe many a wearied sufferer to sleep. The common monk's-hood (*Aconitum napellus*) is applied extensively to relieve neuralgic pain. Black and white mustard (*Brassica nigra* and *B. alba*), although found in the wild state, are also cultivated for commercial and official purposes, the black mustard yielding by its seeds the condiment of our tables. They can be used as safe emetics, stimulants and counter irritants. The horse-radish (*Cochlearia armoraceae*), another cruciferous plant, is valuable in cases of rheumatism, scurvy, neuralgia, loss of voice and relaxed throat. Linseed (*Linum usitatissimum*) is largely cultivated, and the fibre of the bark is spun into yarn. The water in which it is soaked is poisonous, so that Henry VIII. prohibited the washing of flax in any running stream. The seeds are used for poultices; the oil, together with lime-water, is called carron oil, and is largely used for burns. Hemlock (*Conium maculatum*), a poisonous plant, good as a fomentation. It powerfully depresses the functional activity of all the motor nerves of the body. Used in cases of epilepsy and asthma. Elder-flower (*Sambucus niger*), so common round old cottages, is much used as a fomentation, especially in cases of erysipelas, and also taken internally for this and chest affections. Valerian (*Valeria officinalis*) is used largely as a nervine and a stimulant, as well as camomile (*Anthemis nobilis*), which is used very largely by the general public. Dandelion (*Taraxacum officinale*) is composed of taraxcine, gluten, ataraxcerine, with enulin, albumen, potash and an odorous resin. The action is upon the liver and kidneys. The deadly night-shade (*Atropa belladonna*), so dreaded by many people, the fruit being known in Devon as the devil's cherries, yields atropine and hyoscyamine from all its parts, which acts upon the brain, throat and bladder; a very similar action is produced by black henbane. The thorn-apple (*Datura stramonium*), although a native of America, is said to have been found in the Loughboro' district,—the leaves are very poisonous. In their composition the chief constituent is daturine (·02–·03 per cent) an alkaloid in crystals, resembling atropine. It is closely allied to hyosycamine, some consider that the two are identical, and is valuable in cases of asthma to relieve the spasm of the bronchial tubes. The foxglove (*Digitalis purpurea*), called by the Irish "the great-herb," by the Scotch "the dead men's bells," and by the Welsh "goblin gloves," is useful chiefly for its action upon the heart and kidneys. Several kinds of mints have been used medicinally from the earliest times, such as basil, ground-ivy, horehound, marjoram, penny-royal, peppermint, sage, thyme, etc. The leaves and stem of peppermint (*Mentha piperita*), exhale a powerful and refreshing aroma. The plant is common in damp places. Its essential oil owes its virtues to the menthol or mint-camphor which it contains. *Athyrium filix-mas*, the common shield-fern, is a specific remedy in tape-worm. The seeds of the common juniper are also useful in certain cases. Besides the foregoing, which have received the orthodox stamp, there are numerous others that have not. Unfortunately, they are not known so well now, or they might, perhaps, be used for the benefit of many sufferers.—(*Miss*) *Read* (*Hon. Sec. Section D*), *Westcotes Drive, Leicester.*

DOG-HEATHER.—It is not, perhaps, known in scientific circles that the dog-heather, as it is here called, or ling (*Calluna vulgaris*), is in best form for food of herb-eating animals during autumn and to past mid-winter. It becomes dry, with little apparent nourishment in it, towards March and April, and only commences to produce young shoots in the early summer. Flowering in August, with a suitable season, it forms a great hunting-ground for bees, excellent honey being derived from it. The proper flowering is a comparatively delicate process, a cold gale of wind, extreme drought or heavy rainfall will each destroy its honey-giving powers. Sometimes splendid looking bloom yields little honey. It is after the blossom fades that the plants begin to be most nutritious, as a rich growth then commences when the conditions are favourable. Some herbivorous animals become very fond of it when the faded flowers still cling to the plants. Generally it is preferred with a certain amount of atmospheric moisture upon it, as often happens at that stage of its annual development. It then forms good food, especially during snowstorms, and doubtless performs a valuable part as one of the food-plants of various wild and domesticated animals.—*W. Wilson, Alford, Aberdeenshire.*

A TAME ROBIN.—For the past three winters a robin has spent much of his time within our house, where he is a welcome guest, though untrained and uninvited. From the first day he hopped in, there was never any shyness. His earliest visit might have been his fiftieth, so familiar his bearing when hopping about the floor, picking up crumbs scattered for him. He even rested on the fender to enjoy the heat of the fire. Save on occasions of exceptionally warm or moist weather, the visits are daily. With amusing dignity and appearance of importance, he slowly investigates the room and mounts my breakfast table. There he will peck at the loaf, and actually try to drag the bacon from my plate whilst I am eating. When prevented, he stands patiently by until small pieces are cut up and placed on the edge of the plate. These he eats with relish. If he sees preparations for dinner, this robin enters with alacrity and feeds readily from my hand or drinks from its palm. Much as he has tried, he has never been able to induce another robin to accompany him into the house, though they sing to each other through the open casement. He is at my elbow as I write, and answers to his name as well as any domestic pet. Each evening he goes out to roost, and never sleeps in the house.—*(Miss) S. J. Hall, Whiston, Cheadle, Staffordshire.*



NOTICES BY JOHN T. CARRINGTON.

The Observer's Atlas of the Heavens. By WILLIAM PECK, F.R.A.S., F.R.S.E. $17\frac{1}{4}$ in. × $13\frac{3}{4}$ in. (London: Gall and Inglis, 1898.) 21s. net.

This fine stellar atlas contains thirty large maps on scale of about 5° to the inch, showing 9,000 objects accurately placed. There are also diagrams of 1,020 double stars, with a catalogue of them. Likewise catalogues of 580 stars down to 4·5′ magnitude, 186 clusters and nebulae, and 159 variable stars. A chart of the moon extends to eleven inches in diameter. It is explained by a reference list of most of its objects with diameters and areas. Additional charts are given, two containing twelve diagrams for the northern and a like number for the southern heavens, showing the principal stars at any time visible. Much other useful information will be found, including the radiants of several of the meteor showers, marked on the star charts. This atlas forms a good addition to an observer's library.

The Microscope: Its History, Construction and Application. By JABEZ HOGG, M.R.C.S., F.R.M.S. xxiv. + 704 pp. 9 in. × $6\frac{1}{4}$ in., with 20 plates and 447 illustrations. (London and New York: George Routledge & Sons, Ltd., 1898). 10s. 6d.

The fifteenth edition of this, probably the most popular of all books on the microscope, has just been issued. It has been "reconstructed, re-written, revised and enlarged throughout." The illustrations, including those on the various coloured and plain plates, now extend to no less than upwards of 900. Originally published in 1854, this remarkable work has held its place and its popularity, and kept pace with the application of the microscope to high science and research, with consequent benefit to mankind. The historical progress of this instrument forms a leading feature of Mr. Hogg's manual, which is useful as well as interesting to the curious. A new feature is the enlargement of the pages. There is in this edition an appendix introducing a selection of "Formulae and Methods" of staining and mounting; also tables of the metric system of measurements. Dr. Edgar Crookshank has dealt with bacteriology, and economic botany is on the authority of Prof. Marshall Ward, F.R.S. The author is to be congratulated on sixty years' faithful attachment to his early love—"The Microscope"—and on his new edition, which is brought up to July of last year.

An Atlas of Bacteriology. By CHAS. SLATER, M.A., M.B., M.R.C.S. Eng., F.C.S., and EDMUND J. SPITTA, L.R.C.P. Lond., F.R.A.S. xiv. + 120 pp. 9 in. × $6\frac{3}{4}$ in., with 111 illustrations. (London: The Scientific Press, 1898.) 7s. 6d. net.

This work consists of 111 splendidly-executed and reproduced original micro-photographs of bacteriological subjects, with explanatory text. It is, we believe, the first book giving detailed life-histories of the various disease-producing bacteria that has yet been published at a price within the reach of ordinary medical practitioners and students of the subject. Every care has been exercised in the preparation of the illustrations; these, with very few exceptions, have been taken from original material in the laboratory of St. George's Hospital, in London. A valuable feature of the book is a practical introduction to photography of bacilli and their allies. This is followed by a short account of the science of bacteriology, that renders easy the future study of these organisms. Some of the species illustrated are the bacteria of anthrax, tuberculosis, leprosy, glanders, typhus, pneumonia, diphtheria, Asiatic cholera, bubonic plague, tetanus, malarial fever, and many others.

Applied Geology. By J. V. ELSDEN, B.Sc. Part i. vii. + 96 pp. $8\frac{1}{2}$ in. × $5\frac{1}{2}$ in., with 57 illustrations. (The Quarry Publishing Company, Ltd., 1898.) 5s.

The chapters constituting this work are largely of a technical character, and refer to obtaining mineral materials which can be applied in the service of man for building purposes. They have already appeared in the "Quarry," a well-known journal devoted to the interests of those connected with quarrying. The reprint is only a part of the series, and is to be followed by a further instalment. This part deals chiefly with irregular strata, and sets forth certain probabilities and rules for action under specified circumstances. The geologist will not find this work appeal to him so directly as to the employer of capital and labour in quarrying earthy minerals, where knowledge of strata and geology, applied in that direction, means the economic use of his resources.

An Introduction to Practical Physics. By D. RINTOUL, M.A. x. + 168 pp. 7 in. × $4\frac{3}{4}$ in., with 81 illustrations. (London and New York: Macmillan and Co., 1898.) 2s. 6d.

This is quite an elementary work for use in schools, and is based on laboratory work by the author, whilst teaching the subject in Clifton College. Part i. deals with Mensuration and Hydrostatics, which are illustrated by forty experiments. Part ii. is devoted to Heat, exemplified by thirty-six experiments. Part iii. is occupied by Dynamics and thirty-eight experiments. The demonstrations are simple, but effective, and lead the young student on step by step, until he can attain greater things.

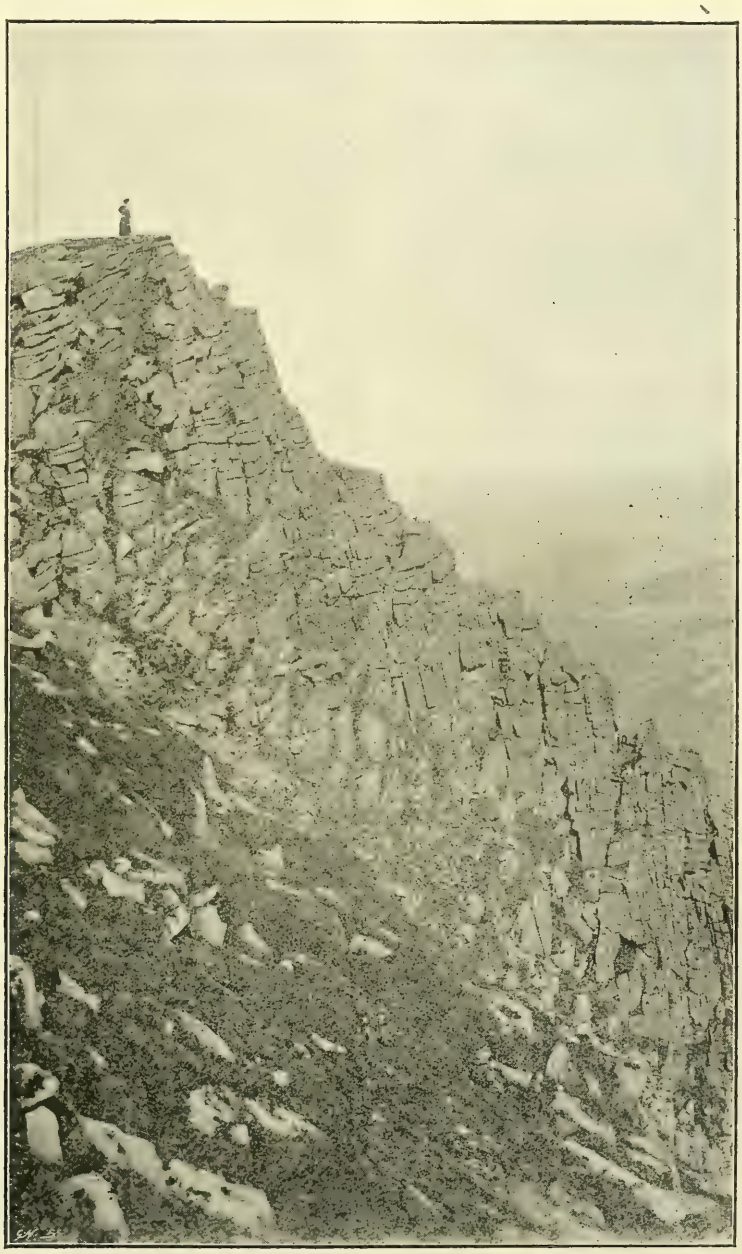
A Study in Philology. By ERNEST PEARSON. viii. + 115 pp. $7\frac{1}{2}$ × 5 in. (London: Kegan Paul, Trench, Trübner & Co., Ltd., 1899.) 3s. 6d.

Although the author claims as the only correct solution of the origin of human languages the Biblical story of a first single language, and then its splitting into a confusion of tongues by the divine miracle of Babel, the student of words will find much of interest in Mr. Ernest Pearson's little book.

Earth Sculpture, or the Origin of Land-Forms. By JAMES GEIKIE, LL.D., D.C.L., F.R.S., etc. vi. + 320 pp. $8\frac{1}{2}$ in. × 6 in., with 2 plates and 89 sketches in text. (London: John Murray, 1898.) 6s.

Professor Geikie's contribution to "The Progressive Science Series," of which this book is one, forms a valuable text-book on the causes that have formed the surface of the earth into what we call landscape. There has been much written on this section of geology in latter times, and it is one that has commanded public attention to a greater extent than any other branch of that science. Popular education having advanced in latter years, people are no longer satisfied with a mere passing remark to the effect that they supposed the scenery around them was always

so; but have begun to enquire into the causes of its local formation. That this is the tendency is shown by the dozen or more books recently published on the subject, nearly all by men of importance in the ranks of science. The author of this work has produced a treatise so plainly written that it is within the comprehension of the least informed in geological science, but one that clearly explains the cause of nearly every land formation to be met by the reader. His explanations are lucid, and, with the diagrammatic illustrations, show at once how any scenery has come to assume its particular form. By permission of Mr. John Murray, we reproduce one of the plates from this work showing the joints of granite where it has been weathered in Scotland. This is an excellent book for both public and private libraries.



JOINTS IN GRANITE, CAIRNGORM MOUNTAIN, SCOTLAND. (*From Geikie's "Earth Sculpture."*)

SCIENCE GOSSIP

A REPRINT from the "Journal of the Quekett Microscopical Club," vol. vii. November, 1898, of a paper by Mr. J. E. Lord, of Rawtenstall, describes two new rotifers, viz., *Taphrocampa nitida* Lord, and *Callidina cataracta* Lord, both being British. They are illustrated.

MISS KATE M. HALL, the Curator, desires us to call attention to the efforts being made to establish a museum of natural science objects in connection with the Whitechapel Free Public Library, London, E. A considerable number of specimens have been given in various orders, but further assistance is needed.

THE Geologists' Association of London has an arrangement with Messrs. Adams and Co., 26, Charing Cross Road, for the reproduction of photographs of geological sections. The original photographers may have special reprints at almost cost price. This should encourage the photographic record of local geological features.

BIRDS are curiously losing their timidity in London. At noon on February 16th, a hawk, probably a sparrow-hawk, swept down among the pigeons feeding on the pavement in front of the Guildhall and carried away one of them. This, as the "Evening Standard" points out in noting the fact, occurred in the presence of a number of persons, some of whom were feeding the pigeons according to custom, and before "several constables," as that paper innocently remarked.

WE are glad to find the "Spectator" has taken up the subject of preserving the New Forest from the ravages proposed by those into whose hands the country placed the property when it was secured as a National Park.

THE Commissioners of Woods and Forests administer this magnificent tract of woodland and wilderness on behalf of the nation, and now it appears that certain interested parties, with the sanction of the Commissioners and Verderers, are promoting a Bill in Parliament, to enable the Commissioners to give or sell land in the New Forest for sewage farms, cemeteries, waterworks, gasworks, schools, infectious hospitals, private roads to building sites, and other abominations. All interested in this lovely sanctuary of wild-life should raise a voice in protest against such iniquity. It was hard enough to secure the Forest, let us keep it in its wild condition.

BY the death of Dr. William Rutherford at Edinburgh, on February 21st, science has lost one of her staunchest devotees, and the professorship of Physiology in the University of that city is vacated. One of the most earnest of men, he spared no pains to keep himself abreast with the latest strides of research and most recent advances in science, so that his lectures might be of the utmost value to the students attending. So greatly was this appreciated, that on the day of his demise a meeting of students was held, when a resolution was passed expressing their sense of the deep loss sustained by the death of their distinguished teacher.

PHYSICS

CONDUCTED BY JAMES QUICK.

A SIMPLE VOLUMENOMETER. — In practical physics classes the need is continually felt of simple apparatus that will demonstrate the law or principle involved and at the same time give good quantitative results. An interesting and at the same time useful arrangement for measuring volumes of solids and arriving at their specific gravities, was shown recently by Mr. H. Wigley at the Teachers' Conference at Chelsea. It consists of a tin can, on the edge of which is soldered a tube for a cork to fit. Through a horizontal hole in this cork passes one limb of a right-angled glass tube, the vertical limb of which is drawn out to a point, dipping down inside the can. To the horizontal end of this tube is connected, by means of a short piece of rubber tubing, a similar tube, also with its vertical limb drawn out to a point. The two tubes therefore form an inverted U tube, one limb of which is inside the vessel, the other outside. The outside limb being longer than the inside, the U tube acts as a syphon, and one which will always keep full when once filled. Water is poured into the vessel, the syphon of course always bringing it to the same level, viz., that of the point of the inside limb. Any body whose volume is required is then lowered into the can, and its own volume of water, which overflows, is measured in a burette or by any other convenient method. Without taking this body out again another may be inserted and its volume measured, and so on. Five or six measurements can thus be made in about fifteen minutes. Results obtained by this arrangement show errors less than half per cent.

PHYSICAL SOCIETY.—At the annual general meeting of the Physical Society on February 10th, Professor Oliver J. Lodge was elected president, Mr. Shelford Bidwell vacating the chair. In reading his presidential address, Dr. Lodge deplored the fact that many physics teachers have an antipathy to call in the aid of mathematics to their physics teaching. If the teacher has an aversion to mathematics, it will be unnatural for him to induce such an interest in the minds of his pupils. This is perfectly true, and he should, therefore, endeavour to equip them with a good reasoning power, but not, however, at the expense of practical work. The satisfactory strides that practical physics has made during the last decade must not be lost sight of, especially when one considers the commercial side of the question, and the number of openings held out to youths with experience in practical physics and electrical engineering.

LANGLEY'S BOLOMETER.—In the American "Journal of Science," No. 5, 1898, Dr. S. P. Langley describes some further modifications he has made to his bolometer. A metal case is added which is kept at a constant temperature. The instrument is also protected against earth tremors. It can be set to within a second of circular arc in the dark, and indicates a change of temperature less than one ten-millionth of a degree centigrade.

CONDUCTED BY FRANK C. DENNETT.

1899.	Mar.	Rises. h.m.	Sets. h.m.	Position at Noon. R.A. h.m.	Dec.
Sun	8	6.32 a.m.	5.50 p.m.	23.15	4° 51′ S.
	18	6.10	6.7	23.52	0° 55′
	28	5.46	6.24	0.28	3° 1′ N.

	Mar.	Rises. h.m.	Souths. h.m.	Sets. h.m.	Age at Noon. d. h. m.
Moon	8	4.37 a.m.	9.3 a.m.	1.39 p.m.	26 2 28
	18	9 13	5.47 p.m.	1.31 a.m.	6 16 7
	28	8.27 p.m.	0.31 a.m.	5.37	16 16 7

	Mar.	Souths. h.m.	Semi Diameter.	Position at Noon. R.A. h.m.	Dec.
Mercury	8	0.42 p.m.	2″ 6	23.46	2° 21′ S.
	18	1.7	3″ 1	0.51	6° 39′ N.
	28	1.7	4″ 1	1.30	12° 36′
Venus	8	9.14 a.m.	9″ 7	20.18	18° 13′ S.
	18	9 21	8″ 9	21.5	16° 4′
	28	9.28	8″ 2	21.51	13° 9′
Mars	8	8 23 p.m.	5″ 2	7.28	25° 20′ N.
	18	7.51	4″ 7	7.35	24° 47′
	28	7.22	4″ 3	7.45	24° 5′
Jupiter	18	2.48 a.m.	19″ 6	14.30	13° 18′ S.
Saturn	18	5.50	7″ 7	17.32	21° 51′ S.
Uranus	18	4.43	1″ 8	16.25	21° 33′ S.
Neptune	18	5.41 p.m.	1″ 3	5.26	21° 55′ N.

MOON'S PHASES.

		h.m.			h.m.
3rd Qr.	Mar. 5	4.7 a.m.	*New*	Mar. 11	7.53 p.m.
1st Qr.	,, 19	3.24 a.m.	*Full*	,, 27	6.18 a.m.

In perigee March 9th, at 10 p.m., distant 225,100 miles; and in apogee on 21st, at 7 p.m., distant 251,600 miles.

CONJUNCTIONS OF PLANETS WITH THE MOON.

Mar. 2	Jupiter†	6 p.m.	planet	5° 45′ N.
5	Saturn†	7 p.m.	,,	2° 33′ N.
8	Venus*†	2 p.m.	,,	0° 56′ S.
12	Mercury†	9 p.m.	,,	5° 30′ S.
21	Mars†	5 a.m.	,,	4° 39′ N.
29	Jupiter†	9 p.m.	,,	5° 44′ N.

* Daylight. † Below English horizon.

OCCULTATIONS:

Mar.	Star.	Magnitude.	Disappears. h.m.	Angle from Vertex.	Reappears. h.m.	Angle from Vertex.
20	56 Geminorum	5	5.32 p.m.	152°	6.50 p.m.	275°
26	*e* Leonis	5.1	4.52 a.m.	52°	5.45 a.m.†	277°

THE SUN is seldom quite free from spots, but frequently they are very small. At 8 p.m. on the 20th the Sun enters Aries, and spring is said to commence.

MERCURY is an evening star all the month, reaching its greatest elongation (18° 36′) east at 11 p.m. on the 24th, at which time it does not set until nearly two hours after the sun. Its path lies almost wholly through the southern portion of the constellation Pisces.

VENUS is brilliant in the south-eastern heavens in the early morning, rising, in the middle of the month, about a quarter to five. It is in Sagittarius at the beginning of the month, but soon travels into Capricornus; is a little south of β, a wide-double 3rd-magnitude star, on the 8th, and reaches Aquarius at the end of March.

MARS is rapidly decreasing in apparent diameter, but is in good position all the evening. Situated in Gemini he traverses a short path near the 4th-magnitude, double star κ, and is closely north of it about the 20th and 21st. Its northern polar cap may be readily seen with a very small instrument.

JUPITER travels along a short retrograde path a little north-west of the 3rd-magnitude, widely-double star α Librae. It rises about 11 p.m. at the beginning of the month, and at the end rather over two hours earlier.

SATURN is a little east of the 4th-magnitude ξ Ophiuchi all through March, but does not rise until just before 1 at the end of the month.

URANUS precedes Saturn by about one hour, being near the 5th-magnitude star ω Ophiuchi.

NEPTUNE, from its high declination north, may still be observed.

METEORS should be especially looked for during the first five days of March and about the 24th.

HAMBURG OBSERVATORY.—Owing to ill-health, Professor G. Rümker has had to resign the directorate, and will be succeeded by Professor E. Küstner, who, since 1891, has been Director of Bonn Observatory.

VATICAN OBSERVATORY has a new director in Father Rodriguez de Prada.

HERR WITT'S PLANET is to be known as Eros. The photographic plates at Harvard have been so successfully searched that this tiny planet has been found on some taken so far back as December, 1893. These have enabled Professor S. C. Chandler even more accurately to determine the elements of its orbit. Its period is 643·1 days; its mean distance from the sun is 1·4581 that of the earth. As its eccentricity is 0·223, its distance varies between 1·13334 and 1·78286, and its nearest approach to our earth 0·133, or about 12 millions of miles. The next opposition as favourable as 1894 will be in 1931. Until then that of 1900 will be the best.

THE ROYAL ASTRONOMICAL SOCIETY is to have Professor George Howard Darwin, M.A., F.R.S., LL.D., D.Sc., second son of Charles Darwin, for its President. Mr. F. W. Dyson, M.A., of the Royal Observatory, is to be the Secretary. Its gold medal has been awarded to Mr. Frank McClean for his photographic survey of stars in both hemispheres, as well as other work.

UNIVERSITY OF ABERDEEN.—A retired schoolmaster, Rev. G. Proctor, has bequeathed £3,000 as a contribution towards the erection of an observatory for King's College, Aberdeen.

PEGASI.—η Pegasi, a star of 3·1 magnitude, is situated R.A. 22h. 38m., N. Dec. 29° 41′, in other words, about 6° north-west of the top right-hand corner of the "square of Pegasus." In 1897 Professor Campbell found this object approaching the sun at a mean rate of 4·3 kilometres per second, whilst in 1898 it was receding 16·2 kilometres in the same time. Herr Belopolsky, of Pulkova, corroborates these determinations very closely, making the two speeds 4·8 and 16·9 kilometres respectively.

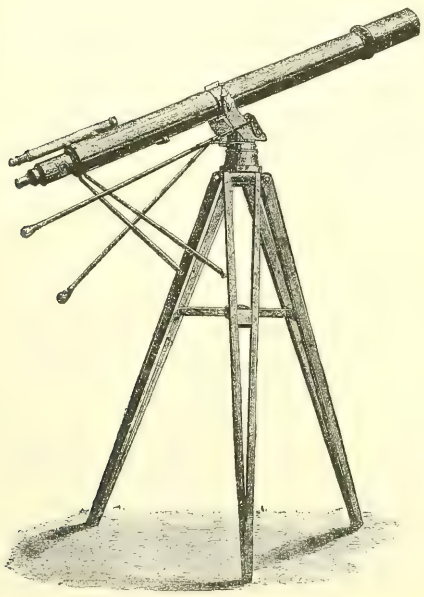
SPECTRUM OF THE CORONA.—The wave length of the coronal line known as 1,474K has usually been given as 5316·79. Mr. Fowler has, however, been investigating the photographs taken by himself and Mr. Shackleton, and believes its wave length is really 5,303·7, or slightly more refrangible than was supposed. Sir Norman Lockyer, on November 24th, read the paper before the Royal Society, and said these results must not be regarded as final.

CHAPTERS FOR YOUNG ASTRONOMERS.

By Frank C. Dennett.

CHOICE OF A TELESCOPE.

In selecting a telescope the chief essential is decidedly quality rather than quantity. A perfect instrument always gives pleasure, whilst an inferior one, notwithstanding the wonders it will bring to view, frequently causes vexation. The first thing to claim attention must necessarily be the optical instrument itself. Telescopes are divided into two classes, refractors and reflectors. Refractors have the light condensed by an object-glass, which, of course, should be achromatic, forming at its focus an image of the object to which it is directed, that image being magnified by an eyepiece. Reflectors accomplish the same

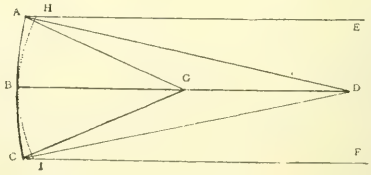


Alt-Azimuth Stand.
(*Designed by T. Cooke and Sons, Limited. York.*)

result by reflecting the light from a mirror ground to a perfect parabolic curve. These mirrors are now almost always made of glass, the top surface having a thin film of pure silver laid on by a chemical process, which may be renewed when necessary at a small expenditure of money.

For telescopes up to four inches aperture, as the effective diameter of the objective is called, there is no choice as to the kind of instrument, because reflectors are not usually, or usefully, made less than four and a-half or five inches in diameter. Even so small a telescope as two inches is not to be despised if of good quality. With one no larger, and even of inferior quality, Harding, of Lilienthal, Schrœter's assistant, discovered the minor planet Juno, whilst with an exceptionally good one, Grover has caught the principal division of Saturn's ring. If the objective is good, every increase in size, when the air is steady, means an increase in the defining power as well as the light-grasping power of the telescope. Nearly all so-called achromatic telescopes, however, have this drawback: that the colour correction is not perfect, as there is a fringe of outstanding colour around bright objects. This fringe in good instruments appears blue, and in poor ones yellow or red. This is a fault much aggravated in large instruments. Reflectors are, however, free from this defect, there being no chromatic dispersion accompanying reflection. The new object-glasses made by Cooke, of York, under H. D. Taylor's patent, are said to be perfect in this respect, but their price is perhaps somewhat expensive for the ordinary student. If a telescope is good it should separate double stars of about sixth magnitude, whose distance apart is equal to $4''\cdot56$ divided by the diameter of the object glass or mirror. Thus a three-inch object-glass should on a favourable night divide a pair whose distance apart is $4''\cdot56 \div 3 = 1''\cdot52$. The reason for this is that although stars have no real angular diameter as seen from the earth, yet they have, from the very nature of light, a spurious disc, which, with a one-inch object-glass, is apparently $4''\cdot56$ in diameter, and with a two-inch $2''\cdot28$. The greater the diameter of the glass, the smaller that of the apparent star disc. As seen with a moderate power, this little disc appears surrounded by one or two thin diffraction rings.

If possible, choose a telescope of comparatively long focus, for the longer the focus of the objective the higher is the magnifying power with a given eyepiece. Thus if a given object-glass has a focus of thirty-six inches, an eyepiece having a focus of one inch would give a magnifying power of thirty-six diameters. If, however, the focus were fifty-four inches, the amplifying power would be fifty-four with the same eyepiece. This is a factor much felt when the endeavour is made to use high powers. There is rather a tendency of late years to reduce the focal length as much as possible, but this should not be encouraged. The accompanying diagram will readily show the reason. If A B C be a mirror whose centre of curvature is D, parallel rays of light as E A and F C falling upon it will be reflected to a focus at G, just midway between B and D. The rays reflected from the edges of the mirror will have a longer focus than those reflected from near the centre, because a circle drawn around the centre G, at the distance G B, cuts through A G and C C, as is shown by the dotted segment H B I. The practical consequence of this is that the rays from



the outer zones of the mirror form a larger focal image of the object under examination than do those from the centre. This effect is not felt when stars are being observed, but in the case of the planets it means a blurring of fine details, a delicate black division, say, on Saturn's ring, becoming only like a pencil mark, if indeed it is not blotted out altogether. This has been illustrated in the case of a mirror because it is so self-evident, but the result is enhanced in an object-glass. I believe Professor Schaeberle was the

first to call attention to this effect, owing to the appearance of Saturn in the three-foot mirror presented by Mr. Edward Crossley to the Lick Observatory. A reflector should have a focal length twelve or fourteen times as great as its diameter, and an object-glass from fifteen to eighteen times as great as its focal length, if the very finest work is to be got from it on objects having an appreciable diameter.

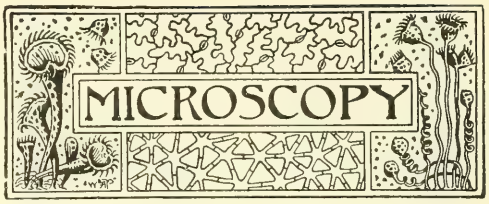
It is most desirable to have rack adjustment to the eyepieces. Some of the poorer object-glasses have a stop in the tube which cuts off the outer portions of the glass from doing service. In buying a telescope choose a good two and a-quarter inch rather than a poor three-inch, but, consistently with quality, get as large an instrument as you can. For large sizes choose the Newtonian reflector rather than the object-glass, because it is equal in definition, superior in purity of colour, much cheaper, and at the same time far more comfortable to use. This is because, with the Newtonian, the observer is looking straight before him, even when the object is near the zenith, whilst with a refractor one has to lie on one's back or crane the neck in a most uncomfortable manner. It is well to have a good selection of eyepieces if possible. One of 30 or 40 diameters with a large field of view, as the width of sky visible is termed, one of 60 or 70, one 110 to 120, one of 180, and so on, according to the size of the telescope.

(*To be continued.*)

Galileo's Treatise on the Tides.—The Abbé Cozza Luzzi has had the good fortune to discover, in the Vatican library, a manuscript, hitherto only known as N. 8193, which proves to be Galileo Galilei's own manuscript treatise on the tides. It ends thus: "Written in Rome, in the Medici Gardens, on January 8, 1616." It was dedicated to his admirer, Cardinal Orsino and Maecenas. The Pope, Leo XIII., has ordered the work to be published.

The Spectrum of the Great Nebula in Orion.—This, like the spectra of so many nebulae, consists of bright lines. There is the F line of hydrogen, known as H β, and two less refrangible lines, λ 5007 and λ 4959, only seen in nebulae. These lines are found by Professor J. E. Keeler, with the 36-inch Lick refractor, to vary in relative brightness in different parts of the nebula. Near a star marked 734 by Bond H β was the strongest line. The bright portion near the Trapezium was found to have the chief nebula line λ 5007 much the most intense, the other two being about equally bright. This seems to indicate differences in the composition of different parts of the nebula.

The Earth's Mass.—At the meeting of the British Astronomical Association, held at Sion College, on January 25th, Professor C. V. Boys read a most interesting paper on "The Determination of the Newtonian Constant of Gravitation," in which he described how he measured the mass of the earth. His value for this is 5·5270, water being 1·0. In other words, he makes the earth turn the scale at 5,882,064,000,000,000,000,000 tons, a result almost identical with that arrived at in a different manner by the Jesuit, Dr. C. Braun, at Mariaschein, in Bohemia, who, however, increased the fourth decimal figure from 0 to 3. The Professor hopes soon to visit the father, when he trusts that this tiny difference may be righted.



Departmental Editor.—The Editor of Science-Gossip desires to thank the numerous gentlemen who have, in reply to his invitation, so kindly volunteered to act as Honorary Departmental Editor for Microscopy in this Journal. They will in a short time receive individual replies, and it is expected that the new Departmental Editor for this section will soon be announced.

A Cheap Condenser.—A cheap and effective form of condenser may be made by taking a globular eight-ounce bottle with an enlarged neck and mouth, and filling it with filtered water. It should be well corked, and used in an inverted position. If filled with a solution of ammonio-sulphate of copper, it may be used in the place of the blue glass chimney and condensing lens.

Structure of the Paris Limestones.—The study of the microscopical structure of the rocks of the Paris Basin by means of thin sections, chemical analysis and comparison of insoluble residues, has enabled Dr. Lucien Cayeon to give to the scientific world a most valuable and instructive work bearing on the genesis and natural history of the sedimentary deposits from Jurassic to Eocene times. To the petrologist the results are invaluable. We cannot here do more than briefly refer to the general scope of the work; but for those who desire further information, we would recommend a perusal of the remarks of Dr. Hinde, in the October issue of the "Geological Magazine." The work is illustrated with beautifully executed lithographic plates of Radiolaria, enlarged sections of chalk, glauconite and other minerals.

Life Conditions of the Oyster.—We are indebted to the courtesy of Professor W. A. Herdman for a copy of the report of the Committee that was appointed to consider the elucidation of the life conditions of the oyster under normal and abnormal environment, including the effect of sewage matters and pathogenic organisms. This report was submitted at the last meeting of the British Association. The questions of the amount of copper and iron present in various kinds of oysters, and of the infection of shell-fish by typhoid-like organisms as well as the differentiation of these from the *Bacillus coli-communis* on the one hand and the true *B. typhosus* on the other, are fully described and discussed. The presence of colon-like organisms, in so many of the batches of oysters mussels, cockles, periwinkles and whelks that were examined, demonstrate the urgent need for some legislation regarding the importation, laying and growing of oysters, as well as periodical inspection of the beds by duly qualified scientific authorities. This colon group of bacilli is frequently found in "shell-fish" as sold in towns, especially in oysters, but there is no evidence that it occurs in Mollusca living in pure sea-water. Neither is there anything to show that the presence of the colon bacillus indicates sewage contamination. There is, therefore, much more work to be done in this direction, before the cause of the infection can be definitely established.

FRESHWATER MITES AND CORIXA.—On the 5th of May, 1898, I made an excursion to collect freshwater mites, and the day following, I found in the water brought home, *Corixa geoffroyi*, with a few of the larvae of some freshwater mites. These were tolerably advanced in growth, attached to the oar of the creature. They reminded me of the so-called *Aclysia dytisci*, figured and described by Mr. Ball in "The Journal of Microscopy and Natural Science" for October, 1885. I placed the *Corixa* in a small specimen jar, with pond water and a little weed and mud, and covered it over with a loosely-fitting piece of glass; previous experience having taught me that *Corixa* usually tries to escape. I had the satisfaction of finding that all went well, and on the 10th of May I noticed that one of the attached parasite skins had become lighter in colour, and flaccid, the contents having escaped. On further search I found a specimen of *Hydrachna globosa* De Geer swimming freely in the water. I had, of course, previously taken care that no water-mites were in the water of the jar. *Hydrachna globosa* is distinguished from other species of *Hydrachna* by two thickened portions of skin, one below each double eye. These are to be seen when the creature is alive, and are rather darker in colour than the rest of the skin; but after mounting in balsam, they become too transparent to be very well made out. On the 30th of May I found another *Hydrachna globosa* at liberty. I do not know exactly when it became free, as I did not examine the jar very frequently after the finding of the first *Hydrachna*. I have succeeded in obtaining from this one set of observations three useful and interesting slides: oar of *Corixa* with parasite attached; another being part of *Corixa* with the empty skin and head-part of larva attached after the escape of the nymph; the third being the escaped nymph. I trust that the publication of these observations may induce other observers of pond life to follow my example during the coming season, and publish the results in SCIENCE-GOSSIP. A very little trouble will insure accuracy, and the results may be valuable. Should there be any difficulty in making out the specific name of the mite produced, I shall be glad to endeavour to identify the specimen, if sent to me in a living state in a little water; and I have no doubt that Mr. Soar would be glad to do the same. In "The Illustrated Annual of Microscopy," 1898, I find a plate by Mr. Soar, giving a good drawing of leg of *Corixa*, with two parasites attached; also outline figures of *Hydrachna globosa*, *Hydrachna cruenta*, etc.—*C. F. George, Kirton-in-Lindsey; January 14th*, 1899.

THE SHEFFIELD MICROSCOPICAL SOCIETY.—The microscope in Medicine, and particularly in Bacteriology finds an enthusiastic advocate in Dr. Porter. In the course of his inaugural address to the Sheffield Society he laid great stress upon the necessity of forming local societies for microscopical research, and the benefit that members derived from them. One of these advantages was that it brought on common ground those who were interested in microscopical work of every kind—biological, chemical, botanical, mineralogical or medical. It facilitated the special work of each, and at the same time made those who were engaged in one branch of science acquainted with what other workers were doing, the use of the microscope being the point of contact. He referred to the immense possibilities of the application of the microscope to the science of bacteriology.

FOSSIL RADIOLARIA.—For some years past Dr. Rust has been at work on the Radiolaria of the Paleozoic, Jurassic and Cretaceous rocks. He has now contributed to the current issue of "Paleontographica," vol. xlv., an important addition to our knowledge concerning this group of organisms by revising his earlier monographs on the Radiolaria of the Secondary rocks, and thus furnishing us with a trustworthy standard of reference as to the character of the micro fauna of the beds in the Tyrol, Bavaria and northern Italy. His monograph is illustrated with some of the hundreds of microscopical sections which he has prepared of the nodules of silicious limestones from Cittiglio. The microscopical examination of these revealed no less than 212 new species.

SANTONINE CRYSTALS.—Of the many forms of crystals, there are few that surpass these for beauty and variety of design. If the microscopist carefully follows these directions, he will invariably succeed in producing a good slide. Make a cold dilute solution (one or two per cent.) in chloroform, drop on a cold slide, and heat rapidly over the flame of a spirit-lamp.—*Frederick Noad Clark, Paddington Infirmary, Harrow Road, London, W.*

PROGRESS IN MICRO-PHOTOGRAPHY.—Messrs. J. E. Barnard and T. A. B. Carver recently explained in "Nature" how they have overcome the difficulty experienced in micro-photography with high powers and critical illumination owing to the unequal intensity of the light emitted from the surface of the incandescent limes, or the impossibility of controlling the electric arc so as to maintain a constant position and condition of the crater on the positive carbon. The latter difficulty they have overcome by having a simple form of hand-feed apparatus, with a pin-hole camera attached, through which an image of the carbon-points is projected on to a ground-glass screen. With such a form of arc-lamps absolute "centration" of the light can be secured and maintained, without reference to the microscope, after the necessary position of the image of the arc on the screen of the pin-hole camera has been once obtained.

MICRO-PHOTOGRAPHY.—Where can I get instructions as to the best way of photographing whole insects mounted in balsam which are too large to be contained in the field of a microscope with low powers, such as a two-inch objective and B eyepiece?—*E. J. Wheeler, Alnwick Castle Estate Office, Northumberland.*

[We have invited Mr. Frederick Noad Clark, a most successful micro-photographer, to reply to this query. He says:—"To photograph insects and other objects (mounted transparent in balsam, etc.) which are too large to be contained in the field of a microscope with low powers, *e.g.*, a two-inch, I should recommend the use of a three- or four-inch objective. But if the object is too large for these, then use an ordinary photographic lens of wide angle in place of the micro-objective, and a camera having a long extension if necessary; or, better still, the new "Planar" lenses, by Ross, are particularly adapted for this class of work, using Nos. 1 to 8, according to the magnification desired. If a micro-objective is used, an eyepiece is unnecessary. Illumination is best effected by interposing a piece of ground glass between the bull's-eye condenser and the object."—*Frederick Noad Clark, Paddington Infirmary, Harrow Road, London, W.*]

LUMINOSITY IN ANIMALS.—One of the most curious phenomena of life is that faculty possessed by certain organisms of radiating into space, as luminous vibrations, a portion of the energy that animates them. In this respect insects take the first place, though this same photogenic power is found both in higher and lower orders of life. Professor Dubois has devoted much time to the study of the origin of physiological light, and he tells us that the luminosity of most of the so-called "luminous earths" is due to the presence of minute organisms, of which *Lipura noctiluca* is an instance. Fig. 1, the glowworm (*Lampyra noctiluca*) is a well-known example among the more highly organized insects. Before fecundation the photogenic property appears in the egg of the glowworm, even while it is contained in the ovary. At the moment of hatching, in the larva of the first stage, the luminous appearance shows itself in the form of two small, yellow ovoid bodies, situated on the sides of the penultimate ring, fig. 2. In the glowworms the light-producing power is not limited to the ovaries, as, when moulting, the entire hypoderm shows a feeble phosphorescence. Fig. 3 shows the location of the photogenic organ in the male *Lampyra*.

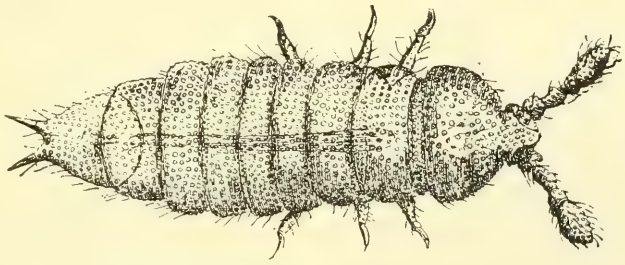


Fig. 1.—*Lipura noctiluca* (magnified 350 diameters).

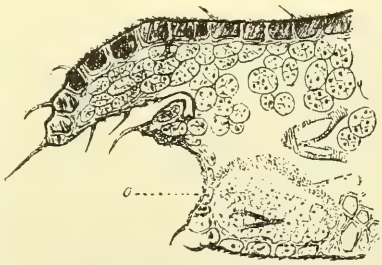


Fig. 3.—Section of the terminal portion of a male *Lampyra noctiluca*. *o*, Photogenic organ.

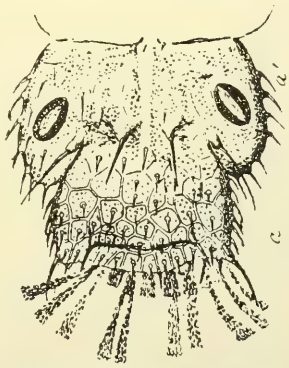


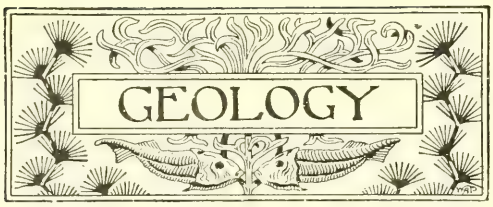
Fig. 2.—Larva of *Lampyra noctiluca* in its first stage: *a a'*, ultimate and penultimate segments. On the right the luminous organs can be seen, showing through. (Magnified 65 diameters.)

"MODERN MICROSCOPY" is the title of a very useful treatise on the microscope and microscopical technique, written by M. J. Cross and Martin J. Cole, and published in London by Bailliere Tindall and Cox. The main object of the book is to afford such information and advice as will assist the novice in choosing his microscope and accessories, and direct him in his initial acquaintance with the way to use it. It is not the novice only that will find this book of service. The second part will be found to be indispensable to the advanced worker by reason of the wealth of practical suggestions that it contains relating to laboratory work. Mr. Martin J. Cole treats this portion of his subject in a masterly manner, and in a course of fourteen lessons he takes the student through the various methods of preparing, staining, hardening and mounting which he himself has adopted in his ripe experience both as a worker and as a teacher. It is a book that every microscopist should possess.

SOME EASTERN PARASITES.—The genus *Filaria*, that of the threadworms, has been credited at different times, according to Dr. G. Archie Stockwell, with more than a score of species, many of which are due to error, and about all of the others there is much to learn. The most notable are the *Filaria sanguinis-hominis*, the *F. guinense*, and the *F. lota* or *F. conjunctiva*. The first-named, comparatively common in the Orient, reaches a length of three-fourths of an inch or more, and infests the circulation, being often unnoticed, but in numbers checking the flow of lymph and producing painful glandular enlargements, abscesses, etc. The Guinea worm, found not only in Africa but in the Philippines and even in the West Indies, resembles a horse-hair, often three or four feet long, penetrating the muscles and sometimes causing dangerous ulcerations. The *F. lota*, found only under the conjunctiva of the eye, is about an inch long, and, though an African worm, is not confined to negroes, as was formerly supposed. A white victim, an Englishwoman, discovered a *Filaria* in one eye through a pricking sensation, and afterwards noticed it wandering over the eye beneath the conjunctiva, raising a ridge as it passed, and even crossing the nose to the other eye, remaining always invisible during cold weather after the lady's return to England. It was finally removed from the left eye, much to the patient's relief.

PRESERVATION OF CRYSTALS.—To prevent the deliquescence of crystalline bodies in microscopical mounts they should be covered with a drop of castor oil and subjected to a gentle heat. If the cover-glass be then put on and sealed down the crystals will last for years.

UNMOUNTED MATERIAL. — Mr. W. West, of 15, Horton Lane, Bradford, Yorks, issues a new catalogue of unmounted material prepared by Mons. S. Louis, for whom Mr. West is the agent in Britain. These objects include beautifully cleaned diatoms from many parts of the world, sections of woods, micro-fungi and rich foraminiferous sands, etc. Microscopists will find this list worth examination.



CONDUCTED BY EDWARD A. MARTIN, F.G.S.

GEOLOGICAL LITERATURE.—Messrs. Dulau, of Soho Square, send their catalogue of books and papers on Geology, a compilation extending to 130 pages.

DRIFT OF THE EASTERN COUNTIES.—By a donation from Mr. F. W. Harmer, F.G.S., the Geological Society has come into the possession of the manuscript maps of the Drift of the Eastern Counties, made by the late Mr. Searles Wood, Jun., and himself.

BRITISH OAK.—In sinking the cylinders of Chepstow Bridge of the Great Western Railway over the River Wye, some sound oak was found beneath a thickness of no less than forty feet of the clay, sand, etc., and fifteen feet below low-water mark. A specimen of this has been presented to the Geological Society by Mr. J. S. Wood.

CLEOPATRA'S NEEDLE.—The Cleopatra's Needle originally came from Syene, in Upper Egypt. There it was hewn out of the native rock, a kind of granite, which mineralogists nowadays know as syenite. Syenite is a mineral composed of felspar, quartz, and hornblende. It is, of course, one of the igneous or fire-formed rocks. In an interesting article in the February "Strand Magazine," the place of the quarries whence come the "Needles" which are found in various parts of Lower Egypt is unfortunately spelt "Syrene," and this is repeated three times. Evidently the author is confusing Cyrene, a place of Biblical fame, with what is correctly "Syene."

CONGLOMERATE IN CUMBERLAND.—A discussion of an interesting nature took place at the meeting of the Geological Society, on November 23rd, 1898, in regard to a communication on the Conglomerates near Melmerby, in Cumberland, which was made by Mr. J. E. Marr, M.A., F.R.S., F.G.S. He found the Skiddaw slates to be covered by about thirty feet of roughly stratified Conglomerate, followed by twenty to thirty feet of rock with small pebbles, and then by a second coarse Conglomerate. The point noticed was that the pebbles possessed the outward form of glacial boulders, and possessed both curved and parallel striae, but the author considered the markings to be wholly due to earth movements. Sir A. Geikie frankly admitted the truth of this explanation, but at the same time held that conclusive evidence had been obtained on other occasions of glacially-striated boulders in old geological deposits. Dr. W. T. Blanford thought that more reliable evidence of glacial action than scratched surfaces is the occurrence of boulders and pebbles imbedded in a fine silt. It was upon such evidence that his belief in a Carboniferous glacial period in India was originally founded. In future it would seem, therefore, that geologists will have to be very careful not too hastily to invite the occurrence of a glacial period to explain what may after all be merely slicken-sides due to earth movements.

LANTERN AND MICROSCOPICAL SLIDES.—We have received an interesting catalogue of lantern and microscopical slides from Mr. Abraham Flatters, Longsight, Manchester, together with specimens of geological lantern slides. These are very clear and accurate. Mr. Flatters prepares slides from his clients' own drawings or prints at a very reasonable rate, returning the negatives with the slides.

PITCHSTONE IN IRELAND.—In reading the issue of SCIENCE-GOSSIP for the present month, I was interested in Dr. Keegan's notes (*ante* p. 281) on "Pitchstone." I take the liberty of sending you a specimen from this district. The pitchstone is found in the Sandy Braes, a townland of Barnish, co. Antrim, where there are several sections to be seen. Prof. Cole, F.G.S., in his paper on "The Rhyolites of co. Antrim," printed in the scientific "Transactions" of the Royal Dublin Society, May, 1896, describes this place as one of the most interesting spots for the geologist in the whole of Ireland.—*R. Bell*, 16, *Charleville Street, Belfast; February 8th*, 1899.

DRIFT NOMENCLATURE.—Unless writers, in dealing with the drifts and gravels, are careful to adhere to one nomenclature, there is great risk of confusion. Mr. A. S. Kennard, in setting a previous writer right, has, Mr. A. E. Salter informs me, fallen into error in regard to the statements attributed to the latter. Mr. Kennard's term "high-level drift," is not exactly the best term he might have used, as there are two sets of drift deposits at still higher levels, whilst those to which he refers are part only of Mr. Salter's Series 3. It is from Series 1 and 2 that Mr. Salter says "no contemporaneous fossils," such as large mammalia, have been recorded" ("pebbly and other gravels," p. 274). He refers to the Galley Hill bones on p. 176, and divides these deposits as follows: (1) High level, or early drifts (? Pliocene); (2) lower plateau and glacial drifts; (3) river drifts, these occurring in three terraces. The statement referred to by Mr. Kennard does not refer to the high-level gravels, which are one of the three terraces of No. 3; but to the true high-level drifts, which Mr. Salter thinks may have been of Pliocene age.

EXHIBITS AT THE GEOLOGICAL SOCIETY.—At the Geological Society's "At Home," on December 16th, the exhibits were of an interesting and varied character. A series of mammoth remains, dredged by Lowestoft smacks from the Dogger Bank, together with part of the skull and antlers of a reindeer, were shown by Mr. W. F. Gwinnell, who also exhibited almost a complete skeleton of the dodo (*Didus ineptus*). Mr. Etheridge showed an illustration of the boring at Brabourne, with numerous rock sections, full particulars of which will, it is hoped, shortly be made public. I may here perhaps be allowed to refer to the interesting fact that in a red conglomerate, at 1,905 feet 6 inches, Dr. Hinde has discovered an included pebble which contains a carboniferous foraminifer (*Endothyra*). Mr. A. E. Salter exhibited a series of erratic boulders from gravels in the Home Counties, and some important results may, I think, be anticipated from his studies on the subject. Lantern exhibitions were given by Mr. H. S. Monckton and Dr. Gregory on Norwegian glacier action and the Geology of Christmas Island, in each case illustrated by original lantern slides.

Royal Meteorological Society. — On the evening of February 15th, Mr. E. Mawley read his annual report on phenological observations, and stated that the weather of the past year, taken as a whole, had been throughout the British Isles very warm and dry. Wild plants blossomed much in advance of their average dates until about the end of March, but then, until the close of the flowering season, they were mostly late in blooming. Rains in May caused the crops of hay to be everywhere remarkably heavy, but the long drought which followed dried up the pastures and caused a scanty yield of roots. The dry season suited the cereals admirably, especially the wheat, of which there was a very abundant crop. There was a splendid crop of potatoes in Ireland and in parts of Scotland, but elsewhere the yield was moderate. Apples, pears and plums flowered abundantly, but adverse weather conditions, and dry subsoil in the spring, caused irregular "set" of fruit, so that crops were below average. There were good yields of all the smaller fruits. A paper by Prof. W. M. Davis, of Harvard University, U.S., on "The Circulation of the Atmosphere," was read by the Secretary.

City of London Entomological and Natural History Society.—Meeting, 17th January, 1899. Exhibits: Mr. J. A. Clark, a series of *Peronea cristana* from the New Forest, one being without the white button on the fore-wings, although a fresh specimen when captured; also of *P. umbrana* in great variation, taken in the same locality. Mr. F. B. Jennings, a fly, *Pipiza noctiluca*, taken in May, 1896, in Epping Forest, on the sloe, attention being drawn to the lunar markings. Mr. A. F. Bayne, two *Agrotis cinerea*, one being very large, taken on the chalk hills at Tring, in 1896. Mr. W. J. Kaye, five boxes of Rhopalocera from Trinidad, taken by himself, showing many Hesperiidae in great variety of form. Many of the insects were species new to science, and await description.—*H. A. Sauzé, Hon. Sec.*

North London Natural History Society.—January 19th, 1899, Mr. L. J. Tremayne, President, in the chair. Messrs. Woodward, Nicholson, Bacot, Prout, and Robbins exhibited British and foreign species of Pieridae. Mr. Nicholson opened a discussion on this family, dealing with its classification, distribution, the characteristics of the early stages, the frequency of mimicry in the family, the abnormal abundance of *Pieris brassicae* larvae last autumn, and the rarity of *Aporia crataegi* and *Pieris daplidice* in Britain, the latter indeed having no claim to be regarded as truly indigenous. In the discussion, Mr. Prout called attention to the interesting cases of seasonal dimorphism in some of the British species. Mr. Bacot referred to the recent discovery that the singularly dissimilar *Terias brigitta* and *T. zoe*, which he exhibited from South Africa, were seasonal forms of one species. Mr. Barber pointed out that where kindred forms occurred at very different latitudes, their greater altitude in the more tropical habitats generally brought about approximately similar conditions of temperature. Mr. Bacot further remarked on the loss of the black spots on the upper side of the species of *Pieris*, and considered it inexplicable, unless, perhaps, on the ground of sexual selection. Mr. Robbins spoke of the profusion of *P. brassicae* larvae in Northamptonshire last September; sometimes more than fifty were counted on a single cabbage-leaf. Mr. Nicholson, in replying, spoke in favour of Wallace's view, that in this country the birds did not trouble themselves much about butterflies; while the large amount of land under cultivation favoured the multiplication of the cabbage-whites.—*Louis B. Prout, Hon. Sec.*

Cambridge Entomological and Natural History Society.—February 3rd. Dr. Sharp exhibited a number of stag-beetles (Lucanidae) from various parts of the world, calling attention to the trimorphism conspicuous among the males of many species. They differ not only in size, but also in the form of the mandibles, and can be usually placed in three well-marked groups in each species. He also exhibited some bees of the genus *Koptorthosoma* from Ceylon, in the female of which a cavity is formed in the anterior end of the abdomen by an involution of the skin. The abdomen is pressed so close against the thorax that in the normal position this cavity is invisible, but it can be seen by bending down the abdomen, or by cutting it off. The cavity varies in form in different species, but is found throughout the genus in the females, and always contains a number of large acari. It is not known whether these parasites have any connection with the development of the structure in question. Dr. Harmer exhibited an amphipod crustacean of the genus *Niphargus*, found in a well at Norwich. This genus is only known to occur in deep wells; and in the complete absence of pigment from all parts of the body, including the eyes, it resembles a cave animal.

Hull Scientific and Field Naturalists' Club. This society has altered its place of meeting to the "Young People's Institute," Charlotte Street, Hull. On February 1st, the members held a "sectional" meeting. It was arranged that the evening should be devoted to geological topics, and there was a very good attendance. Mr. William Morfitt, of Atwick, one of the club's corresponding members, exhibited and described an interesting collection of geological rarities, most of which had been secured during this winter from the beach and cliffs of the Holderness coast between Hornsea and Skipsea. Foremost amongst them should be mentioned a large portion of a tusk of a mammoth (*Elephas primigenius*), which had been obtained from the boulder clay cliffs. There were also several vertebrae and other bones of the gigantic fish lizards (Saurians) which flourished in Liassic times. These, though found near Atwick, had originally been derived from the rocks at Whitby. Of more recent date was a very fine polished stone axe-head of large size, and with the cutting edge as sharp and fresh as if made but yesterday. This was taken from one of the beds of peat which in two or three localities occur resting on the boulder clay. Mr. J. R. Boyle, F.S.A., pointed out that this implement was a relic of the Vikings, who in various ways have left abundant evidence of their presence in great numbers of places in this district. Other matters of interest were brought forward and papers were read.—*T. Sheppard, Hon. Sec., 78, Sherburn Street, Hull.*

NOTICES OF SOCIETIES.

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

City of London Entomological and Natural History Society.

Mar. 7.—†"Poisonous Plants in connection with Medical Jurisprudence." F. Bouskell, F.E.S.
,, 21.—†"Oporabia autumnata." L. B. Prout, F.E.S.

H. A. Sauzé, Hon. Sec.

Geologists' Association of London.

Mar. 3.—†"Honeycomb Surface Weathering of Sandstone and Limestone." Geo. Abbott, M.R.C.S. Lantern illustration.
,, 11.—*Visit to Mr. W. H. Hudleston's Museum, 8, Stanhope Gardens, S.W., 3 p.m.
,, 30 to April 4.—*Easter Excursion to Sidmouth.

Percy Emary, F.G.S., Sec.,
12, Alwyne Square, Canonbury, London, N.

North London Natural History Society.

Mar. 2.—†"Extracts from Letters from the Transvaal." Miss A. H. Bacot.
,, 16.—†Short Papers on work in 1898.
,, 25.—*Visit to the Royal Botanical Gardens. J. S. Comrie.
,, 30.—†Debate: "Which Science is the better adapted for the elucidation of Biological Problems—Botany or Entomology?" Opened in favour of Botany by M. Culpin; of Entomology by L. B. Prout, F.E.S.
April 20.—†"My trip to the Cariboos" (with lantern illustrations). W. S. Sebright Green, F.R.C.I.
May 4.—†"Comets and Meteors." C. Nicholson, F.E.S.
,, 18.—†"Notes on a Tour in the Swiss Alps." C. B. Smith.
,, 19 to 22.—*Excursion to the New Forest. C. Nicholson, F.E.S.
,, 22.—*Alternative whole-day Excursion to Cuxton. L. B. Prout, F.E.S.
,, 27.—*Half-day in Epping Forest. The President

South London Natural History Society.

Mar. 9.—†"Nature of Metamorphosis in Insects." J. W. Tutt, F.E.S.
,, 23.—†"British Orthoptera." Malcolm Burr, F.Z.S., F.E.S.

Clapham Junction Y.M.C.A. Natural Science Circle.

Mar. 8.—†Lecture on "Chemistry," with experiments. W. G. Whiffen, F.I C., F.S.C.I.
,, 22.—†"South Africa." Lime-light views. Duncan Milligan, F.R.A.S.
April 5.—†"The position of Insects in regard to Man and their influences on Plants." A. Bacot.

Hon. Sec., F. W. Cannon, 1, Glycena Road, S.W.

Selborne Society—Croydon and Norwood Branch.

Mar. 23.—†"Birds and Bird Protection." E. A. Martin, F.G.S. Croydon Liberal Association Rooms, 8.30 p.m.

Streatham Geological and Natural History Society.

Mar. 4.—†Short Papers on Summer Excursions.

Hon. Sec., L. W. J. Costello,
Callington, Stanhope Road, Streatham, S.W.

Hull Scientific and Field Naturalists' Club.

Mar. 8.—†"Shooting Stars." J. A. Ridgway.
,, 22.—†"Electrical Measurements," with Experiments. J. T. Riley, D.Sc., A.R.C.Sc.I.

The Meetings are held at the "Young People's Institute," Charlotte Street, Hull, at 8 p.m.

T. Sheppard, Hon. Sec.

Tunbridge Wells Natural History and Philosophical Society.

Mar. 8.—†"Wonders and Romance of Insect Life." Lantern. F. Enock, F.L.S., F.E.S., F.R.H S. 3 p.m.
,, 24.—†"The Chaldean Genesis." H. S. Roberton, B.A., B.Sc.
April 7.—†"British Vegetable Gall Formations." E. T. Connold.
,, 21.—†Specimen and Microscopical Meeting. "Insects' Metamorphoses," H. de C. Child.

Hon. Assist. Sec., R. R. Hutchinson, Belmont, Princes Street.

Preston Scientific Society.

Mar. 8.—†"The Solar Corona." Rev. A. L. Cartie, S.J.
,, 22.—†"Moors in Spain." Rev. C. F. Richardson, B.A., LL.D.
,, 1, 2, 6, 9, 10, 13, 15, 16, 20, 21, 23, 24, 27, 29.—†Sectional Meetings and Instruction Address in Microscopic Mountings, Geology, Botany, Astronomy, Photography and Natural History.

Lecture Hall, 119, Fishergate.

W. H. Heathcote, F.L.S., Sec.

IMPORTANT NOTICE.

The Proprietor of Science-Gossip having decided to manage the business department from an independent office at 110, Strand, London, W.C., all subscriptions, advertisements and payment for advertisements must in future be sent to that address, and no longer to the Nassau Press. We desire to refer our readers to advertisement page iv., accompanying this number.

NOTICES TO CORRESPONDENTS.

To Correspondents and Exchangers.—Science-Gossip is published on the 25th of each month. All notes or other 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.

Business Communications.—All Business Communications relating to Science-Gossip must be addressed to the Proprietor of Science-Gossip, 110, Strand, London.

Subscriptions.—Subscriptions to Science-Gossip, which may commence with any number, at the rate of 6*s.* 6*d.* for twelve months (including postage), should be remitted to the Office, 110, Strand, London, W.C.

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.

Notice.—Contributors are requested to strictly observe the following rules. All contributions must be *clearly* written on one side of the paper only. Words intended to be printed in *italics* should be marked under with a single line. Generic names must be given in full, excepting where used immediately before. Capitals may only be used for generic, and not specific names. Scientific names and names of places to be written in round hand.

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.

The Editor is not responsible for unused MSS., neither can he undertake to return them, unless accompanied with stamps for return postage.

CORRESPONDENCE.

A. P. (Isle of Wight).—The dipterous fly bred from the *Arctia* larva is *Exorista cheloniae* Rond, a rather unusual parasite.

EXCHANGES.

Notice.—Exchanges extending to thirty words (including name and address) admitted free, but additional words must be prepaid at the rate of threepence for every seven words or less.

A one-fifteenth water immersion objective, by Ross and Co., equal to new.—J. Rogers, 1207, Chester Road, Stretford, near Manchester.

Wanted, any tropical insects but moths or butterflies; also spiders, preferably preserved in spirit. Rare micro slides or cash offered.—J. Jackson, Moorfield, Bolton.

Wanted, Coleoptera (British and foreign), also store boxes, in exchange for South African Coleoptera, Lepidoptera, etc., plants, shells, or micro material.—Delancey Dods, Box 634. Cape Town, South Africa.

Duplicate eggs of nightjar, nightingale, landrail, snipe, cuckoo, and others. Desiderata, offers of British eggs or lepidoptera. Unaccepted offers not answered.—Charles Bellamy, Ringwood.

Wanted, fragments or specimens of meteorites; a liberal exchange in ammonites, trilobites, crystalline minerals and agates.—P. J. Roberts, 11, Back Ash Street, Bacup.

Wanted, large foreign Helices, Bulimi, Cyclostomae, etc., in exchange for British land and freshwater shells; list sent.—G. T. Rope, Blaxhall, Wickham Market.

Offered, single eggs and parts of clutches of uncommon British birds' eggs for well-blown complete clutches of many common species.—T. E. Doeg, Evesham.

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