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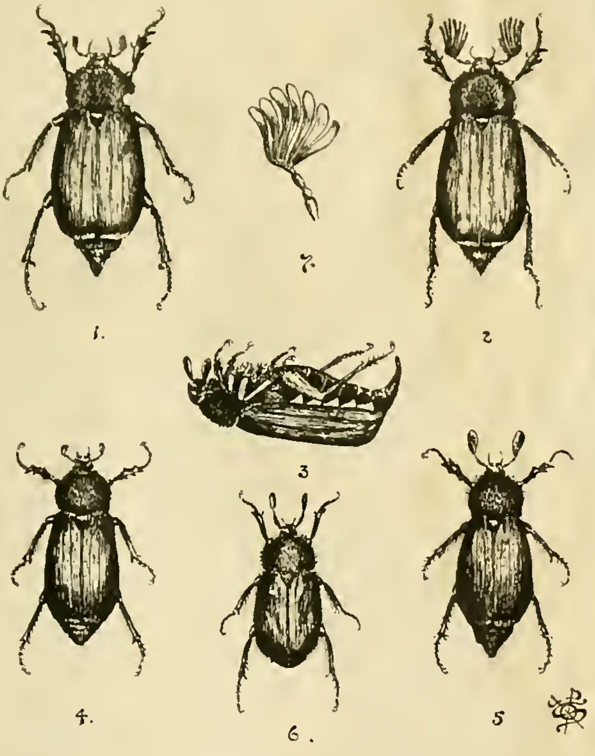
N.B.—SUBSCRIPTIONS THAT BEGIN WITH VOL. VII. ARE NOW DUE.

BRITISH COCKCHAFERS.

By E. J. Burgess Sopp, F.E.S.

GENUS MELOLONTHA.

In his interesting "History of the Earth and Animated Nature" Oliver Goldsmith says:— "Of the beetle kind there are three different classes, distinguished by their feelers:" and of beetles with their "feelers clavated or knobbed at the end meant the dumble-dor, of which I wrote in a former article (*ante*, p. 225), the name being applied by the older writers to the common cockchafer (*Melolontha vulgaris*), an insect whose "noxious qualities" have contributed to render it a familiar and dreaded object to the agriculturist from the earliest times. To those of us who have struggled with the unwieldy group of



British Cockchafers.

1. *Melolontha vulgaris* (female); 2. *M. vulgaris* (male), showing lamellae of antennae expanded; 3. *M. vulgaris* (lateral and ventral view); 4. *M. hippocastani* (female); 5. *M. hippocastani* (male); 6. *Rhizotrogus solstitialis* (male). All natural size. 7. *Antenna* of common cockchafer enlarged.

there are ten kinds, and among these . . . if the knob be divided at the ends and the belly be streaked with white it is no other than the Dorr or Maybug, an animal the noxious qualities of which give it a very distinguished rank in the history of the insect creation." By the Dorr beetle is not here clavicornes, of which over fifteen hundred are now described as British, it is refreshing to learn that but ten kinds were recognised in Goldsmith's time, a statement well calculated to make us envious of the "good old days" that are past. His beetles with "clavated or knobbed feelers" included, moreover, the Lamellicornes, to the sub-family Scarabaeidae Melolonthini of which division belong the cockchafers. The group is essentially a tropical one, and is but poorly represented in temperate regions. Rather over two hundred species inhabit Europe, of which seven beetles, constituting five genera, are indigenous to the British Islands; and of these, two only can be said to be in any measure generally distributed throughout a large portion of the kingdom. Of the Melolonthae, or true cockchafers, some thirty species are known, and these are widely scattered over the face of the globe. Two only occur in Britain, although until within recent years the beetles comprised in the closely allied genus *Rhizotrogus* were generally included with them. Under the older Fabrician arrangement our single representative of the Sericae and the more beautiful albeit more distantly related chafer *Anomala frischi* were also added to the list.

The Melolonthidae are mentioned by Aristophanes, who likens a young glee-maiden to "a little golden cockchafer"; as well as by Herodes, Pollux, and other ancient writers. With regard to the former, it is not improbable he referred to one of the Rutelinae or Cetoniinae rather than to a member of the genus *Melolontha* as we now know it; for it is certain that some of the brighter of the species allied to the rose-chafers were in earlier times sometimes spoken of as "golden" cockchafers. Greek children were wont to amuse themselves by tying a string to the leg of a cockchafer and causing it to fly, reference to which practice is made by Socrates, who says: "Do not always revolve your thoughts around yourself, but let your meditation free into the air, fastened with a strong thread to its leg, like a cockchafer." This amusement is not, I believe, altogether unknown to the youth of France at the present day.

Although we in England have occasionally had to deprecate the ravages caused by these destructive insects, the damage wrought in our islands is infinitesimal when compared with the havoc occasioned by them on the continent of Europe. In Germany, France, Switzerland, and other countries they sometimes swarm in incredible numbers, often laying waste large tracts of land by their depredations. In Britain they have appeared a few times in considerable quantities, and even in ordinary years are responsible for sufficient damage to have moved our Board of Agriculture to issue and distribute free a leaflet (No. 25) suggesting methods for their destruction. Mouffet, whose Natural History was the first printed in this country, tells us that in February, 1574, cockchafers appeared in vast numbers in many parts of England, and that the number which fell into the Severn alone was sufficient to stop some of the water-mills on that river. Mention of this visitation is also made elsewhere; but, as Kirby has already pointed out, there is probably some slight inaccuracy with regard to the date, as cockchafers do not usually appear until the latter end of April or beginning of May, hence the synonyms "Maybug" in England and "Maychafer" (Maikäfer) in Germany. Figuier mentions a somewhat similar plague as occurring in the county of Galway some 114 years later, when the destruction of crops and general devastation wrought by these unwelcome pests were so complete that in many districts the natives had to fall back on the cooked bodies of the invaders in order to stave off starvation. Truly an "injustice to Oireland" such as is rarely experienced. During a gale in 1804 so enormous was the number of cockchafers precipitated into the Lake of Zurich that their drowned bodies formed a thick bank along the shore, the fetid emanations from which putrefying mass polluted the atmosphere for a considerable distance in the vicinity. Figuier tells us that some years later vast clouds of these insects traversed the Saône Valley, causing terrible destruction to the vineyards of the Mâconnais; the streets of Mâcon itself being so thickly covered by them as to render it necessary to shovel them up with spades. Similar instances of like periodic great plagues of cockchafers which have from time to time occurred on the Continent might be adduced without number, but enough has been written to show that a "reconnaissance in force" by a horde of these intrepid and voracious beetles may not only become a serious local catastrophe, but even conceivably assume the dimensions of a national calamity.

The life-history of *Melolontha vulgaris*, which is the cockchafer *par excellence*, is soon told. The beetles emerge from their subterranean quarters towards the end of April or early in May, about the middle of which latter month the mating takes place, shortly after which the males die. The eggs, which are round-oval and "about the size and shape of a hemp seed" (Board of Agriculture Leaflet, No. 25), are of a dirty yellowish-white, and are laid in June, each female producing from twenty-five to sixty eggs, which are sometimes deposited together, but more often divided up into two or more separate batches. These are placed in the ground, the insects using their short powerful forelegs to scoop holes for the purpose of laying in. These cavities range in depth from 2 inches to 8 inches, according to the nature of the ground; but when possible the females nearly always select a nice light well-worked soil, such as is to be found in nurseries, gardens, fields, and similar situations. In fact, to a certain extent farming operations may be said to be favourable to cockchafer life, and it has been several times noted that they often increase with the spread of agriculture. In from a month to six weeks, the eggs in the meanwhile having swelled considerably with the development of the embryo, the larvae are hatched, and, being polyphagous, immediately commence to feed upon the young and tender fibrous roots of whatever plants may occur in their neighbourhood. When quite young they can straighten themselves out and crawl, but when older lose this power, in consequence of which ambulatory evolutions above ground are rendered practically impossible.

In colour the larvae partake of a dirty white, with the head, thorax, and legs of a warm reddish-brown hue; but later, on becoming more fully developed, when they attain a length of an inch and a half, the abdomen generally presents a bluish or leaden appearance. In Sweden the peasants entertain a curious belief that from this circumstance can be divined the approximate severity of the approaching winter. If the larva be of a blue coloration, mild weather may be expected; but if on the contrary the grub be white, then will the winter be long and severe. They even venture into some detail in the matter, for De Geer (iv. 275) tells us that if the anterior part of the Bemärkelse-mask (prognostic-worm) be white and the posterior blue—which is more likely to be the case than the reverse—the cold will be more intense at the beginning than towards the end of the winter. This change of colour is due to food. The outer skin of the cockchafer grub is somewhat transparent, so that when the abdomen is full the food, indistinctly seen through the body-wall, gives the larva a leaden or bluish appearance; whereas, should the animal have fallen upon hard times, its posterior portion is correspondingly both lighter in colour and less distended than is usually the case.

Cockchafer grubs are known in many parts of this kingdom as "white-worm," and where abundant to any degree do considerable damage by devouring the roots of corn, grass, and other crops; for, possessing insatiable appetites and strong jaws and digestive apparatus, during the three or four seasons which they pass in the larval condition (¹) they are capable of consuming an astonishing amount of food. At the end of each succeeding summer they burrow down to a considerable depth below the surface of the ground, where they repose in comparative safety until the returning power of the sun in spring-time begins to warm the soil above, when they again ascend and renew their attack upon the young rootlets of whatever kind chances to come within their reach. They are unable to stand severe cold, and late frosts in April and May will often surprise and kill vast numbers of them.

Of foes, in addition to their arch-enemy man, they have many to contend against, for moles, weasels, shrew-mice, magpies, ravens, gulls, and—last but not least—rooks are exceedingly fond of them. It has, in fact, often been noted that the destruction of rookeries in a district has been followed by an increase of white-worm, and Miss Ormerod in one of her delightful works on injurious insects states that the black-headed and common gulls will go for miles inland to follow the plough for grubs of the cockchafer. Lesser foes they also have amongst the reptiles and insects; some of the predacious ground-beetles, for instance, waging constant war against them. More especially is this the case with *Carabus auratus*, an extremely rare insect in Britain, and not really indigenous to our islands, but which on the Continent, particularly in France, is unrelenting in its attacks upon these terrible pests.

Towards the end of the third or fourth autumn the larva burrows down a couple of feet or so, and there constructs a rude chamber in which to undergo its change to the pupal state. In this condition it passes a week or so, and, after assuming the imago form, still remains quiescent until the following spring, when it emerges from its subterranean retreat to enter upon its most important functions in life.

(*To be continued.*)

(¹) "In Central Europe the life-cycle of the individual occupies three years, though in dry periods it may be extended to four. In Scandinavia the time occupied for development appears to be five years."—Sharp, "Insects," Camb. Nat. Hist.

NIDOLOGY OF THE CUCKOO.

By H. Kirke Swann.

In the summer the cuckoo (*Cuculus canorus* Linn.) is spread over the whole Palaearctic region, migrating as far as South Africa, India, and casually to Australia. In Scotland it is called "gowk," from its Saxon name "geac." The cuckoo shares with the swallow the distinction of being typical of the spring bird of passage, but with a difference; for while the swallow is one of the sights of early spring in an English countryside, the cuckoo is one of the sounds, the appearance of the bird being far less familiar to most people than its cry. The male birds come to us about the third week of April, always several days in advance of the females, and immediately announce their arrival by the well-known musical cry, usually delivered when perched upon the branch of a tree, but frequently while on the wing in pursuit of the female. The "cuck—oo" note, or song, is uttered by the male only, the note of the female being a very dissimilar rattling or "water-bubbling" cry, usually heard while it is being pursued by the males.

There is no doubt that the males are always far in excess of the females, and, considering this strange disproportion in conjunction with the manner in which several males may commonly be observed to pursue one female, there can be very little doubt that the cuckoo, unlike most other birds, is polyandrous. Working upon this habit, we can arrive at the conclusion, already accepted by more than one ornithologist of note, that this constant harrying of the female by several males is the natural explanation of the remarkable fact that no nest is built, and that the female is obliged to intrude an egg into a strange domicile here and there, and to leave the raising of its progeny to strangers.

The egg is not, however, placed in a nest haphazard; for the female cuckoo really hunts for nests in quite a systematic way—usually, I believe, by watching the owners as they enter or leave. From the situation of the nests thus selected, and from actual observation of the cuckoo's methods, there can be no doubt that the egg is never actually laid in the nest, but is invariably deposited upon the ground or elsewhere, and then conveyed by the female in its gullet to a nest previously selected. It is in this fact that we find the real explanation of the remarkably small size of the egg in proportion to that of the cuckoo itself. It would be impossible for the bird to carry safely the egg in its mouth if its burden were in the least degree larger.

Before it became known that the cuckoo's egg was not laid directly in the nest, it was commonly supposed that the reason for the egg being so small was that it could thereby be introduced among those of small insectivorous birds that would provide the young cuckoo with its proper food. The fact that the egg is frequently found in the nests of seed-eaters, as well as in those of birds that lay larger eggs, such as the blackbird, &c., renders the explanation given above far more probable. A very interesting fact in this connection, and one which seems to have been generally overlooked, is that the shell of the cuckoo's egg is very much harder than a similar-sized egg of any Passerine bird, obviously a provision of Nature against the peculiar usage to which the egg is subjected. As might be expected, this extra strength results in a correspondingly greater density and weight in the shell. Thus a trustworthy means of identifying cuckoos' eggs, formerly a difficult matter, is to take a suspected "cuckoo clutch" to a chemist and get him to weigh all the eggs accurately, when the cuckoo's egg, if really there, will be indicated by its extra weight, on account of proving 25 per cent. heavier than a similar-sized egg of a Passerine bird. I am indebted to Mr. H. W. Marsden, of Clifton, for the following table illustrative of proportionate weights, based upon practical experiments, which will no doubt be found helpful by oologists. The weights are in centigrammes :—

Species	Weight	Cuckoo's of same size should weigh
Skylark	21 c.gr...	24 to 26 c.gr.
,, ...	17 ,, ..	,, ,,
,, ...	18 ,, ..	,, ,,
,, ...	19 ,, ..	,, ,,
,, (very large egg) ..	22 ,, ..	28 to 30 ,,
House-sparrow (very heavy for the species)	21 ,, ..	24 to 26 ,,
House-sparrow	19 ,, ..	22 to 24 ,,
,, ,, ...	18 ,, ..	,, ,, ,,
Tree-pipit	16½ ,, ..	20 to 23 ,,
Tree-sparrow	13 ,, ..	20 to 21 ,,

The eggs of the cuckoo are rather more globular than those of most of the birds in whose nests they are found, and, moreover, usually show little or no gloss. The Rev. Julian G. Tuck writes that he has always noticed that the yolk is peculiar in colouring, with either a greenish or brownish tinge.

Among the various species whose nests are selected by the cuckoo as receptacles for its eggs may be enumerated the hedge-sparrow, house-sparrow, tree-sparrow, wren, linnet, bullfinch, swallow, wheatear, nightingale, willow-wren, wood-wren, skylark, tree-pipit, whitethroat, meadow-pipit, pied wagtail, sedge-warbler, reed-warbler, yellow-bunting, cirl-bunting, blackbird, garden-warbler, blackcap, redstart, red-backed shrike, spotted flycatcher, redbreast, greenfinch, reed-bunting, chaffinch, song-thrush, mistle-thrush, ring-ouzel, stonechat, and whinchat.

The existence of a remarkable number of widely dissimilar varieties of eggs of the cuckoo is a point around which a good deal of controversy has at times been waged. Much careful observation is necessary still to elucidate facts out of the many existing theories. To describe all the different varieties in the limited space at my command would be an impossibility. I will therefore merely say that the more common varieties vary from greenish-white to pale rufous-grey, spotted and mottled closely or otherwise with olive-brown or rufous-brown of different shades. The average size is ·90 by ·75 of an inch ; but they vary a good deal. Among the principal varieties may be mentioned eggs almost precisely like those of the skylark, pied wagtail, house-sparrow, tree-sparrow, sedge-warbler, tree-pipit, reed-warbler, &c. In Continental collections a pale blue egg without markings is not uncommon, although I have never known one of this variety to be taken in Britain. This remarkable and wholesale mimicry has given rise to an absurd theory, still held to some extent, that the female cuckoo has the power to lay an egg of any particular colour or markings she chooses, in order to make it match those amongst which she intruded. Thus when she selected a nest with blue eggs, such as a hedge-sparrow's, she would lay a blue egg, and so on. A far more natural theory, however, is that certain individuals lay eggs of a certain type, and therefore instinctively endeavour to select nests containing eggs of a similar appearance to their own—the fact that they sometimes deposit their egg with a clutch of dissimilar eggs being, of course, explained by the supposition of difficulty in finding an appropriate nest ; therefore it was put into the first likely one.

A very interesting fact is that the nest selected never contains incubated eggs at the time the intrusion takes place. This is, no doubt, usually made sure through the cuckoo's habit of watching when the eggs of the rightful owner are laid. This fact is very necessary, for otherwise the eggs of the rightful owner of the nest might be hatched before the cuckoo's, and the foster-brethren thus enabled to become too strong for their eviction by the parasite, which event invariably takes place soon after the latter is hatched. The unfortunate occupants are then ejected from the nest one after the other, in which way the young cuckoo provides insensibly for the receipt of the enormous quantity of food it requires, and without which it would inevitably starve. It has been said that this ejection takes place when the parasite is nine or ten days old ; but my experience is that it always occurs before the third or fourth day of its existence. The remarkable instinct possessed by a blind, naked, and apparently helpless creature to enable it to perform such a feat strikes one with as much astonishment as does the strength exhibited in its achievement.

The procedure of the young cuckoo in ejecting other birds from the nest is to work its body under that of its foster-brother, then, balancing its burthen in the natural cavity existing (at this age) in the centre of the usurper's back, it forces the young bird gradually up the side of the nest, until, with a final effort, the victim falls over the rim.

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BUTTERFLIES OF THE PALAEARCTIC REGION.

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

(*Continued from page 336.*[1])

Genus 10. *PIERIS* Schrank.

This genus was named by Schrank in "Fauna Boica," pp. 152-162 (1801). *Pieris* contains butterflies ranging in expanse from rather large to medium size. Second sub-costal nervure not given off at the extreme end of the disc. cell of f.w., as in *Aporia*. Antennae long, distinctly articulated, and terminated by a very distinct club. All the Palaearctic species have the ground colour of the wings white, with the exception of a few aberrant forms. The apices of the f.w. are generally marked with black, and there is nearly always a black spot near the inner margin in the female. The black markings are always more developed in that sex than in the male. The hind wings are decorated on the under side with green or yellow scales, variously disposed, but having a tendency to follow the course of the neuration, or to form quadrate or triangular blotches between the nervures.

Pieris kreitneri.

Pieris davidis.

Larvae. Long, cylindrical, pubescent, slightly tapering at the extremities, marked with longitudinal stripes, more or less granulated on the surface. They feed usually on low herbaceous plants, and principally on those belonging to the order Cruciferae.

Pupae. Angular, terminated anteriorly by a single point.

1. **P. hippia** Brem. Bull. Acad. Pet. III. p. 464. 1861. *Aporia hippia* R. H. p. 117. *Crataegoides* Lac. Ann. Ent. Soc. Franç. 1866, p. 503.

56—73 mm.

Has somewhat the appearance of *Aporia crataegi*, but the fore wings are more pointed and the h.w. less rounded than in that species. They are more densely scaled and of a duller white above. There is not that entire absence of any pattern seen in *Aporia* (ἀπορία = "poverty"). F.w. with triangular marginal spots most marked near the apex, a black elongated spot at the outer edge of the discoidal cell. Beneath, the f.w. are white with broad grey lines following the course of the nervures. H.w. Above, very much as in *Aporia crataegi*. U.s. ground colour, light ochre-yellow, grey lines along the nervures, base narrowly bright yellow. Head, thorax, and abdomen black. Antennae black, with well-marked clubs.

Hab. Amur, Ask, Vlad, Chabar, etc. VII.

Larva. Rather larger than that of *A. crataegi*, with a longitudinal brown dorsal line and a lateral row of brown spots; the hairs on the first and last segments rusty-red, otherwise greyish. R. H. On *Berberis sinensis* and *B. amurensis*.

a. var. *tianschanica* Grum. 50—57 mm. A smaller and darker form, and more strongly coloured beneath, than type. Hab. Tianschan.

b. var. *martineti* Oberth. A light form described by Oberthur from Thibet.

2. **P. kreitneri** Friv. R. H. p. 118, 709.

50—55 mm.

(1) This series of articles on Butterflies of the Palaearctic Region commenced in Science-Gossip, No. 61, June 1899.

Ground colour much whiter and more opaque than in *P. hippia*, or any of its vars. Above, markings more intensely black. F.w. with a distinct black discoidal spot: h.w. with the nervures broadly veined with grey, owing to the markings of u.s. appearing through. Often a distinct black discoidal spot. U.s. f.w. white nervures narrowly black, with a distinct discoidal spot. Apex bright ochre-yellow, which colour extends along the costa between it and the subcostal nervure. H.w. Ground colour bright ochre-yellow of a uniform tint, except a faint indication of submarginal lighter patches; nervures very broadly lined with black. The pattern and coloration of h.w. w.s. is very similar to that of *M. peloria*.

HAB. Central Asia, Lob Noor, Mongolia.

3. **P. bieti** Oberth. R. H. p. 118.

50—55 mm.

About the size of the last species. F.w. have all the nervures strong and broad, marked with black, and the white ground colour is more or less streaked with black shading. H.w. have the nervures marked with black throughout their whole length, except the six internal ones, which are only marked at their extremities. Fringes of all the wings black. U.s. f.w. with strongly marked neuration. Ground colour tinged with yellowish along costa and ou.-mar. H.w. strongly marked with broad black veins, ground colour yellowish.

HAB. Thibet, Mongolia. VI.—VIII.

4. **P. davidis** Oberth. Etudes. Ent. II. p. 18. 1876. *Aporia davidis*. R. H. p. 709.

41—43 mm.

Smaller than *P. bieti*. F.w. with a sub-marginal blackish band, and black rays reaching from it to the costa. Nervures forming discoidal cell strongly black, as also the sub-costals; the rest of the neuration less conspicuous. H.w. without markings, except a faint costal spot, and some shading along the course of the nervures; those nearest the costa, however, are marked with black at their extremities. Bases of all the wings narrowly black. U.s. much as in *P. kreitneri*. H.w. with the ground colour uniformly light yellow. The nervures are marked broadly black. Head, thorax, and abdomen black, as also the antennae, which have the clubs somewhat more rounded than in the preceding species.

HAB. Koko Noor.

5. **P. leucodice** Ev. Bull. Mosc. 1843, p. 541.

38—43 mm.

Wings white. F.w. with a black ante-marg. band and black rays reaching to the costa, as in *P. davidis*. A black elongated spot at extremity of disc. cell. H.w. much as in the last species, but with a faintly marked disc. spot or streak of black. Wings narrowly black at base. Fringes black. U.s. f.w. as above, but with black markings intensified. H.w. ground colour yellowish-white, with nervures marked black. A narrow, black, wavy band continued as far as the internal nervure. Head, thorax, and abdomen black. Antennae black, with ovate clubs as in the last species.

HAB. North Persia, Central Asia, Turkestan. VI. Said to occur in North California.

a. var. *illumina* Grum. The black markings are more intense and the lines of neuration more broadly marked. HAB. N. Persia, Alai, Turkestan.

b. var. *altensis* Stgr. A small form from the Altai.

This species is usually placed between *P. callidice* and *P. daplidice*, but it seems to me that its proper place is in the present group of the genus, in spite of the central band on the u.s. h.w.

6. **P. butleri** Moore. P. Z. S. 1882, p. 256. *P. potanini* Alph.

35—38 mm.

Fore wing white, with three or four black streaks near apex, and a rectangular black spot at end of disc. cell. Base narrowly black. H.w. white, with light grey streaks along the nervures. A long and narrow black disc. spot; base broadly blackish. U.s. f.w. as above, but apices ochre-yellow with brown veining. H.w. ochre-yellow, with strongly-marked brown veins, the nervures appearing as a light-coloured line in the centre of each streak. Head and pro-thorax covered with brownish-grey hairs. Rest of thorax and abdomen black. Antennae with a distinct ovate black club; their shafts are ringed with white. (♂ only described here.)

HAB. Koko Noor, Mongolia, Prov. of Kuliab. V.e. At great elevations in the mountains.

7. **P. mesentina** Cramer. Pap. Exot. III. t. 270. 1782. *Aurota*. Fab. Ent. Sept. 1793.

38—47 mm.

Ground colour of all the wings white in both sexes. F.w. in ♂ with a narrow black spot at the extremity of the discoidal cell. Apex and ou. marg. black to about half-way; on this black patch are six white oblong spots between the nervures. H.w. with a marginal border of narrow black chevron-like markings. Neuration distinct, but not black. Fringes black. Head, thorax, and abdomen black, with whitish hairs. Antennae greyish-black, not ringed. ♀ resembles the ♂ in the general character of the markings; but the black spots and borders are much wider, and with very little white mixed with them, recalling at first sight the appearance of a species of the genus *Melanargia*. U.s. as above, but apices and costa of f.w. and almost all the ground colour of the h.w. tinged with yellow. Neuration marked rather broadly black on h.w.

HAB. Syria (Jaffa, Beirut), Steppes of Kobish, Persia, R. H. Asia Minor (var. *augusta* Oliv.), Kirby Cat. 456. III. and VIII.

LARVA. Yellowish-green, with a broad purple-red longitudinal stripe on each side.

On *Holcus* (R. H.).

(To be continued.)

THE Société Zoologique de France notifies the change of address of its offices to the Hôtel des Sociétés Savantes, 28 Rue Serpente, Paris.

DESMIDS.

By Dr. G. H. Bryan, F.R.S.

(*Continued from page* 326.)

MOUNTING.—A thin cement cell is necessary to prevent the varnish used in sealing up the preparation from running in. I have used gold-size, zinc cement, brown cement, and sealing-wax varnish for the cells, and gold size and brown cement for closing them up. As to the efficacy of different cements it may be possible to express some opinion when my slides have been mounted twenty years. The well-known slides mounted by Mr. Joshua of Cirencester, at about that time ago, were sealed with zinc cement, and very few of them now survive. Some of them were sent to me about a year ago by Mr. Watkins, of Painswick, of which I managed to save four by the application of fresh glycerine and gold-size. In most of these once beautiful slides, the zinc cement has chipped away and the mounting medium has escaped, or evaporated. Nevertheless, I have mounted most of my desmids in zinc cement cells, trusting to the use of gold-size in sealing them, as affording some protection; and some slides of *Cosmarium* and of the diatom *Meridion circulare* mounted in camphor water in this way, in 1890 and 1891, are still as good as new. Gold size hardly gives cells of sufficient consistency. My present idea is to place a thin ring of gold size on the slide and over it to spin a ring of zinc cement, the latter giving the cell the required degree of thickness, and the former by its adhesion preventing the zinc cement from chipping off.

The cell in which the desmids are mounted should not be deeper than is absolutely necessary. In order, therefore, to get a sufficient number of desmids into the slide, it is best to push the pen-filler right down into the sediment of desmids at the bottom of the specimen tube or cork float containing them, so as to take up a thick mass of desmids with little glycerine. In mounting such objects the text-books tell us not to use more preservative fluid than will just fill the cell; but they do not say how this is to be done. The only way is to make the fluid form a convex drop, without extending quite to the edges of the cell. The drop must stand higher than the cell-wall, and, if a cover-glass is lowered horizontally, the fluid will spread out and fill the cell. The amount of fluid must be estimated by holding up the slide and looking at it edgewise; the part of the drop projecting above the cell should just be sufficient to fill the uncovered portions of the cell. If too much glycerine has been used, the superfluous liquid must be soaked up with blotting-paper; but in doing this a large proportion of the desmids are apt to be drawn out from under the cover. If there is too little fluid an air-bubble will be left in the cell. If this bubble is small it may be worth while to try whether its presence renders the slides less liable to leakage by allowing for expansion and contraction with variations of temperature. I have sealed up several desmid slides containing small air-bubbles, but the bubbles have generally disappeared in a short time, fortunately without causing the varnish to run in.

Before lowering the cover-glass, it may be well to stir the drop of fluid with a needle to spread the desmids. If the gathering is not exceptionally clean, any particles of dirt that are visible to the naked eye may at the same time be picked out with the mounting-needle, while any dust-fibres which may have crept into the material in the process of cleaning may be similarly removed under the microscope. If the cleaning process has failed to remove all the flocculent matter or vegetable *débris*, better results can sometimes be got by putting too large a drop of fluid on the slide, and then drawing part of it off, which will remove more of the dirt than of the desmids, often producing a much cleaner slide. If *sand* is the chief impurity this plan will only increase the proportion of it left on the slide and spoil its appearance. In most cases a little care in picking out dirt makes an immense difference in the quality of the slides.

For sealing the cells I have used brown cement or gold-size; generally the latter. Most writers recommend brown cement, or some other spirit varnish containing shellac for sealing glycerine, in preference to gold-size, on the ground that the latter does not close the cell securely if the edges are moist with superfluous glycerine. I have found no such difficulty; on the contrary, gold-size seems to me fully as efficacious as the cements with alcoholic solvents. When a second and thicker layer of gold-size has been added it may take weeks to harden, and may be easily indented with the finger after months; but it is probably the more reliable, because it dries so slowly. The brown cement dries more quickly, and has stood the test equally well up to the present.

Desmids, being as a rule far larger than the average run of diatoms, are easily selected either by using a bristle to move them from a drop of fluid into the centre of the slide, or by drawing them up in a finely pointed glass tube, and depositing them on a clean slide. Possibly even a split hair from a shaving-brush, though far too clumsy for manipulating diatoms, might prove useful with the larger desmids. The chief difficulty is that there appears to be no way of fixing the desmids when selected, and there is a risk of their floating from under the cover—or, at least, to the edges of the cell when the cover is applied. To obviate this, Mr. White, of Litcham, has used sunk cells, in which the specimens naturally gravitate towards the centre.

Desmids may often be kept alive in a bottle of water for a considerable time. On lately examining a bottle of material collected last September, I found a number of *Euastrum verrucosum* still living.

There are many points in connection with the manipulation of desmids which I have not tried, and I am in hopes that the present papers may lead other microscopists to give their experiences of them. For example, the use of formalin as a fixative, the best reagents for staining desmids, etc. It would be particularly interesting to learn whether the gelatinous envelope of such species as *Hyalotheca* can be stained, or the tip of *Closterium* showing the motile bodies in their cavity. Apart, however, from the undoubted possibility of improving on the technique, or varying it to suit individual taste or available appliances, it is certain that, given a suitable locality, a great deal of real enjoyment can be got out of collecting and preparing these tiny little plants, without the risk of exterminating or increasing the rarity of species which attaches to the netting of butterflies, or the collection of phanerogams and ferns.

(*To be continued.*)

AN INTRODUCTION TO BRITISH SPIDERS.

By Frank Percy Smith.

(*Continued from page* 330.[1])

FAMILY CLUBIONIDAE.

THE spiders contained in this family are of a more or less cylindrical form. The eyes are widely spread across the front part of the caput, the clypeus being rather narrow. The arrangement of the spinners is very different from that in the Drassidae. The Clubionidae usually live in silken tubes, from which they slip with wonderful rapidity when disturbed. The pubescence on the abdomen often hides to a great extent the real colour of the integument, but this becomes at once apparent when the spider is immersed in spirit.

GENUS *CLUBIONA* LATR.

The eyes in this genus are arranged in the form of a crescent, the posterior laterals forming the extremities. The maxillae are long, the extremities being somewhat enlarged. The spiders which this genus comprises are very similar to one another in appearance, and their differentiation is often a matter of difficulty. The male palpus, particularly the radial apophysis, and the vulva are, of course, almost certain clues to the identity of a spider; but as a large majority of the specimens captured are immature, these indications in that case do not exist. If the eyes are carefully measured, and also the distances between them, the species may be distinguished in most instances. I have made drawings of the eyes of several species; and it will be noticed that the most tangible differences are the relative distances between the eyes of the front row, and also the distance between the hind centrals, compared with their diameters.

Clubiona grisea L. Koch. (*Clubiona holosericea* Bl.)

Length. Male 8.4 mm., female 12 mm.

Cephalo-thorax brown with pale hairs. Legs reddish-yellow, with some spines. Abdomen of a pale brown tint, with a dense covering of grey hairs. The radial joint of the male palpus is of a most curious form, and almost indescribable. This spider, which is not very common, is usually found among the low herbage of damp ditches.

Clubiona terrestris Westr. (*Clubiona amarantha* Bl.)

Length. Male 8 mm., female 9 mm.

Cephalo-thorax pale reddish-brown. Legs reddish-yellow, with spines. Abdomen reddish-brown, clothed with hairs, and having an indistinct marking of a darker hue on the upper side. This spider is not uncommon amongst low herbage and débris.

Clubiona reclusa Cambr.

Length. Male 6 mm., female 7 mm.

Cephalo-thorax with some vein-like markings upon it. Radial joint of male palpus with a very prominent apophysis. *C. formosa* Bl. is probably an immature specimen of this spider.

Clubiona lutescens Westr.

Length. Male 6 mm., female 6.5 mm.

This rare spider is similar to *C. terrestris* Westr., but may be distinguished by the form of the radial apophysis and the palpal organs; the falces are also much longer.

Clubiona neglecta Cambr.

Length. Male 6 mm., female 6.3 mm.

This rare spider may be distinguished from its congeners by the possession of a long, curiously twisted spine connected with the palpal organs.

Clubiona pallidula Clk. (*Clubiona epimelas* Bl.)

Length. Male 10 mm., female 10.5 mm.

Cephalo-thorax of a greenish tint, suffused in front with brown. Abdomen reddish-brown, with small markings of a dark brown colour. The species is common and generally distributed.

Clubiona corticalis Wlk.

Length. Male 12 mm., female 12.5 mm.

(1) This series of articles on British Spiders commenced in Science-Gossip, No. 67. December 1899.

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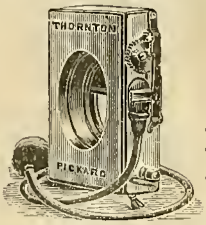

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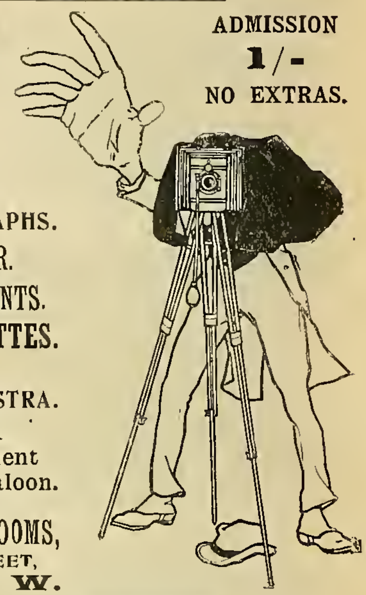

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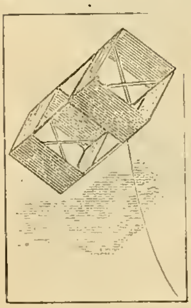

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Cephalo-thorax reddish-yellow. Legs nearly white. Abdomen of a yellowish-grey tint with a central and some oblique lateral markings of a purplish-brown colour. This is a very distinct and handsome spider, and seems to be rather local, though common where it does occur. I have received it in large numbers from Norwich and Oakham.

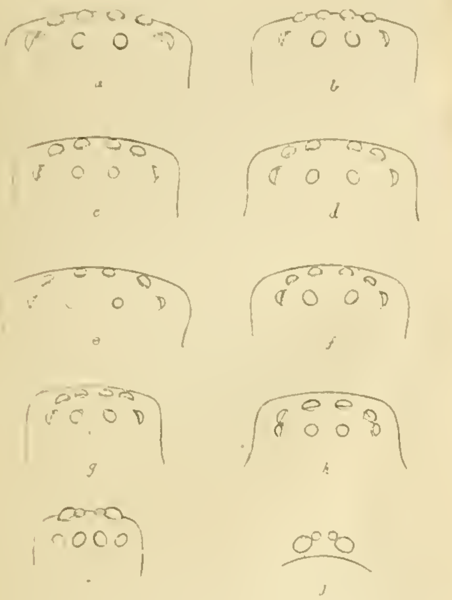

FIG. IX. EYES OF CLUBIONIDAE.

a. Clubiona grisea. b. C. terrestris. c. C. pallidula. d. C. corticalis. e. C. holosericea. f. C. compta. g. C. diversa. h. Chiracanthium nutrix. i. Micariosoma festivum, all from above. *j. M. festivum* from in front.

Clubiona holosericea Degeer. (*Clubiona phragmitis* C. Koch.)

Cephalo-thorax red-brown, the caput being much darker. Legs of a yellowish tint. Abdomen reddish-yellow, with an indistinct central marking of a darker colour. This spider may be distinguished by the form of the falces, which, especially in the male, are enormously developed and very powerful.

Clubiona brevipes Bl.

Length. Male 5.5 mm., female 6.5 mm.

Cephalo-thorax and abdomen of a dark brown colour, densely clothed with grey hairs.

This spider, which is not uncommon, may be found in rolled-up leaves.

Clubiona coerulescens.

Length. Male 6 mm., female 6.5 mm.

Cephalo-thorax yellow. Legs pale yellow. Abdomen reddish-brown clothed with fine hairs. An extremely rare species in this country.

Clubiona compta L. Koch.

Length. Male 4.2 mm., female 5 mm.

Cephalo-thorax reddish-brown. Legs dull yellow. Abdomen dark yellow, with a distinct central reddish-brown marking, followed by several oblique marks of the same colour. This spider may be easily recognised on account of its distinct pattern. It is fairly common.

Clubiona trivialis L. Koch.

Length. Male 4 mm., female 4.5 mm.

This rare spider is similar in shape to the last, but is smaller and not nearly so distinctly marked.

Clubiona diversa Cambr. (*Clubiona pallens* C. Koch and "Spiders of Dorset.")

Cephalo-thorax dull yellow. Legs of a yellowish tint. Abdomen bright orange-yellow with an irregular reddish-brown band along its upper side. This spider is rather rare. I have received it from Shoreham, Sussex, and have taken it quite recently on Wimbledon Common.

Clubiona subtilis L. Koch. (*Clubiona pallens* Bl.)

Length. Male 4 mm., female 4.2 mm.

Cephalo-thorax dark yellow with a tinge of green,

FIG. X. CHARACTERISTICS OF CLUBIONIDAE.

a. C. grisea, radial joint from above; *b. C. grisea*, palpal organs from beneath; *c. C. terrestris*, radial joint from beneath; *d. C. compta*, vulva; *e. C. holosericea*, radial joint side view; *f. C. holosericea*, vulva; *g. C. diversa*, radial joint from above; *h. C. diversa*, vulva; *i. M. festivum*, vulva.

the caput being darker. Legs dull yellow. Abdomen reddish-yellow. A local spider common in the Fens of Cambridgeshire.

(*To be continued.*)

ON COLOURING OF BIRDS' EGGS.

By J. A. Wheldon.

I AM glad to find my notes on this subject (*ante* p. 200) have drawn such an interesting and courteous reply from Mr. Hughes (*ante* p. 241), for which I thank him. It is only by fully discussing such difficulties as are presented that the truth can be arrived at.

In some respects the drift of my remarks has not been fully understood. I certainly did not intend to express, nor do I think my remarks should be construed as expressing, any doubt as to the results of Mr. Hughes's interesting experiments on the chemical composition of the various pigments. These decidedly confirm, or afford additional proof if such is required, that iron is an undoubted constituent of the egg-colouring matters. This I am prepared to fully admit. Indeed it was proved long ago, by the researches of Mr. H. C. Sorby, who, chiefly by means of spectroscopic analysis, distinguished no less than seven different egg pigments, all nearly allied to the colouring matter of the blood and bile ; indeed two of the most important, which he termed oörhodein and oöcyan, closely approach haemoglobin and bile pigment in composition. Now haemoglobin is derived from the red corpuscles of the blood, and is stated to contain 0·4 per cent. of iron, as well as a little sulphur, which is another of the elements detected by Mr. Hughes.

The chemical composition of these organic colouring matters is so complex, however, that the slightest rearrangement of their elements causes an alteration of tint, which might easily be produced by physiological action, such as some selective power of the pigment glands acting on the haemoglobin of the blood. I have seen it suggested somewhere that the effect of the environment upon the mental or nervous constitution of the mother bird during the laying period has probably some influence on the pigmentation of the shell.

The real point at issue between Mr. Hughes and myself is whether the nature of the food bears any relation to or produces any effect on the colouring of the eggs. I was first led to doubt this from the apparently insurmountable difficulty of arranging birds into dietary classes, which would afford parallel groups of eggs separable on account of colour. Nor is this taxonomic difficulty the only one, for after considering the chemical and physiological aspects of the question I feel more strongly convinced than before that we must look in other directions for an explanation of this mystery, which appears to evade solution as pertinaciously as does that affecting the remarkable sculpturing of the eggs of insects and the integuments of seeds and pollen grains.

To arrive at an idea of how slight an influence food is likely to have on the colouring matter of egg-shells, we must consider how the pigment supply is obtained. As is the case with other secretions, I presume it to be extracted by special glands from the blood supply. All birds must obtain iron and sulphur, no matter what the colour of their eggs may be, in order to maintain the supply of red blood corpuscles. It does not appear to me necessary that these mineral essentials should be always entirely drawn from the food supply, for the grit used by many birds and the drinking water frequently contain them. The vital point seems to be this, that no matter how varied the raw material which enters the stomach, the result is invariably the production of blood of fairly uniform composition. I cannot conceive that the particular diet from which the blood is derived can have any influence on the subsequent action of special glands on that fluid, except in extremely abnormal conditions produced by starvation, poison, &c., which do not enter into the argument. Given plenty of food of any of the classes named by Mr. Hughes, fish, seed, or insect, and the bird-machine will evolve so much blood of probably identical composition, from which each species will extract a different shell-colouring peculiar to its kind.

I think it will be found the exception, rather than the rule, that colours in the animal world are much influenced by the chemical composition of the food. I exclude, of course, diseased conditions produced by poisons, under which I would class the action of hemp seed on the plumage of bullfinches, and of cayenne upon canaries. As a solitary example of my meaning, it could not be established that the pigment of the skin and hair of a negro differed from that of a European because of the nature of their diet ; and the same would apply to the various shades of skin, hair, and iris noticeable in many races of man and animals.

I frankly admit that I cannot explain why various birds nesting in similar positions should have different coloured eggs, nor can I call to mind any serious attempt to account for this anomaly. It is one of the afore-mentioned weak points in the argument for protective coloration. I do think, notwithstanding Mr. Hughes's doubts, that a spotted egg has some claims to be considered more protectively coloured than a pure white one amongst the flickering lights and shades of a hedgerow or the foliage of a tree ; the rusty spotted robin's egg might be readily overlooked amongst the russet leaves it delights in strewing about its nest. Spots and streaks on animals, moreover, have been long looked upon as protective ; and in my own experience mottled caterpillars and pale green ones are often equally difficult of discovery on the same background thus reproducing in another direction the case of the hedge-sparrow and robin.

I take exception to Mr. Hughes's statement that only the eggs of birds which nest on the ground are liable to be stolen. The jay and crow are both inveterate thieves of the eggs of birds which nest in hedges, trees, and thickets, and there may be other offenders in this direction, although these are the only ones of which I have actual proof. In other countries serpents would probably be numbered amongst the aggressors.

By the way, Mr. Hughes adduces several instances of protective coloration, some of which had not previously occurred to me. Some of the white-egged species had even prejudiced me against the theory; but Mr. Hughes says most nocturnal species lay white eggs. Is not this because their eggs are not likely to be exposed to enemies by day, as the parents only desert their nests after dark, when protective colouring would be unnecessary? Some birds, also, which lay white or spotless eggs, cover them when leaving the nest. Protective colouring is admitted in the case of several species nesting on the ground, especially that of the nightjar, although I think Mr. Hughes cannot fairly place its egg beside that of the robin as a test, because one of the two would have to be removed from its natural environment. Although the nightjar is a nocturnal bird, its eggs require protection, because they are laid on the ground and exposed to the depredations of small nocturnal mammals unlikely to menace the species breeding in trees and bushes.

I do not contend that protective coloration explains everything, but probably it comes largely into use; and numerous cases will occur to all who are familiar with the nesting of birds. So many exceptions of a puzzling and contradictory nature also occur that I am often led to doubt whether the so-called "protective" instances are not often merely accidental coincidences of colour and surroundings.

In watching a large flock of birds feeding together in a field to-day, this discussion occurred to my mind. There were gulls, rooks, starlings, and lapwings, which daily resort to the low-lying fields around here for sustenance. Their food must be similar, probably worms and grubs in every case. Yet here we have represented olive-green, spotted blue, plain blue, and stone-brown types of eggs, falling under three separate classes of Mr. Hughes's arrangement, and not with the uniformity that similar feeding should produce. No doubt other instances could be adduced.

60 *Hornby Road, Walton, Liverpool.*

BRITISH FRESHWATER MITES.

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

(*Continued from page* 338.)

GENUS *ATAX* FABRICIUS, 1805.

UNDER this genus, there have been between thirty and forty species described during the present century by different writers from various parts of the world. In 1894 Piersig divided this genus into two, retaining the name of *Atax* for one portion and *Cockleophorus* for the other. Koenike does not think Piersig had sufficient grounds to do this, so he ignores the latter name; and in his work on the Hydrachnidae of Madagascar, published in 1898, places all the species of these two genera under the one genus *Atax*. Mr. R. H. Walcott, the American writer on water-mites, thinks the differences in the two genera above mentioned clearly defined, and has accordingly adopted Piersig's suggestions. As I wish to follow Piersig as nearly as possible, I will adopt these two genera, commencing with the genus *Atax*.

Atax has been also divided into two groups, free-swimming and parasitic. The parasitic are to be found within the shells of the fresh-water mussels.

Piersig describes from Germany seven species in the genus *Atax*. In Britain we are behind this number, but I hope our list will be later increased.

The chief characters of this genus are: Body soft. The first pair of legs of an unusual thickness. In the free-swimming species the first pair of legs are provided with long, stout, movable, sword-shaped spines. Second pair of legs usually longer than the third pair. *Epimera* in four groups, the posterior pair being large and having rectangular claws to all feet. Eyes wide apart.

Fig. 1. *Atax crassipes*. Ventral surface of female, showing papillae on posterior margin.

1. *Atax crassipes* Müller.

Female.—Body oval in form, length about 1.20 mm. Colour a pale transparent yellow, with brown markings on the dorsal surface, and a brighter yellow T-shaped patch in the centre. Eyes are small, and wide apart near margin of body; they are of a bright red colour.

LEGS.—First pair about 2.64 mm. in length. Second pair, 3.54 mm. Third pair, 2.44 mm. Fourth pair, 3.28 mm. In colour they are chiefly of the same pale yellow as the body colour, but I took a number of specimens in North Wales in 1896 which had all the chitinous parts of a deep slaty-blue. The first pair of legs are fitted with the long sword-like

FIG. 2. *Atax crassipes.* Genital plate of female.

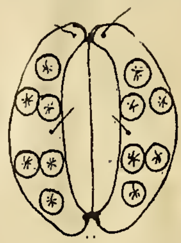

FIG. 3. *Atax crassipes.* Genital plate of male.

spines which are peculiar to this genus; they are very strong, and movable at the base where joined to the leg.

EPIMERA.—In four groups (fig. 1); the posterior pairs are very large.

PALPI.—About 1.0 mm. in length, being very long in proportion to the body. The last segment but one has three very strong pegs on the inner curve.

GENITAL AREA.—Composed of four plates on the extreme posterior margin; each plate holds three discs (fig. 2).

MALE.—Very much like the female in structure. Length 0.92 mm. It also has the two papillae on the posterior margin in the same position as the female; and the long second pair of legs, which measure 3.40 mm. The great difference is in the genital area; here there are only two plates (fig. 3),

FIG. 4. *A. crassipes.* Posterior margin of nymph.

each plate holding six discs in the position shown in drawing.

NYMPH.—Has all the structure of the imago, except that it has only two pairs of discs on the posterior margin (fig. 4).

In Britain we have two distinct varieties of *Atax crassipes*, both having the same specific characteristics; but they differ so much in size that to distinguish one from the other I have named the large variety *major* and the smaller *minor*. In var. *minor* the palpi and legs are shorter in proportion to the length of body than we find in var. *major*; but as they appear to be fairly constant, I think a table showing the differences in mm. will be of great assistance in identification.

Atax crassipes:

	Var. *Major.* ♀	Var. *Major.* ♂	Var. *Minor.* ♀	Var. *Minor.* ♂
Length of body	1.20	0.92	1.0	0.7
,, 1st leg	2.64	2.42	1.40	1.10
,, 2nd leg	3.54	3.40	2.84	2.50
,, 3rd leg	2.44	2.40	1.36	1.10
,, 4th leg	3.28	3.04	1.72	1.50
,, palpi	1.0	0.72	0.36	0.30

The above are mean measurements, taken from a number of specimens.

LOCALITIES.—Very common everywhere. I have taken large numbers from the Norfolk Broads, ponds in Epping Forest, Suffolk, and North Wales.

2. *Atax taverneri* Soar, 1899.

FEMALE.—Body about 1.12 mm. long, breadth about 0.78 mm. Colour a pale straw-yellow. Very similar in structure to the preceding species, and it

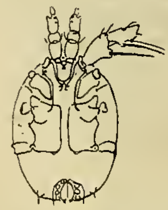

FIG. 5. *A. taverneri.* Ventral surface of male.

may easily be mistaken at first sight for *Atax crassipes*. It has the two papillae on the posterior margin in the same position (see fig. 5).

LEGS.—First pair, 1.44 mm. Second pair about 1.80 mm. Third pair, 1.40 mm. Fourth pair, 1.88 mm. The second pair are in this species longe

FIG. 6. *A. taverneri.* Genital area of female.

than the third; but the fourth are the longest. The first pair have the sword-like spines, as in *A. crassipes*.

EPIMERA.—In four groups, but a hard chitinou

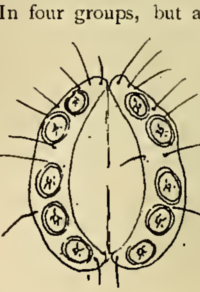

FIG. 7. *A. taverneri.* Genital area of male.

ridge runs down from the first pair of *epimera* to the third (fig. 5).

PALPI. About 0.48 mm. long, with three pegs on the inner curve of the fourth segment.

GENITAL AREA.—Composed of four plates on the extreme posterior margin (fig. 6). The two lower plates contain three discs each, the two upper only two each.

MALE.—Similar to female, except in the genital plates (fig. 7). Here again we find two plates, with five discs on each plate.

LOCALITIES.—Found free-swimming in clear water, at Highams Park in Middlesex, by Mr. Taverner. Several were taken, and a few nymphs.

3. *Atax figuralis* Koch.

FEMALE.—Body about 1.25 mm. long. Pale yellow in colour, with brown markings; it has two very small papillae on the posterior margin, but nothing to be compared to the size of those on the two previous species.

LEGS.—First pair about 1.64 mm. Second pair about 2.58 mm., which, like *Atax crassipes*, are the longest pair. The first pair are not quite so thick as the first pair of *A. crassipes*, but they possess similar long, strong spines.

EPIMERA.—In four groups (similar to fig. 1).

PALPI.—Rather short, being about 0.40 mm.

GENITAL AREA.—Four plates, very much like *A. taverneri*, having three discs in the lower plate and two in the upper one. They differ in this respect

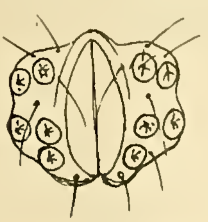

FIG. 8. *A. figuralis*. Genital area of male.

from *A. taverneri*, which has the three lower discs nearly in a line, while in *A. figuralis* they are so placed as to form an angle.

MALE.—Very much the same as female, except in genital area. Here we have two plates, with five discs each, but arranged quite differently from the male of *A. taverneri* (fig. 8).

LOCALITIES.—I have found only three specimens, two females and one male, in September, 1898, on the Norfolk Broads.

(To be continued.)

NEW CATALOGUES.—Messrs. Nachet et Fils, of Paris, send us their catalogue of Microscopes and accessories. Messrs. Bausch & Lomb Optical Company, of Rochester, N.Y., send us catalogues of Photographic Objectives, Shutters, &c.; also of Chemical Apparatus and Reagents. The latter firm have in the press new catalogues of Microscopes and accessories, which we will deal with more fully when they reach us.

THE NATURE OF LIFE.

By F. J. ALLEN, M.A., M.D.

HAVING for many years made a careful study of the fundamental chemistry of life, I hope I may be allowed to offer a few comments on Mr. Geoffrey Martin's paper, "Life under other Conditions," in your issues for March and April (*ante*, pp. 291, 326).

I have given a summary of my views on the nature of life in the Proceedings of the Birmingham Natural History and Philosophical Society for 1899, to which I would refer Mr. Martin and others interested in the subject. Life is too complex to be defined in a concise aphorism. All definitions as yet given have missed the mark; and Mr. Martin's definition of life as "organised motion" is not more successful than the others. In order that it should convey a definite meaning we must first understand what organisation is. Does life depend on organisation, or organisation on life? John Hunter taught the latter, but perhaps the discussion is an empty one, for *life* and *organisation* are almost synonymous terms.

The most fundamental physical phenomenon of life is the *energy traffic*, or the function of trading in energy. The chief physical function of living substance is to gather up radiant energy (*e.g.* from the sunshine), store it in the potential form, and afterwards to disperse it in the active or kinetic form. The complex chemistry of life differs from other kinds of complex chemistry, such as that of the silicates, in that the former entails great changes of energy, whereas the latter does not.

In seeking an explanation of the chemistry of life, investigators have confined their attention too exclusively to the properties of carbon. If they had given equal attention to nitrogen, they might have realised long ago that the most characteristic phenomena of life are due to this element. The intense instability or "lability" of living substance is a specialised form of the lability of nitrogen compounds, as seen in gun-cotton, nitro-glycerine, fulminic acid, "lyddite," etc. These compounds are formed of the same elements (nitrogen, oxygen, carbon, hydrogen) that form the bulk of living substance. Nitrogen combines readily with many other elements, but has no strong attractions and few preferences, the result being that its compounds are the most changeable on earth. They are also the most various in their properties. Compare nitric acid, ammonia, cyanogen, azo-imide, etc. In short, nitrogen may be called the *critical element* of this world, *i.e.* the element which under the given circumstances is always wavering as to its state of combination.

Carbon, on the contrary, has one overruling attraction—namely, for oxygen. It would exist on this earth in combination only with oxygen, as carbon dioxide and carbonates, were it not for the action of nitrogen. It seems that under certain circumstances nitrogen compounds can interact with carbon compounds, the nitrogen drawing off the oxygen from the carbon and causing a re-arrangement of the elements. Thus are produced the immense number and variety of organic compounds.

In these actions nitrogen behaves as "middle-man"; *i.e.* all the elements pass in and out of the compounds by forming a temporary union with the nitrogen. Oxygen also plays an important part; indeed, so far as I can discern, *every vital action involves a passage of oxygen either to or from nitrogen.*

The great vital function of carbon is *the storage of energy.* The removal of oxygen from carbon, with the substitution of some other element, involves an accumulation of energy in the new carbon compound. Thus the complex carbon compounds in living beings represent a store of potential energy which can be expended in an active or kinetic form during vital oxidation.

The functions of phosphorus, sulphur, and iron are very important to life, and those of several other elements are only a little less important; but they cannot be discussed within the limits of this article.

It seems probable that very diverse kinds of life may occur in other parts of the universe, and that different sets of elements may be engaged, according to the circumstances of each case; but the properties of silicon, mentioned by Mr. Martin, do not suggest vital activity; nor represent any important trade in energy. We have yet to find a class of silicon compounds which could behave like carbon compounds in the storing of energy. Silicon seems to perform a passive, not a dynamic function in the life of this world. There are other elements whose properties seem more suited than those of silicon for vital functions at high temperatures: such are iodine, iron, and phosphorus.

It is hardly probable that the surface of the earth was ever at a very high temperature. According to the meteoric theory, the earth began its existence as a collection of cold meteoric fragments, dust, and gases. Heat was produced internally by compression; but the surface always retained a balance between the high temperature of the interior and the low temperature of stellar space. A small world like ours could produce but little heat internally, and its surface would always have been cooled nearly to the absolute zero, had it not been for the compensating action of the sun's radiation, which has kept the balance at a higher level. The surface temperature is shown by geological evidence to have been for countless millions of years about the same as now. Igneous rocks seem never to be formed at the surface. They are produced at a considerable depth, and especially at points where lateral pressure causes a rise of temperature. Thus there may never have been on this earth's surface a temperature high enough for any kind of life but nitrogen life; and the vast age during which this kind of life has existed helps to account for the complexity and perfection of its products.

Kingsleigh, Colwall, Malvern,
April 10, 1900.

ECONOMIC ENTOMOLOGY IN ARIZONA.

By Professor T. D. A. Cockerell, F.Z.S.

The Marked Mealy-wing.

On October 17, 1899, at Mesa, Arizona, I found on a few orange-trees in a single orchard rather numerous examples of a minute flying insect, a variety of *Aleurodes mori* of Quaintance, a species of mealy-wing. These creatures are pale lemon-yellow, with four white wings, on which are rather conspicuous black marks. The markings on the upper wings consist of a spot on the lower margin near the base, an oblique band near the middle of the wing, bent sharply backwards some distance before the lower margin, forming a V, of which one arm is longer than the other. A transverse band near the end of the wing is broadly interrupted in the middle; and a longitudinal band passing from the tip of the wing between the halves of the transverse band, or sometimes not long enough to reach the latter. On the under sides of the orange leaves will be found minute black objects, fringed with white. These are the pupae of the mealy-wing, from which the adults emerge.

This is not the same mealy-wing which has been so troublesome in orange groves in Florida: it may readily be known from that by the markings on the wings. It very closely resembles the *Aleurodes mori*, lately described (Can. Ent., 1899, p. 1) by Professor Quaintance for Florida and Jamaica, infesting mulberry and a variety of other trees. It has also been found by Professor E. E. Bogue on leaves of *Morus rubra*, growing on the grounds of the State University of Ohio, at Columbus. Recognising this resemblance, I sent specimens to Professor Quaintance to be compared with his insect, and he replies (December 17th, 1899) as follows:—"The *Aleurodes* on orange is quite like *mori*, indeed. It will, however, average larger; and in the adult the pattern of wing-markings is somewhat different, and the red

SCIENCE-GOSSIP

AN ILLUSTRATED MONTHLY RECORD OF

NATURE AND COUNTRY-LORE

AND

APPLIED SCIENCE

EDITED BY

JOHN T. CARRINGTON

ASSISTED BY

F. WINSTONE

VOL. VI.—NEW SERIES

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"EACH MIGHT HIS SEVERAL PROVINCE WELL COMMAND,
WOULD ALL BUT STOOP TO WHAT THEY UNDERSTAND."

Alexander Pope.

"NEW OBJECTS AFFORD US GREAT DELIGHT, ESPECIALLY IF FOUND OUT BY OUR OWN INDUSTRY." *John Ray*, 1722.

"FELIX, QUI POTUIT RERUM COGNOSCERE CAUSAS."

Virgil.

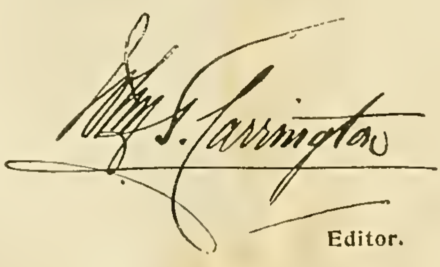
Our Annual Greeting.

NOW that another volume of Science-Gossip has been issued from its independent offices at 110 Strand, the Editors may justly congratulate the contributors upon the continued excellence of its contents. In doing so, we would thank them all, and especially those who have furnished the serial articles of scientific value. We are grateful for assistance to our honorary departmental editors for Astronomy, Geology, Microscopy, Mollusca, and Physics, whose columns have been so interesting to students in those branches of science. We would add our thanks also to Mr. Dennett and Mr. Shillington Scales, for their very useful chapters for beginners in Astronomy and Microscopy, respectively.

A new feature will commence in the coming volume, by the addition of a department for Experimental Chemistry. This will be conducted by Mr. Harold M. Read, F.C.S., a gentleman with special knowledge in that department of the science, and professionally engaged as adviser in the making of apparatus used in Experimental Chemistry. This innovation has been arranged for our magazine, in consequence of frequent requests from readers, for more attention to the subject. We shall be pleased to have articles and notes from them for consideration. It is hoped to add other improvements to our pages during the coming year, including a department for Photography as applied to science and generally.

We venture to ask our readers for further support in extending the circulation of Science-Gossip by bringing it before the notice of their friends and correspondents. Continued improvements mean increased expense ; therefore an enlarged circulation indirectly benefits those who help us to obtain the means necessary for the many features that could be added to our pages.

110 *Strand, London.*
May 1900.



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markings which I have always noticed in *mori* are quite absent in the specimens sent. This may be within the variation of the species, and it would seem safe, for the present at least, to refer your orange specimens to *mori*." While I think it is not improbable that we have to do with a distinct, and new, species, it will not be amiss to follow Professor Quaintance's suggestion for the present.

At present the creatures are not nearly abundant enough in Mesa to make it worth while to take measures against them.

Other species of *Aleurodes* were found on ash at Phoenix and on maple at Mesa, but they were not numerous enough to do any harm. They are the red-banded vine-hopper (*Dicraneura cockerelli* Gillette) and the variegated vine-hopper (*Typhlocyba vulnerata* Fitch). These two species of vine-hoppers were observed to be common on the grape-vines at the experiment station at Phoenix, Arizona, October 9th. The red-banded species was the more abundant. It is of a light yellow colour with greenish eyes, thorax marked with orange; wings with a broad oblique irregular band of the brightest red and a small black spot not very far from the end. The variegated species has a darker tint, being variegated or marbled with white, dull red and grayish. The banded species was also common at Mesa. In the Mesilla Valley of New Mexico the vine-hoppers are *Dicraneura cockerelli* and *Typhlocyba coloradensis*, but in the Salt River Valley *T. vulnerata* takes the place of *T. coloradensis*.

It is not usually worth while to take any measures against these insects in New Mexico, and probably they are no more troublesome in Arizona. It is desirable, of course, to collect and burn up all the leaves and trash about the vineyards in the winter, so as to get rid of the hibernating hoppers.

The Locust-Tree Shield-Scale.

The typical form of this scale (*Lecanium robiniarum* Douglas), on locust, was not observed; but what must be regarded as a variety of it was found in Phoenix on osage-orange and pepper tree. The scale is very convex, dark brown, hard, about or nearly a quarter of an inch long. So far as observed, it was not abundant enough to call for remedial measures. Mr. P. J. Parrott, of the Kansas Agricultural College, has been so good as to prepare a description of the Phoenix specimens, which is given herewith for the use of entomologists.

"*Lecanium* (*Eulecanium*) *robiniarum*, var. Female, 5 to 6 mm. long; 4 mm. wide; 3 to 4 mm. high; hemispheroidal, chestnut-brown, somewhat shining, which is often concealed by a slight frosting. Some specimens are quite smooth and retain their form without foldings, while others are plicate and pitted. Specimens boiled in caustic potash give a reddish-brown colouring matter, and do not bleach readily. Mouth-parts prominent. Antennae and legs are apparently deciduous. The antennae are seven-jointed, the third joint being the longest, and the sixth the shortest. The measurements of the joints of one antenna were as follows, in micromillimeters: (1) 49; (2) 28; (3) 70; (4) 20; (5) 21; (6) 14; (7) 35. Formula 372546. Legs rather small and slender, measuring as follows: coxa, 70–91; femur with trochanter, 119–140; tibia, 70–105; tarsus, 56–70; claw, 12–21 micromillimeters.

"These descriptions from specimens from osage-orange agree with the typical *L. robiniarum* in the fine punctuation along the lateral margin, and in the presence of the large gland pits, but differ from it in that the tesselature is very marked, particularly along the margin. Specimens from pepper tree (*Schinus molle*) present several slight differences. They average about 5 mm. in length, 4 mm. in width, and from 3·5 to 4 in height. The flatter specimens resemble those of the osage-orange very closely, while the more convex specimens are quite smooth, and less shiny, and possess little or no frosting. Boiled in caustic potash they give a reddish-brown colouring matter, and become very transparent. Legs and antennae are not easily obtained. The antennae are seven-jointed; the segments measure as follows in micromillimeters:—(1) 14; (2) 46; (3) 79; (4) 25; (5) 23; (6) 23; (7) 41. Formula 3274 (56). The measurements of the parts of the legs are as follows:—coxa, 70; femur with trochanter, 140; tibia, 98; tarsus, 70; claw, 20 micromillimeters." (P. J. Parrott.)

The Olivaceous Locust.

A variety of *Melanoplus olivaceus* Bruner (MS. Scudder) was found in Mesa and Phoenix in October on the orange-trees; but so far as observed, not abundant enough to do any serious damage. The typical *M. olivaceus* is from Los Angeles, California; the Salt River Valley insect is a distinct variety or sub-species, having the following characters:—Male cerci not quite so broad at apex as in type. Lateral angles of pronotum with a more or less well-defined narrow pale stripe, edged below with black; disc of pronotum varying from dark olivaceous to a more ferruginous tint, and the transverse sulci are usually marked out in lighter colour. Femora largely scarlet on the inner side. This must not be confused with *M. thomasi*, from which it is easily known by the paler, nearly uniform colour and measurements. The female *M. thomasi* has short tegmina, not reaching the tip of the abdomen. The following measurements are in millimeters:—

	Length of body	Tegmina	Hind femora
M. olivaceus, type; male	23	20	13 3/4
,, ,, female ..	29	25 1/2	15 3/4
,, Arizona variety; male ..	28	24	16
,, ,, female	38–42	26 1/2–29	20–21
M. thomasi, from Tularosa, N.M., male ..	31	23	17
,, female	35–40	22 1/2–23	18–19

A HISTORY OF CHALK.

By Edward A. Martin, F.G.S.

(*Continued from page* 337.)

THE Upper Greensand has been divided by Dr. Barrois into two zones—viz. the zone of *Pecten asper* above, and the zone of *Ammonites inflatus* below. Taken as a whole, it may be said to consist of clays and sandstones, with thin bands of calcareous grit known as Chloritic Marl; this latter contains an abundance of phosphatic nodules. The Chloritic Marl may be held to represent the product of the action of an advancing sea. As erosion went on, fossils derived from strata undergoing the process found their way into the Marl forming. According to Murray and Renard ("Deep Sea Deposits," p. 396), phosphatic nodules tend to accumulate where currents meet, and it is well to bear this in mind in connection with the many nodular layers in the Cretaceous formation. If a shore on which an influx of currents played were undergoing depression, the result would be that the layers of nodular Marl forming would represent different phases of time, and as in the case of the Chloritic Marl of the West of England, would contain fossils proper to various zones. It has been estimated that at the shallowest the Marl was laid down in about 100 fathoms of water.

The Chloritic Marl derives its name from the grains of glauconite scattered throughout the Marl. The particles are of a dark olive-green colour, and are of a crystalline nature. In chemical composition they consist chiefly of silicates of aluminium and magnesium, and usually contain a proportion of iron. This Marl constitutes a basement bed to the chalk. Jukes-Browne says:—"There is evidence of strong current action at this epoch, and these currents seem to have swept away portions of the deposits where they formed the sea-bottom, sifting the soft marls and sands, washing out such fossils as were hardened by the deposition of phosphate of lime, and incorporating them in the basement-bed of the new formation. In the South of England it contains fossils derived from the *Pecten asper* zone; but in Bedford and Cambridge the derived fossils have been obtained from the gault, and the bed is sometimes called the *Cambridge Greensand*." The Cambridge Greensand is a coprolitic bed, and where it occurs the gault proper is but a few feet thick; whilst the Greensand is crowded with fossils, both derived and otherwise. Nodules of phosphate of lime are in such abundance as to have been largely worked for artificial manure.

In a similar way to that in which, as we have already seen, the remains of animals are even now, in our existing seas, being enveloped at certain depths in oxide of manganese, so here, as the sea became shallower, animal remains became phosphatised and were imbedded in the deposit forming; along with boulders from neighbouring shores where the older rocks of slates, schists, and granites were exposed.

The Cambridge Greensand is remarkable for the evidence that it affords, by its included fragments of various rocks, of the source from which it has been derived. The currents that brought together the derived material of the bed also brought fragments of basalt, granite, felstone, sandstones, quartzite and slate, with an occasional piece of limestone. Mr. Whitaker suggested in his "Geology of London" that these fragments were derived from a tract of land off our eastern coasts, which, before the Chalk was laid down, formed an exposed area and suffered denudation at the time. Also from the nature of these fragments we may be fairly certain that the then-exposed area was one of ancient palaeozoic rocks. In a boring at Culford, 25 miles from Cambridge, palaeozoic rocks have since actually been found immediately beneath the Gault Clay. It is possible, as Jukes-Brown points out, that the derived nodules of the Cambridge Greensand may have been obtained rather from the Gault, which probably exists underground in the neighbourhood of Cambridge, and nearer to their present home; whilst on the erosion of the Gault they became transferred to the bed that was forming, and which we now call the Cambridge Greensand.

While the Gault and the Upper Greensand were being deposited in the east, a local deposit was taking place in Dorsetshire and Devonshire, that has been termed the *Blackdown Greensand*. A corresponding depression to that of the Gault Sea was in existence here, although, perhaps, not to the same extent. This bed is probably of the same age as part of the Gault, and the Upper Greensand, and is deposited unconformably upon Triassic beds.

The greater part of eastern England must have sunk beneath the waters of the Gault Sea, but unlike the conditions of sea and land areas in the true Chalk age, Wales probably was still dry land, as well as the north-west of England. A change, however, came over the land in these parts. The shallowing of the Gault Sea, which altered the character of the deposit from a clay (Gault) to a sand (Upper Greensand), did not continue until the succeeding Greensand was actually raised above the ocean. There is no palaeontological break between the Upper Greensand (Chloritic Series of Lyell) and the early Chalk beds, so we may safely assume that deposition went on continuously. The land, too, after possibly remaining almost stationary for a long period, commenced to sink. The Lower Chalk beds then began to be formed. With these we propose to deal separately.

(*To be continued.*)

The Jubilee Celebration Meetings of the Royal Meteorological Society were most successful, and included commemoration meeting, conversazione, excursion to the Royal Observatory, Greenwich, and a dinner.

COUNTRY LORE

Alien Queen Ant. The ants concerned in the following account belong to two common species. The one is *Lasius niger*, the small brown-black ant that builds its nests in gardens and in hedgerows. The other, *L. umbratus*, a fairly common species, though not so frequent as *L. niger*, is often overlooked, owing to the resemblance its workers bear to that commonest of all English ants, the yellow *L. flavus*. In August, 1896, I had in captivity a nest of *L. niger*, which through an accident lost its queen, that had been injured in moving the nest. The ants still crowded round the dead body for three weeks, when it was brought out of the nest and thrown away. The nest being a flourishing one, I was desirous of getting it a queen; but, knowing the almost entire refusal of all ants to accept a new queen, I was at a loss as to what should be done. I had at the time a solitary fertile female *L. umbratus*, and finding that when placed in a box with several *L. niger* workers she was not attacked, I put her into the queenless nest of *L. niger*. It might be mentioned that the female *L. umbratus* is not at all like the female *L. niger*, the latter being larger, darker, and of a different form. Nevertheless the little black ants received the strange queen with "open arms," and she was very shortly established as queen of the nest. To anyone acquainted with ants' habits, this event will appear extraordinary enough. During the year 1897 all the eggs and larvae left by the old queen hatched, the last brood of larvae living through the winter; but in that year and the next, though I paid careful attention to the nest, I was unable to trace any of the offspring of the *L. umbratus* queen to maturity. As the workers of *L. umbratus* are bright yellow, and those of *L. niger* are black, there is no possibility of confusing the two. During the next year, 1899, however, numbers of the *L. umbratus* workers hatched, over 300 being observed by me to hatch. They were assisted by the *L. niger* workers. All of these young ants were either killed at once and eaten, given to the larvae as food, or killed after a few hours' duration. Some very few were allowed to live for a day, and others were carried out of the nest either before hatching or immediately afterwards, and thrown into the surrounding water-ditch. Owing to this sudden influx of unnatural food, the nest refused food of other kinds for some days. I had noticed that the queen paid peculiar attention to the larvae before they changed to pupae, examining them and licking them—a rather unusual proceeding for a queen ant. Perhaps she feared for them in the midst of barbarous strangers. I rescued about thirty of these young *L. umbratus* workers, and about the same number of pupae, and formed a small nest, giving them a young fertile *L. umbratus* queen which I had found previously. This small nest was augmented by occasionally taking pupae from the nest of *L. niger*, and placing them outside, the workers carrying them inside. Among these pupae I once put about a dozen pupae of the little black ants, *L. niger*, and was surprised to find that the *L. umbratus* workers carried them in as readily as those belonging to their own species. However, these dozen pupae, before being opened, were kept longer in the nest than was good for them, and in consequence nearly all were dead when taken out. These the *L. umbratus* workers used for food; but I noticed one or two alive that lived for a day or two, afterwards disappearing. When all the pupae had hatched, two black ants were left alive, and lived amicably in the nest all the winter, their black colour showing a sharp contrast to the bright yellow of their hosts. One of them—the smaller—mingles freely with the others, and crowds with them round the queen. The other—a large ant—always holds aloof, and once or twice I saw it attacked for a short time by a *L. umbratus* worker. In February of the present year, when the ants, kept in a warm room, began to be active and to require food, I saw no workers of *L. umbratus* feeding outside their nest. Thinking that they must require food I kept a close watch upon them, and found that about eight o'clock every morning the larger *L. niger* came out to the honey and fed, afterwards returning to the nest and feeding the *L. umbratus* ants. I never saw the other *niger* come out, nor any *L. umbratus*. This arrangement still goes on, but I have not seen the *L. niger* feeding the queen; probably the ants of her own species alone do that. It might be suggested that the rightful owners of the nest compel the solitary ant, as their slave, to work for them; but I suspect the reason lies in the greater activity of *L. niger*, the *L. umbratus* being timid and rather sluggish, not caring to venture out so early in the year. The former case of a *L. umbratus* queen in a nest of *L. niger* is interesting as throwing a light on slavery and the case of the extraordinary ant *Anergates*. If in this nest the young workers of *L. umbratus* should ever be allowed to live, they would quickly outnumber the *L. niger*, who would practically become their slaves.—(*Rev.*) *W. Cecil Crawley, Oddington Rectory, near Oxford.*

Late Spring in North Devon.—This spring of 1900 is one of the most backward on record for many years past. Cold easterly and northerly winds predominated during February, March, and until the middle of April. Swallows were not seen until the 17th of the latter month, when four crossed this village hurriedly from east to west, as though still on migration. Up to this, April 19th, not any other summer migratory bird has been seen, excepting a fine wheatear in breeding plumage. It sometimes happens in this district that summer almost leaps from lagging spring when it has been cold as this season. This year we have missed those days when, as Tennyson sang in "Sir Launcelot and Queen Guinevere," "The maiden Spring upon the plain Came in a sunlit fall of rain." By the way, when the sun shines through rain in these parts of the country, the peasantry call it a monkey's birthday Can anyone suggest the origin of the expression? The rainfall recorded during February last by Mr. T. H. Briggs in the raingauge on the lawn of Rock House, Lynmouth, was exceptional, being so high as 7·81 inches that fell on the nineteen days when it rained. During the previous two Februarys the fall was on twenty-one days in 1898 = 2·62 inches, and in 1899 on twelve days 4·34 inches fell. Not any but hybernated butterflies have yet been seen, and these included the "brimstone" (*Gonopteryx rhamni*), tortoise-shell and peacock butterflies (*Vanessa urticae* and *V. io*). Wild flowering plants are generally backward.—*John T. Carrington, Lynmouth.*

BOOKS TO READ

NOTICES BY JOHN T. CARRINGTON.

Flowers of the Field. By the late C. A. JOHNS, B.A., F.L.S. 29th Edition. Re-written by G. S. BOULGER, F.L.S., F.G.S. lii. + 926 pp., 7 in. × 5 in., with numerous illustrations. (London: Society for Promoting Christian Knowledge, 1899.) 7s. 6d.

A new flora of British plants is welcome. Although this is the 29th edition, it is practically new, as Professor Boulger has re-written and revised the entire volume. It is also enlarged and somewhat altered. It thus becomes, under Professor Boulger's charge, a book to be relied upon, which could hardly be said previously. In its new form "Flowers of the Field" will be found a useful book for the beginner in the study of field botany and for the lover of plants generally. We dislike to find fault, but in trying to get conciseness the author has carried that generally desirable quality almost too far in his omission of the distribution of plants; there is hardly any indication in what British region some very local plants may be found.

The Story of Life's Mechanism. By H. W. CONN. 219 pp., 6 in. × $3\frac{3}{8}$ in., with 50 illustrations. (London: George Newnes, Limited, 1899.) 1s.

As an example of the present condition of public opinion this small book is instructive. Even within our own lifetime the publication in shilling form of the information contained herein would have raised a violent protest from those who arrogated to themselves the direction of that which was to be read by the young. The author deals largely with the lower forms of life, embryology and evolution.

Sexual Dimorphism in the Animal Kingdom. By J. T. CUNNINGHAM, M.A. xi. + 317 pp., 9 in. × 6 in., with 32 illustrations. (London: Adam and Charles Black, 1900.) 12s. 6d. net.

In this book Mr. Cunningham, so well known for his investigations among our marine fishes, has worked out the theory of the evolution of secondary sexual characters. To quote from the introduction: "The essentials of animal existence are the acquisition of food, the escape from enemies, and the generation of offspring. Under different conditions these objects are attained in different ways. In the most familiar animals we observe in the bodily structure striking and complicated mechanisms for attaining them. Such co-ordinated structural adjustments are called adaptations. The study of the modes in which the structure of the bodies of animals enables them to maintain their existence leads to two great questions: (1) Is everything in structure essential or advantageous to the maintenance of life?; (2) What is the cause by which adaptations are produced?" This is the basis of Mr. Cunningham's inquiry. He extends it to the differences between closely allied animals and even individuals of species. This brings us to the reasons for deviations in kinships which go to form species and sub-kingdoms. The title of the book thus indicates its object. It is a thoughtful work, and if only a fragment on account of the future literature of a great subject, it forms a sound basis for the commencement of a valuable course of study, and one that may be pursued by most intelligent persons.

A Treatise on Zoology. Edited by E. RAY LANKESTER, M.A., LL.D., F.R.S. PART III. ECHINODERMA. By F. A. BATHER, M.A., assisted by J. W. GREGORY, D.Sc., E. S. GOODRICH, M.A. viii. + 344 pp., $9\frac{1}{4}$ in. × 6 in., with 308 illustrations. (London: Adam & Charles Black, 1900.) 15*s.* net.

This is the first volume issued of what promises to be an admirable library in itself relating to the subject of zoology. Under the able supervision of Dr. Ray Lankester, the Director of the British Museum of Natural History, such a work cannot fail to be of the highest authority. It is to be issued in parts, as written, and the portly volume before us forms an excellent specimen from which to judge the prospects of the work in full. We have already promised by the publishers: Part I., Introduction and the Protozoa; Part II., General Discussion of the Metazoa—The Porifera—The Hydromedusa—The Scyphomedusa—The Athozoa—The Ctenophora; Part III., the volume under notice; Part IV., The Mesozoa—The Platyhelmia—The Nemertini. Very wisely, the publishers intend issuing the parts as ready, and without waiting for sequence. The design of the work seems to be admirable, the terminology the most recent, the illustrations well chosen, and at the end of each division is a bibliography that enables anyone desiring further information to save much time in literary research. The parts of this splendid work should be secured as they appear for every public library in the kingdom and Colonies. Private students will find it a necessity.

Lessons in Elementary Physiology. By THOMAS H. HUXLEY, LL.D., F.R.S. Enlarged and Revised Edition. xxiv. + 611 pp., $6\frac{1}{2}$ in. × 4 in., with 187 illustrations. (London and New York: Macmillans. 1900.) 4*s.* 6*d.*

A revised edition of this standard book will be useful to many persons as well as to young students at large. Dipping into its pages recalls the charm of the late Professor Huxley's style, which is always a pleasure to read.

Scientific Study of Scenery. By JOHN E. MARR, M.A., F.R.S. x. + 368 pp., $7\frac{1}{2}$ in. × 5 in., with 21 illustrations and 80 diagrams. (London: Methuen & Co. 1900.) 6s.

In introducing this work to his readers, Mr. Marr very properly points out that the natural sciences are too frequently regarded from a purely philosophical or a merely economic standpoint, and that their aesthetic side is too generally ignored; though this is a valuable means of education. A scientific study of the causes that have left the earth's surface in its present varied form and those which continue to change the scenery of every district is within the power of every person, even those without previous instruction on the subject. This possibility is gained through such a book as that before us. To fully attain aesthetic culture and consequent pleasure through full appreciation of scenery, we should have at least a general knowledge of its origin. In the twenty chapters constituting this book, Mr. Marr clearly explains in easy language the natural phenomena that brought about earthly change on its surface and what have been, or will be, the results.

He then takes the reader through the different types of scenery, commencing with mountains, that occupy three chapters. These are followed by two others on valleys and a like space on lakes. The rest of the chapters are devoted to volcanoes, plains, and plateaux, deserts, frost, snow and ice, glaciers and ice-sheets, signs of former glaciation, oceans; and, finally, a general conclusion. In discussing these subjects Mr. Marr has given many of his instances from our own islands, but has necessarily had to go abroad for others. All are clearly illustrated by reproductions of photographs taken in some cases for the purpose. We give one example, with the permission of the publishers. It is a view of High Force in Yorkshire to show one form of valley making. The other illustrations are varied views, each given with a view of explaining the formation of scenery. Thus in a small compass we have

"High Force." Teesdale.

(*From the Scientific Study of Scenery.*)

a book that will give food for thought to any of us who care to trouble to know more than hitherto about either familiar surroundings or the places we see in our travels or of which we read elsewhere. It is a good book and one sure to be largely read.

Illustrated Annual of Microscopy, 1900. 148 pp., $9\frac{3}{4}$ in. × 7 in., with 7 plates (2 coloured) and 115 other illustrations. (London: Percy Lund, Humphries & Co., Limited.) 2s. 6d.

The large sale of the 1899 Annual has evidently justified the publishers in continuing their venture, and the present Annual is in no way inferior to its predecessor either in variety of interest or in appearance. The contributors are writers well known in the microscopical world; while the printing, paper, and beautifully produced illustrations reflect the greatest credit upon all concerned in the publication. We miss in the present volume Dr. Henri Van Heurck's review of microscopes and apparatus during the preceding year, but the publishers have left the individual makers to speak for themselves as to their own productions, and the plan seems to have worked well. We have not space to mention in detail the long list of contributors and their respective articles; but we may refer to a coloured plate with key, illustrative of pond-life, which will interest beginners in this hunting-ground so dear to the amateur microscopist, and also to a coloured drawing of a hyaline daphnia, as shown by dark-ground illumination, due to Mr. D. J. Scourfield. This drawing is really quite a work of art. Among other interesting articles we may mention a further contribution by Mr. Julius Rhineberg on Multiple Colour Illumination; an article on "Some Mollusca and the Microscope," by Mr. Wilfred Mark Webb, with micro-photographs of odontophores, etc., by Messrs. F. Noad Clark and William Moss respectively; an illustrated note on the genus *Arrenurus* of Fresh-water Mites, by Mr. Chas. D. Soar; and an article on Dental Histology that will be of service to many workers in this field of research. There are several very practical notes on photo-micrography, including one on chromo-photo-micrography. In fact, the varied contents will interest all microscopists, and we can strongly recommend the volume to their notice. We are glad to see this second year's issue and trust the "Annual of Microscopy" has come to stay. F. S. S.

SCIENCE GOSSIP

THE death of Dr. St. George Mivart, which took place on March 30th, at the age of seventy-three years, was not unexpected. He was born in London and was educated at Harrow, King's College, London, and the Roman Catholic College of St. Mary at Oscott, near Birmingham. He joined the Roman Church in 1844, and it will be remembered that quite recently he was denied its sacraments in consequence of the advanced thought expressed in his later writings. Dr. Mivart was for a time Professor of Biology at University College, Kensington, was M.D., Ph.D., F.R.S., and of several other learned societies. Among his best-known books was the important comparative anatomical treatise on "The Cat."

MR. H. SOWERBY WALLIS, the eminent meteorologist, will continue, as already announced, the rainfall organisation founded by the late G. J. Symons, F.R.S. Mr. Wallis writes asking those who have contributed records in future to address them to himself at 62 Camden Square, London, N.W. In writing he adds: "The burthen without his (Mr. Symons's) aid and counsel will be a heavy one, but I am hoping that it will be lightened by the feeling that his correspondents will heartily co-operate with me in carrying out his wishes." Doubtless, new contributors would be welcomed.

THE "Victoria History of the Counties of England," which is being prepared under the supervision of an important Advisory Committee, with offices at 2 Whitehall Gardens, Westminster, with Messrs. H. Arthur Doubleday, F.R.G.S., and G. Laurence Gomme, F.S.A., as joint general editors, will include chapters on the fauna and flora of the respective counties. Mr. Doubleday is appealing to recognised workers in various branches of Natural Science for assistance in completing the lists of species occurring in various counties.

WITH regard to the fruiting of *Euonymus japonica* at Southend (*ante*, p. 343), we note a communication from Mr. J. C. Tonkin, of St. Mary's, Scilly Isles, who says:—"Seeing an article in a recent issue relative to the fruiting of the euonymus, I should like to add my testimony as regards that shrub. I have grown it for more than thirty years. During that time I have raised from cuttings many thousands. I have in my grounds fences from ten to twelve feet high. It is grown chiefly through the islands for shelter for the narcissus fields. During the whole time that I have grown it I never have seen the least sign of a fruit until the past winter, when the fruit was very abundant, resembling holly berries—indeed, it was freely used for decorations in lieu of the holly. As a protection from the wind I know of nothing so effective. It will stand any amount of pruning. I have fences in my grounds that would resist a charge of heavy cavalry."

THE following are among the lecture arrangements at the Royal Institution after Easter:—Dr. Hugh Robert Mill, Three Lectures on Studies in British Geography; Dr. Alexander Hill, Two Lectures on Brain Tissue considered as the Apparatus of Thought; Professor Dewar, Four Lectures on A Century of Chemistry in the Royal Institution. The Friday Evening Meetings will be resumed on April 27th, when a Discourse will be given by the Right Hon. Lord Kelvin on Nineteenth-Century Clouds over the Dynamical Theory of Heat and Light.

THE death is announced of the eminent French biologist, M. Milne-Edwards, Chief Officer of the Paris Museum of Natural History. He was 84 years old.

LEAFLET No. 63, on the destruction of charlock, is issued by the Board of Agriculture. Charlock is a wide term covering a series of corn-weeds, including *Brassica sinapis*, *B. sinapistrum*, and *B. arvensis.* These leaflets are issued free on application to the Secretary, 4 Whitehall Place, London, S.W.

SPECIMENS of a process of printing pictures of lepidoptera in their natural colours have been submitted to us by Mr. Bernard Piffard. They are interesting, as they form a kind of "nature printing" of butterflies and moths.

IN connection with the annual Congress of the South-Eastern Union of Scientific Societies, to be held at Brighton on June 7th, 8th, and 9th, there is to be a photograph exhibition illustrating the association of photography with scientific work. The exhibits will not be confined to the members of the Union, and the Committee will welcome outside assistance. The Secretary's address is Mr. H. E. Turner, B.Sc., Lindfield Lodge, Folkestone.

WE note the record of death of a celebrated Continental lepidopterologist, Dr. O. Hofman, which occurred on February 22nd. His careful and painstaking investigations among the microlepidoptera are renowned, and after half a century's work in that section of the Order his books have become authoritative. Among other obituary occurrences for the past month is the death of Sir William Overend Priestley, the well-known surgeon and naturalist. He came of the same family as the celebrated discoverer of oxygen, and was born at Morley Hall, near Leeds, in 1829. The Liverpool Geological Society has lost its founder by the death of George Highfield Morton, an authority on the formations in the neighbourhood of that city. Those botanists who have often read the notes appended to the descriptions of plants in "Sowerby's British Botany" will be sorry to hear of the death of Mrs. Lankester, their author. She was widow of Dr. Edwin Lankester, the popular scientific writer of a generation ago.

THE National Photographic and Allied Trades' Exhibition for 1900 will be held at Portman Rooms, Baker Street, London, W., from April 27th to May 5th. We have received from the secretary, Mr. Arthur C. Brookes, 15 Harp Alley, Farringdon Street, E.C., an advance prospectus of a number of scientific and practical addresses that are to be given at intervals, several times daily, during the exhibition.

THE Saturday afternoon excursions of the London Geological Field Class, under the direction of Professor H. G. Seeley, F.R.S., will commence on April 28th. Further particulars can be obtained from the Hon. Sec., R. Herbert Bentley, 43 Gloucester Road, Brownswood Park, London, N. These classes have been successfully conducted for some years past, and afford an excellent opportunity for geological study.

PHYSICS

CONDUCTED BY JAMES QUICK.

A Vacuum Electroscope.—Experiments have recently been made by Pflaum to prove that at the highest vacuum obtainable electrical forces are still exerted. A pear-shaped electroscope was constructed, having two strips of aluminium foil suspended inside and attached to an aluminium plate. The vessel was then exhausted to as high a vacuum as possible, and the movements of the leaves recorded when a charge was given to them. It was found that electrostatic effects took place with great energy, no lag taking place owing to absence of air resistance. Actual discharges apparently cease through the high vacuum, not the slightest luminous effects being observed. The construction of such an electroscope is, however, a difficult matter.

Röntgen Rays and Selenium.—A marked effect is observed if a selenium cell is exposed to the action of an X-ray tube at a short distance. In one particular observation, recently made, when the X-ray tube was at a distance of 5 cm from the cell, the resistance of the latter fell quickly from 40,000 ohms to 34,000 ohms, and kept oscillating about the latter value, owing probably to variations in the intensity of the rays. When these ceased to act, the cell regained its normal conductivity more slowly than it does after the impact of light. The above diminution in the resistance of the cell was the same as would be produced by a gas-jet placed at a distance of 1·5 mètres. The action of the rays diminished with increasing distance, but was still sensible at 17 cm.

Solid Hydrogen.—This formed the subject of a lecture of absorbing interest delivered by Professor Dewar before a crowded and appreciative audience at the Royal Institution on April 6th. No one can speak with so much authority upon this line of investigation as Professor Dewar, as it is to him the honour is due of having reached a much lower temperature than any other investigator. Prefacing his discourse by a few general words, he very clearly led his audience through many details of his brilliant researches of the past few years; illustrating his remarks with several successful experiments. Liquid air and liquid hydrogen were freely used as if they only cost a few shillings a pint to prepare, instead of being the very expensive luxuries that they are really. Professor Dewar showed that whereas it is possible to solidify nitrogen solely by the cold due to evaporation consequent upon reduced pressure, it is impossible to solidify oxygen in this way. The latter gas was solidified, however, during the lecture by surrounding it in a proper manner by liquid hydrogen; the solid mass, as a white opaque powder being thrown out on the lecture table in full view of the audience. Solid hydrogen was afterwards successfully obtained in a somewhat similar manner, this particular experiment eliciting unanimous applause owing to the temperature of the mass being practically the lowest ever attained—namely, 15° upon the absolute scale, or 258° C. below the freezing-point of water. Professor Dewar has been able to reach a slightly lower temperature than this, about 13° above the absolute zero, but, as he pointed out, the difficulties encountered in thus obtaining a temperature of even 1° below the melting-point of hydrogen are enormous. Another experiment performed was one illustrating the work of Professors Dewar and Fleming on the electrical conductivity of metals at extremely low temperatures. A circuit was arranged including an incandescent lamp and a coil of wire. The current was so regulated that it was just sufficient to keep the filament of the lamp at a dull red heat when the coil of wire was at the ordinary temperatures. The coil was then immersed in liquid hydrogen and, therefore, brought to an exceedingly low temperature. This resulted in a reduction of the resistance of the wire, more current consequently flowing through the lamp, which glowed very brilliantly.

An Electrical Micrometer.—At the last meeting of the Physical Society of London, Mr. P. E. Shaw described a very delicate instrument, an electrical micrometer, which he had devised to measure extremely small distances. It consists essentially of a screw with a pitch of 0·5 mm. and having a head divided into 500 parts. This screw presses against the long arm of an aluminium lever, the short arm of which presses against the long arm of another, and so on through three levers. The motion of the spherometer screw can thus be transmitted to a fine platino-iridium point close to a small platino-iridium disc, which, in Mr. Shaw's experiments, was fastened to the centre of a telephone diaphragm, the movements of which Mr. Shaw has been investigating. By careful and accurate reading an observable twist of the spherometer head corresponds to a movement of one millionth of a millimètre of the fine point. Mr. Shaw has found that he cannot hear any sounds from the telephone if the amplitude of vibration of the diaphragm is less than 0·37 millionths of a mm. A motion of 50 millionths gives comfortable sounds, 1,000 millionths uncomfortable sounds, and 5,000 millionths sounds unbearably loud.

Radium Rays.—Much important work upon these mysterious emissions from radium has been done lately by Becquerel and Curie. The latter has apparently proved without doubt that the rays emitted from radium are composed of material particles carrying negative electrical charges. From first thoughts therefore it would appear that the body emitting these rays would suffer a loss in weight, but M. Curie has shown that the charges carried off are so feeble and the mass of matter so small that probably some millions of years would be required to remove one milligram in the case of the most intense radiation that has yet been observed.

Actinium.—Scarcely a week now passes without some work being done in connection with new elements, or with elements possessing emissive properties. Radium and polonium have been recently discovered and investigated, particularly by M. and Mme. Curie, and now a new radio-active element is reported to have been discovered by M. Debierne, who names it Actinium. It has been produced from the residues from pitchblende and is precipitated by the principal agents for titanium. With the rays emitted by actinium it is possible to produce the same phenomena as those of the rays emitted by radium and polonium. Further, in an intense magnetic field, the rays of actinium, or rather a portion of the rays, are deviated and will impress a photographic plate placed below a lead cell containing the substance.

MICROSCOPY

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

Liverpool Microscopical Society.—We have received the thirty-first annual report of the Liverpool Microscopical Society, which is an interesting record of the Society's work during the past year. Seven papers, including the President's Inaugural Address, have been read before the Society, each paper being illustrated with the lantern, and at each meeting various objects were exhibited by the members. Two field meetings were held during the summer, which were well attended. The President's (Mr. W. T. Haydon's) address is printed in the report in full, the subject being "A Fresh-water Chert from Asia Minor, with observations on its formation and structure, together with some account of the Organic Remains found therein." This is an interesting paper, and suggests many equally interesting directions in which to carry out further investigation. The cherts referred to were "Worked Flints" found in a cargo of horse-beans from Smyrna. "Several acknowledged experts" at first pronounced these to be arrow-heads and scrapers, probably of the Neolithic Age; and there are underlying ironies attaching to the subsequent determination that they were really teeth dropped from the old-fashioned threshing-boards still used in Asia Minor to remove the beans from their pods. These cherts were readily traced to their original source, and the paper above alluded to deals with their chemical analysis, and more especially the painstaking microscopical examination by Mr. Haydon and his friends of the abundant vegetable and animal remains found therein. For this, and for the conclusions drawn by the writer as to their process of formation, we must refer our readers to the original paper, the ultimate conclusion being that their origin is mainly diatomaceous.

Baker's New Achromatic Condenser.—Mr. Charles Baker has recently submitted for our examination his new achromatic condenser, which has a N.A. of 1·0, and an aplanatic aperture of about ·9, being in this respect a great advance upon the one hitherto listed and sold by this firm, which had an aplanatic aperture of only ·65. The power is slightly higher than usual, but not enough to make it a high-power condenser, whilst we noticed with approbation its light and compact mounting. The condenser is fitted with the usual iris diaphragm and ring for stops, but a rotating ring within the latter would be a convenience. The price is £3 15s. complete.

Material for Botanical Study.—The obtaining of suitable material for botanical study has been a difficulty that the individual worker has had to contend against equally with those in charge of our laboratories, science schools, and colleges. For some time past zoology has had an advantage over botany in this respect, and we therefore note with great satisfaction a new departure by Messrs. J. Backhouse & Son, Limited, of the well-known nurseries at York. This firm has for three generations been directed by gentlemen of high scientific ability, and during this period they have devoted a large amount of their time to the study of the conditions affecting the naturalisation and distribution of plants, especially those which are not indigenous to Great Britain. As a result they possess in their York nurseries a larger number of species, representing tropical and sub-tropical as well as Arctic floras, than almost any firm in the country. They have now decided to undertake systematically the collecting and preparing of botanical material for scientific purposes, and have opened a scientific department under the special superintendence of Dr. Arthur H. Burtt, D.Sc., B.Sc. They have further issued an extensive classified catalogue which, though only meant as a preliminary list, covers the whole field very completely. It comprises Myxomycetes, Schizophyta, Diatoms, Desmids, and other Algae, both fresh-water and marine, Characeae, Fungi, Lichens, Hepaticae, Musci, Filicinae, Equisitinae, Lycopodinae, Gymnospermae, and most of the more important orders of Angiospermae. The material will be supplied either fresh or preserved; and in the latter form it is intended to keep in stock large quantities of material, so that students will be independent of the season for their supplies. Special attention will be devoted to microscopy, and high-class and guaranteed preparations illustrating the more important structural features of the principal types will be generally available. The scheme will fill a long-felt want, and we trust it will prove as satisfactory to its promoters as it will undoubtedly prove of great service to students and teachers generally.

ANSWERS TO CORRESPONDENTS.

W. L. W. E. (Alresford).—The use of a Camera Lucida will be fully dealt with in our next (June) issue in "Microscopy for Beginners," see *ante*, p. 249.

B. B. (Bath).—Objects, other than crystallisations, for polarised light are generally mounted in Canada Balsam. The mounting of hairs is quite simple, though it is advisable to give them a preparatory soaking in turpentine or benzole beforehand. They make striking objects when crossed or interwoven. Mr. Cole recommends the following procedure in mounting fish-scales:—"Scrape the fish from the head towards the tail; if scraped the other way, nearly all the scales will be injured. Place the scrapings in a bottle of water, shake well, pour off the water, and repeat the process until quite clean. Examine with a microscope; and if you find that the scales are not clean, pour off the water, add liquor potassae, and soak for an hour or two. Then wash away the potash with repeated changes of water, dehydrate in methylated spirit, clear in clove oil, and mount in Canada Balsam. Sometimes fish-scales buckle up in spirit, and they will not lie flat. When this happens, put them into water again, and soak a little while; then place them on a slide, and put another slide over them, press down until quite flat, and tie the two glasses together with twine, and place them in a vessel of methylated spirit to dehydrate under pressure. This method will answer for all tissues that twist during process of dehydration."

H. J. O. W. (Budleigh Salterton).—We have not met with a mixture of stearine and naphthaline for embedding, nor can we find any reference to it in any text-book available, so are not able to give you the relative proportions in which the mixture should be made. We have made inquiry in one or two likely quarters, without result. Can any one of our readers give the necessary information?

MICROSCOPY FOR BEGINNERS.

By F. Shillington Scales, F.R.M.S.

(Continued from page 346.)

Opaque objects are illuminated by several methods. The most frequent way is to focus the light directly upon the object by means of a bull's-eye stand condenser, remembering that the flat of the condenser must be nearest to the object and quite close to it, the focus being short. If a lamp be used, it will be necessary to raise it well above the stage. A better way is by the use of a "side silver reflector," which is a small, silver, parabolic mirror, placed close to the object and reflecting the rays of light thereon from a lamp placed quite near and about level with the stage. Its management is soon learnt. Perhaps the most perfect means of illuminating opaque objects is by the now but little used "Lieberkühn." This is really a speculum fitted above and round the objective, the light being thrown from *beneath* the object and reflected down again upon it. Its disadvantages, and those which have caused it to be largely disused, are that each objective must be fitted with its own Lieberkühn, and that the object must be mounted not upon a black background, but in such a way as to give an annular ring of illumination round it. When we deal with mounting, we will point out that the generally recommended method of mounting opaque objects upon a black background is not only unnecessary, but inconvenient. The writer invariably mounts such objects in an ordinary cell, and puts under them a plain slide upon which a disc of black paper has been fastened. What more is needed?

Before leaving the subject of illumination we will deal with the bull's-eye condenser. In one of our earlier papers (Science-Gossip, Vol. VI., N.S., page 215) we have alluded to the enormous spherical and chromatic aberrations of this lens, and these render it unsuitable for really critical work on account of its bad definition. For this reason we do not advocate its general use, save for opaque illumination. Should it be necessary, however, to fill the field with light by its means (see page 215) we would ask our readers to bear its optical properties in mind and to remember that to obtain parallel light the condenser must be placed close to the flame of the lamp, and with its flat side against the flame. The bull's-eye must, of course, also be placed both centrally and at right-angles with the direction of the light. It is an assistance to beginners if they do their focussing, both with bull's-eye, and even with condenser, upon a sheet of note-paper placed in the requisite position. If the bull's-eye be used, it must be properly and carefully adjusted, or it will only interfere with the proper focussing of the condenser.

To pass now to the focussing of the objective itself. This needs but little explanation, but it may again be advisable to point out (see page 157) that the so-called focal length of the objective does not in any way represent its distance from the cover-glass of the object. In fact, with increase of aperture, the objectives have got closer and closer to the object. When using high powers it is a help, and sometimes a preventive of damage, if the aperture of the stage, as is customary in English stands, is made sufficiently large to admit of the insertion of the finger underneath the slide so as to slightly lift or tilt its fore-edge. A high power can then be safely brought down upon the object, and, the approximate distance being found, the finger can be removed, and the objective then brought gently to its ultimate focus.

We do not think it advisable here to explain the use of the correction-collar or adjustment of tube-length for differences in the thickness of cover-glass. This has been fully dealt with in an earlier paper (Science-Gossip, Vol. VI., N.S., p. 184); but it really requires a trained and critical eye, as well as a critical object, to enable these adjustments to be satisfactorily made. We may, however, remind our readers that the oft-met-with instructions as to varying the magnification by the simple device of altering the tube-length are not really practicable save for very rough-and-ready work, and we recommend our readers to find out at the time of purchasing whether their objectives are corrected for the 6¼-inch or 10-inch tube, and to remember that they perform properly only on the tube for which they are designed. Most students' objectives (for an unsatisfactory reason connected, we believe, with foreign competition) are corrected for the short tube; but makers have a misleading habit of giving in their catalogues complete lists of magnifications calculated as if they were corrected for the English 10-inch tube-length, and vouchsafing no hint as to the real facts.

There are a few more suggestions that may be useful to the beginner. The first is to remember never to use a stronger light than is necessary. Nothing is more fatiguing to the eyes, or more likely to work mischief, than excessive glare; but if reasonable precautions be taken, we do not believe the use of the microscope is injurious to the eyesight. Some people are much troubled with what are called "floating flies" in the eye, but this is to a certain extent a question of ease of position. The second rule is to accustom oneself to keep *both* eyes open. The screwing-up of the eye not in use is a most injurious and unnecessary habit. At first, doubtless, some difficulty will be found, and the eye that is not looking down the tube will be distracted by external influences; but this difficulty is only temporary, and a little perseverance will overcome it. Some writers recommend a shade, but we have advised many beginners to commence simply by holding the hand a short distance from the eye, and to gradually move it further away as they gained experience, until finally it was no longer necessary at all. All workers have a tendency to use one eye more than another; and in this case the eye most used becomes generally rather less sensitive to brightness of image, but more capable of perceiving critical points. But every worker should learn to use either eye with equal facility.

Various tints of blue or yellow glasses, or a disc of ground glass, are useful for moderating the light, and in some cases for accentuating the image.

Remember to use no higher magnification than is absolutely necessary. The real microscopist uses the lowest power that will serve his purpose, for reasons that a very slight acquaintance with the microscope makes abundantly evident, and in all probability the most generally used lens is that of the modest inch.

Remember also that the fine adjustment is a delicate piece of mechanism, and endeavour to save it (and the mechanical stage, if there be one) from the very first. Any one of the microscopes we have described will satisfactorily and easily focus a ⅙ inch by means of the coarse adjustment alone. Do not bear heavily upon any of the adjustments; endeavour to balance them gently between the finger and thumb, that the motion may be uniform; and do not on any account roll the fine adjustment by pressing one finger to one side only of the milled head.

(*To be continued.*)

CONDUCTED BY F. C. DENNETT.

1900. May	Rises. h.m.	Sets. h.m.	Position at Noon. R.A. h.m.	Dec. ° ′
Sun .. 10	4.18 a.m.	7.34 p.m.	3.8	17.35 N.
20	4.4	7.48	3.47	19.57
30	3.52	8.2	4.27	21.45

May	Rises. h.m.	Souths. h.m.	Sets. h.m.	Age at Noon. d. h. m.
Moon 10	3.29 p.m.	9.5 p.m.	2.12 a.m.	11 6 37
20	—	4.44 a.m.	9.42 a.m.	21 6 37
30	5.27 a.m.	1.43 p.m.	9.54 p.m.	1 21 10

	May	Souths. h m.	Semi-Diameter.	Position at Noon. R.A. h.m.	Dec. ° ′
Mercury	10	10.40 a.m.	3.0″	1.52	8.55 N.
	20	11.11 a.m.	2.6″	3.2	16.1
	30	11.58 a.m.	2.5″	4.28	22.24
Venus	10	3.8 p.m.	13.5″	6.19	26.55 N.
	20	3.4 p.m.	15.5″	6.55	26.13
	30	2.53 p.m.	18 0″	7.23	24.52
Mars	20	10.11 a.m.	2.1″	2.2	11.40 N.
Jupiter	20	0.32 a.m.	21.0″	16.21	20.35 S.
Saturn	20	2.28 a.m.	8.3″	18.17	22.22 S.
Uranus	20	0.48 a.m.	1.8″	16.38	22.3 S.
Neptune	20	1.50 p.m.	1.2″	5.41	22.11 N.

MOON'S PHASES.

		h.m.			h.m.
1st Qr.	May 6	1.39 p.m.	*Full*	May 14	3.37 p.m.
3rd Qr.	,, 21	8.31 p.m.	*New*	,, 28	2.50 p.m.

In apogee May 9th at 2 a.m.; and in perigee on 24th at 6 p.m.

METEORS.

				h.m.	
Apr. 29 May 6	η Aquarids*	Radiant	R.A.	22.28	Dec. 2° S.
May 3-9	α Serpentids	,,	,,	15.36	,, 10° N.
,, 5-June 17	α Scorpiids	,,	,,	16.56	,, 21° S.
,, 15	η Aquilids	,,	,,	19.36	,, 0°
,, 29-June 4	η Pegasids	,,	,,	22.12	,, 27° N.

* To be looked for just before sunrise.

CONJUNCTIONS OF PLANETS WITH THE MOON.

				° ′
May 2	Venus*	5 p.m.	planet	4.55 N.
,, 15	Jupiter†	7 p.m.	,,	1.13 N.
,, 17	Saturn†	7 p.m.	,,	1.4 S.
,, 26	Mars*	2 p.m.	,,	3.41 S.
,, 28	Mercury*	11 a.m	,,	0.20 S.
,, 31	Venus	10 p.m.	,,	6.5 N.

* Daylight. † Below English horizon.

OCCULTATIONS AND NEAR APPROACHES.

May	Star.	Magnitude.	Disappears. h.m.	Angle from Vertex. °	Reappears. h.m.	Angle from Vertex. °
1	ι Tauri	4.7	8.58 p.m.	71	9.48 p.m.	224
5	A¹ Cancri	5.6	11.48 p.m.	84	0.42 a.m.	240
6	ω Leonis	5.6	11.1 p.m.	40	11.51 p.m.	290

THE SUN should be watched, as spots are appearing at more frequent intervals.

MERCURY is a morning star until 30th, when it comes into superior conjunction at 7 a.m., but too near the sun, however, to be observed except in daytime.

VENUS is a splendid evening star all the month, nearing its greatest brilliancy, situated in Gemini.

MARS is in conjunction with Mercury at 4 a.m. on May 4th, 2° 10′ north of that planet. It is a morning star, but too near the sun for observation.

JUPITER is in opposition with the sun at 7 p.m. on May 27th, and therefore in the most favourable position for observation. Its great south declination is, however, much against good observation. It is situated in Scorpio, nearly 6° north of Antares.

SATURN comes to the meridian about two hours later than Jupiter, but is even more unfavourably placed for observation.

URANUS is a degree and a half farther south than Jupiter, and comes to the meridian about 17 minutes later.

NEPTUNE is too near the sun for successful observation.

ECLIPSE OF THE SUN, MAY 28TH.—The path of total shadow crosses Mexico, the United States (Mississippi, Alabama, Georgia, South and North Carolina), the North Atlantic Ocean, Portugal and Spain, from Ovar to Cape Santa Pola, Algeria, Tunis and, at the time of sunset, Egypt. In England it will be visible as a partial eclipse, beginning 146° west of the Vertex at 2.47 p.m. as seen from Greenwich. The greatest phase will be at 3.54·9, at which time 0·681 of the sun's diameter (= 1·0) will be obscured. The Eclipse ends 69° east of the Vertex at 4.57·5 p.m. At all places north of Greenwich the magnitude of the eclipse, and also its duration, will be reduced.

ROTATION PERIOD OF VENUS.—We are glad to hear that Dr. Belopolsky, of Moscow, is announced to have confirmed the short rotation period of this planet by means of four spectrograms.

A NEW MINOR PLANET was observed on February 22nd by M. Charlois, of the Nice Observatory.

BRILLIANT METEOR.—On Sunday evening, April 1, Mr. W. J. Reynolds, observing from Woodford, in Essex, saw a most brilliant meteor, many times brighter than Venus, travel from close by that planet to within 2° of the moon's terminator, brightening just before its disappearance. It was at 7h. 10m. 15s. p.m., and therefore very nearly daylight. It was so intensely white as to make the moon look dull-orange in comparison.

THE COMING SOLAR ECLIPSE.—At the meeting of the British Astronomical Association, on March 28, Mr. E. W. Maunder suggested that at the time of greatest obscuration attempts should be made here in England to photograph the corona. This would need a photographic telescope on an equatorial stand with a rigidly fixed guiding telescope. At the same time it would be advisable to just stop out the image of the sun by the help of a small diaphragm.

M. EMMANUEL LIAIS has passed away. He was born at Cherbourg in 1826. After being a pupil of MM. Arago and Leverrier he held a post at the Paris Observatory. In 1858 he went to South America to observe the solar eclipse. His remarkable drawing showed many of the details now revealed more perfectly by photography. He became Director of the Observatory at Rio de Janeiro. He discovered Comet I., 1860. In 1859 M. Lescarbault, a physician of Orgères, in France, announced the observation of the transit of an intra-Mercurial planet; but M. Liais was fortunately observing the sun with a better instrument at the same time, and was able to show that, whatever the object was, it was certainly not the planet in question. He returned to France in 1881, and at the time of his death he was Mayor of Cherbourg.

CHAPTERS FOR YOUNG ASTRONOMERS.

By Frank C. Dennett.

(*Continued from page 317.*)

VENUS.

This beautiful planet, whose brilliance sometimes adds such splendour to the sky as even to startle those who have not studied astronomy, is the earth's truest companion so far as size is considered. Venus has a diameter of some 7,480 miles, and its volume is therefore, in comparison to that of the earth, as eighty-four is to one hundred. Its density is slightly less than the earth's, so that compared with our planet, if one hundred be used to signify the mass of the latter, seventy-eight will give that of the former. Its apparent diameter varies greatly, more so than that of any other planet except Mars. When it is in superior conjunction with the sun, and shining as a little full moon, it appears to be only 9·5" in diameter; whilst at the time of inferior conjunction, as at the time of transit, it increases to 62", the difference being indicated by the accompanying diagram.

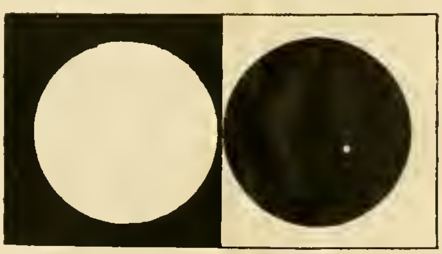
Venus at Greatest and Least Diameters.

Like Mercury, Venus is never seen on the meridian at night. When farthest from the sun its greatest elongation can never exceed 47° 12′, at which time it presents very much the appearance of a little half-moon, the phase being readily visible with very slight telescopic power. It does not reach its greatest brilliance as an evening star until more than a month later, when, although its diameter has increased, the form is that of a decided crescent. At such times, when distant some 40° only from the sun, its brilliance is such that on a clear day it may be readily seen with the naked eye, whilst at night it throws a perceptible shadow. A singular phenomenon has been observed by many with respect to the phases: a difference of some few days occurring between the calculated and the observed time of quadrature. Schroeter found this difference to amount to as much as eight days, whilst De Vico found it at least three days, and quite small instruments will show the discrepancy. Another phenomenon sometimes noticed when Venus is near inferior conjunction is that the horns appear to be too long, an effect of refraction, probably due to the atmosphere of the planet.

The early observers with the ancient non-achromatic refractors detected irregularities of the terminator or boundary between sunshine and darkness. These gave the impression that the surface was mountainous. More recent observations with modern instruments confirm this. At the end of last century Schroeter carefully watched these irregularities, and from changes occurring in them came to the conclusion that the planet revolved on its axis in 23 h. 21 m. 8 s. One feature that particularly struck this observer was the frequent blunting-off of the southern horn, whilst at times a small point appeared detached with an apparent interval. Sometimes the northern horn appeared blunted, but more frequently it was seen too pointed. These observations have been confirmed by many observers since, using instruments of the finest definition.

The intense brilliance of Venus makes it difficult to observe well, seeing that it not only dazzles the observer, but finds out all the defects of the telescope. If possible, observations in daylight and near the meridian are the best, the planet then being less affected by the tremulous condition of our atmosphere, whilst the brightness of the sky lessens the dazzling brightness of Venus. Thus observed, the planet may be followed very near to the sun; Dawes thought to within 1° of his limb. When a very narrow crescent it has been seen interrupted at three points. Schroeter considered it would necessitate mountains twenty-seven or twenty-eight miles in height to produce the effects he observed.

When viewed as a very narrow crescent a singular phenomenon is sometimes seen: the entire planet becomes visible. As I write I have lying before me the names of at least twenty-four observers who have thus observed it during the past 170 years. Some have considered that the dark side of the planet shone out with a pale ashen light, which made it just brighter than the sky. Some few have fancied that the planet was really dark, but seen projected upon the bright background of the solar corona. Refraction by the atmosphere of Venus may contribute somewhat in the matter. That the appearance is real there seems to be no doubt, both from the trustworthiness of many of the observers, and the precautions taken by some of them. The dark side was indeed visible when the bright crescent was hidden behind a bar in the field of view. One point agreed upon by many observers is that the unilluminated portion of the limb is apparently a portion of a smaller circle than is indicated by the bright crescent, an effect doubtless due to irradiation. An illustration of this seeming enlargement occurs in the well-known puzzle, "Which is the larger?"



Which is the Larger?

(*To be continued.*)

GEOLOGY

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

PHOSPHATIC DEPOSITS.—At the annual meeting of the Geologists' Association on February 2nd, after the report and accounts had been disposed of, the President, Mr. J. J. H. Teal, M.A., F.R.S., delivered his address, taking as his subject "The Natural History of Phosphatic Deposits." In view of the phosphatic floors which have been found from time to time in the chalk, the address, when printed, will prove of great interest to students of that formation.

MUSEUM AT CROYDON.—By the energy of the local Natural History Society, the nucleus of a museum has been formed and arranged in the Town Hall. Mr. N. F. Robarts, F.G.S., is acting as curator. For the present the exhibits are almost entirely geological. A fine specimen of *Inoceramus cuvieri* is shown from the chalk, also a large flint with seven specimens of *Echinoconus conicus* imbedded therein.

THE ERUPTION OF KRAKATOA.—The tremendous eruption of the volcano of Krakatoa in 1883 will be fresh in the minds of many people, owing to the extraordinary and grandly luminous sunsets which were caused in our islands by the immense quantity of material which was shot up into the air. The finer particles were found to have made more than one complete circuit of the globe. We are indebted for very detailed accounts of the eruption to the work of the Krakatoa Committee of the Royal Society, which made its report in 1888. The group of islands of which Krakatoa was the chief lie between Java and Sumatra, and have long been recognised as of volcanic origin, being probably the remains of an immense cone that had at a very remote epoch been shattered by a similar yet grander catastrophe. An eruption had been recorded in 1680; but between that date and 1880, when earthquake movements set in, there had been apparently a period of rest. The eruption itself commenced in May 1883, and continued almost without interruption until August 26th. The island was then lost under a cloud of black vapour, which it was estimated rose to a height of seventeen miles. Loud explosions were heard, and these gradually increased in intensity and violence, until early on the following day one of fearful intensity rent earth and air. This was followed by three others in the space of about three and a half hours. In two days more the eruption was almost at an end. During the period of greatest eruption a huge dust-cloud travelled in about two hours to Batavia, a hundred miles away, and for some hours the town was in complete darkness. There was scarcely a place on the globe which did not see the effects of the dust-clouds. The materials are estimated to have been shot up to a height of no less than twenty-five miles above the mouth of the crater, into an area of the atmosphere the rarefaction of which makes this great height the more remarkable. The after-glows seen in our islands in November and December 1883, that created such interest by reason of their beautiful tints, were caused by the minute powdery dust which was still floating in the atmosphere. The question of greatest interest to geologists is that relating to the after-results of the eruption on the island itself. Independently of its effects on the smaller islands Krakatoa, an island of more than five miles in length, lost in these terrible explosions about two-thirds of itself. Where formerly was land, a depth of 960 feet of sea has been fathomed. Some of the ejected material had gone to form an extended coast-line elsewhere, whilst great banks of ejected pumice covered the sea for miles. Where all the lost material, the relics of the land, had gone, even now has not been satisfactorily determined.—*E. A. Martin.*

THE PREHISTORIC RHINE.—At the Victoria Institute in London, on April 2, a paper by Mr. W. P. Jervis, F.G.S., was read by Prof. Logan Lobley on "Thalassographical and Thalassological Notes on the North Sea." We print the title in full, but there seems no real necessity for the introduction of these barbarous terms into our language. A large amount of useful detail is given, which has been obtained from various soundings in and about the Norwegian Fjords and on the Baltic coast; but the theoretical portion of the paper, which deals with the "Palaeo-Rhine," appears to be altogether lacking in proof. After incorrectly quoting from Mr. Harmer's paper, in which Mr. Harmer deals with the former probable course of the Rhine through the unsubmerged North Sea area, he suggests that it is possible that its course extended northward by what is known as the "Silver Pit." The theory is interesting, and we quote his remarks:—"Fifteen miles out to sea, off the coast near Grimsby, lies the Silver Pit, well known to fishermen. This remarkable physical feature is a distinctly marked, tortuous, submerged river valley, 23 miles long by 2 miles broad, running towards the north. For the first 15 miles the depth of the mid-channel rapidly increases from 40 to 45 and 50 fathoms consecutively, bounded by lateral declivities 40 fathoms in height; in other words, by respectable elevations of 240 feet. Farther on the depth gradually diminishes to 35 fathoms, and finally is only 23 fathoms, beyond which we cannot now follow the valley, which has been quite filled in with sediment. Cromer (Mundesley) is 33 miles distant to the south-east from the head of the Silver Pit, which we consider to have undoubtedly formed part of the course of the Palaeo-Rhine. There is nothing to surprise us if all evidence of the line the river followed should have been obliterated (as between Holland and Walton), except in this one isolated place, seeing that it ran principally through Tertiary strata with low banks. Possibly the Silver Pit, on the other hand, marks its passage through chalk rocks. What with the strong littoral currents and the detritus caused by the very considerable encroachment of the sea on the east coast of Lincolnshire and Norfolk, the wonder is that any trace of the original valley should have come down to our times. If this theory is accepted, we have been enabled to trace the course of the Palaeo-Rhine for 60 miles farther than Mr. Harmer." Mr. Jervis is ingenious in his suggestion, but we are unable to see in it more than a suggestion, as proof must of course be lacking. The same may be said of his theory of the extension of the same river to (1) what is now a hundred-fathom sounding in lat. 58° 45′ N., long. 0° 22′ W.; and (2) to the channel which now exists between the Orkney and Shetland Islands. An interesting discussion followed the paper, which was remarkable for the statements which were given utterance to by Professor Hull.

Notes & Queries

Arrival of Swallows. The first swallow I have observed this season was on Easter Monday, April 10th. This was in a Chine to the west of Bournemouth, where it was hawking in the shelter of pines that fringed the windward side of the narrow valley.—*James Saunders, A.L.S., Luton.*

The Stevens Collection of Lepidoptera. By the dispersal, at the well-known auction rooms in King Street, Covent Garden, on March 27 and 28, of the first and principal portion of the collection of British Lepidoptera formed by the late Mr. Samuel Stevens, a collection of some historical importance has ceased to exist. Mr. Stevens was one of the fast disappearing band of lepidopterists whose experiences dated back to those times when the "great copper" butterfly was still occurring in the East Anglian Fens, and could be purchased for one shilling and its larvae for sixpence each: at that time *Laelia coenosa* Hb. and *Noctua subrosea* St. were common if local. Then, too, the gipsy moth (*Ocneria dispar*, H-S.) was truly British, and to be found in full proportions in every collection. At that period the metropolitan collectors worked in Hammersmith marshes and other fine localities close to London that long since became the prey of the speculative builder. Neither had the seaside hunting grounds been invaded by cheap trippers, golfers, and campers-out. Many were the quaint stories of expeditions of those days, told by Samuel Stevens: how he and Edward Newman collected in the flower-strewn and willow-bordered meadows of Deptford. No wonder then that the Stevens collection contained many fine varieties as well as rare species. During his long life's interest in butterflies and moths, Samuel Stevens regularly attended the sales at the auction rooms with which he was at one time associated, as mentioned in our obituary notice (*ante*, p. 161), so that he had many opportunities of obtaining rare or historic specimens at prices far lower than now obtain. Among these were some from Haworth's and other old masters' cabinets. Latterly, however, some specimens were purchased with less of that sound judgment than formerly, which was unfortunate, as doubtful authenticity is a great detriment to any collection. The butterflies in the Stevens cabinets comprised 117 lots for auction, and produced a total of £271. The principal prices were a *Pieris daplidice* taken by himself at Dover in 1872, £1. A specimen of *Colias edusa*, exhibiting left side male and right side female, £3 10s. A fine rayed and suffused variety of *Argynnis paphia*, £3, and two other aberrations of the same species, £4 10s. and £2 10s. respectively. *A. aglia* var. *charlotta*, £5 5s. A silvery variety of *A. adippe*, £6 16s. 6d., and other varieties of this fritillary reached £3 10s., £3 5s., and £3. A particularly fine form of *A. euphrosyne*, £6, and others from the some series, £4 10s., £2 5s. Haworth's var. *eos* of *Meletaea athalia* produced £6 10s., though Haworth's var. *dictynna* of that species only reached £2. A specimen of peacock butterfly with "blind eyes," £5, and a remarkable variety of the Admiral butterfly (*Vanessa atalanta*), £5 10s. Two aberrations of the painted-lady butterfly (*V. cardui*), £6 10s. and £8. Light forms of *Melanargia galatea* and *Epinephele tithonus* £7, £5 and £5 10s. per specimen. The fourteen "large coppers" (*Polyommatus dispar*) averaged nearly £5 5s. each, the highest price being £8 for one specimen; this being with one exception the highest price ever reached for one of these now extinct butterflies. A golden var. of the small copper was sold for £5, and a silver form £4. There was small demand for Sphingidae and low prices, neither did the Bombyces reach their value. The Noctuae made bad prices excepting *Noctua subrosea*, at about £3 10s. each. The two days' sale of all the macro-lepidoptera realised £625, by no means the highest price reached for a collection of this section of lepidoptera, especially considering some specimens had historic value.

Prestwich Collection of Flint Implements. This collection is now available for inspection by the general public who visit our noble geological collection at the Natural History Museum at Kensington. The exhibits embrace the implements collected by Sir Joseph Prestwich in the Somme Valley in 1859, when the discoveries by M. Boucher de Perthes of the occurrence of flint implements with the remains of extinct mammalia were, after ten years, beginning to attract scientific attention. The present writer has two photographs, authenticated with the autograph Joseph Prestwich, of the first implement seen by him *in situ*, in undisturbed river gravel near Amiens. He used to tell of the difficulty, in those days of wet-plate photography, of getting a photographer to undertake the work at a reasonable rate. But he succeeded in that, as in everything else to which he put his energetic hand. There are also his implements from Norfolk, Suffolk, and Kent, collected about the same time as those of the Somme Valley. In these matters Prestwich was no armchair geologist (*vide* "Life and Letters of Sir Joseph Prestwich," pp. 160, 162, 165, etc.), but visited for critical examination the sections where flint implements occurred. The fine type collection of Eolithic implements contributed by Mr. B. Harrison and others, illustrating Dr. Prestwich's paper on "Some Controverted Questions," are in a long case in the same room near at hand. As Lady Prestwich says, in the "Life" (p. 356), "To the last Prestwich persistently maintained his belief in the rude plateau implements as being the handiwork of man, and not mere natural flints." Dr. Prestwich, when speaking to the present writer on the long and bitter opposition which greeted the palaeolithic tools from the Somme Valley and elsewhere, and the long years it took to establish their position as human handiwork, often said that he was not surprised at the same treatment being meted out to the eolithic specimens of the chalk plateau of Kent and other localities; and he was just as certain of the acceptance of the latter as man's handiwork as he had been of the former in 1859. There, at all events, his specimens stand, worthily housed in our great national collection, the only regret that must be felt by all her friends being that his indefatigable helper, Lady Prestwich, did not live to see her wish fulfilled. Suitably, too, the South African eoliths described at the Anthropological Institute in April 1898, by Professor Rupert Jones, F.R.S., are added to the Prestwich Collection, a juxtaposition which will be useful to serious students of prae-Glacial man.—(*Rev.*) *R. Ashington Bullen, F.L.S., F.G.S., March* 1900.

CORRESPONDENCE.

We have pleasure in inviting any readers who desire to raise discussions on scientific subjects, to address their letters to the Editor, at 110 Strand, London, W.C. Our only restriction will be, in case the correspondence exceeds the bounds of courtesy; which we trust is a matter of great improbability. These letters may be anonymous. In that case they must be accompanied by the full name and address of the writer, not for publication, but as an earnest of good faith. The Editor does not hold himself responsible for the opinions of the correspondents.—*Ed. S.-G.*

HEREDITY EFFECTS OF OCCUPATIONS.

To the Editor of Science-Gossip.

Sir,—If acquired properties are transmissible to offspring, must not the existence of hereditary trades or occupations involve a vast field for the operation of this kind of heredity? Should not the effect on individuals after many generations be cumulative? Have, however, the castes of India—in Ceylon every trade has its caste or the habits, diets, or occupations peculiar to each, produced any effects that might be expected from this point of view? Might not habits or surroundings in operation during the whole or the greater part of their lives be expected to extend their effects to the germ-cell potentialities, even where sudden mutilations have apparently failed to do so? This point has, if I mistake not, been neglected; but I should be obliged for references thereto. C. G. S. Menteath.

Upper Bedford Place, W.C.

LECTURERS' DIAGRAMS.

To the Editor of Science-Gossip.

Sir,—During the last decade the method of illustrating lectures has been entirely revolutionised. Lantern slides have taken the place of drawn and coloured diagrams, and in many respects the new method is a great improvement. A larger variety of subjects can be shown within the limited time, and generally with greater accuracy of detail. A box of slides is more easily carried about than a big roll of thick paper, and in many lecture-rooms there is much difficulty in hanging diagrams so that they can be well seen. Nevertheless the old method had some advantages. The lecturer did not have to speak in the dark, and in the matter of colour the diagram can often beat the slide. The change, however, has probably come to stay, and a question arises as to what is to become of the vast collection of diagrams which must be cumbering the cupboards of perhaps hundreds of lecturers throughout the country. Is there any prospect for them beyond the bonfire? Consider what vast labour has been bestowed upon them, and how beautiful are many of them. I have seen some used for hanging on the bare walls of corridors at soirées and exhibitions. Could they be utilised in decorating Board School rooms? Anyone who will suggest a useful career for these superannuated servants will deserve the thanks of the community.

It might help towards a practical result if we could get together some statistics as to the diagrams now lying idle—viz. the subjects illustrated, the number and size of the sheets, and whether or not coloured. If anyone feels sufficient interest in the subject to send me particulars of his possessions in this line, I shall have pleasure in collating them and sending the result to Science-Gossip. F. T. Mott.

Crescent House, Leicester,
January 29th, 1900.

NOTICES OF SOCIETIES.

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

North London Natural History Society.
May 3.—† Research Work in Local Societies. R. W. Roberts.
,, 17.—† More Swiss Notes. C. B. Smith.
,, 19.—* Epping Forest. James A. Simes.

South London Entomological and Natural History Society.
May 10.—† § "Orchids."
,, 24.—† § Another Life History. F. Enock, F.L.S.

Lambeth Field Club and Scientific Society.
May 7.—† Growth of Plants. E. J. Davies.
,, 19. * Kingsbury. E. Step, F.L.S.

Nottingham Natural Science Club.
May 5.—* Trent and Leen Valleys. J. Shipman, F.G.S.
,, 19.—* Gedling Wood and Burton Joyce. W. Stafford.

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.—The volumes of Science Gossip begin with the June numbers, but Subscriptions may commence with any number, at the rate of 6s. 6d. for twelve months (including postage), and should be remitted to the Office, 110 Strand, London, W.C.

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

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.

ANSWERS TO CORRESPONDENTS.

F. B. (York).—The best way to soften wood preparatory to section-cutting is to soak it in water for two or three days, or to boil it for some hours. A more drastic means would be boiling in a two per cent. solution of caustic soda; but this would require watching. The section-knife should be of the finest steel, and have a strong but fine edge. An ordinary section-knife is not strong enough, and a plane-iron knife is better. Hard paraffin should be used for embedding. See a note on "Preparing and Mounting Wood Sections" on page 215 of the present volume of Science-Gossip.

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.

Wanted.—"Ginger Beer" Plant. Offered, rare named algae, or will make best other return possible—Miss Stanley, Dalhousie, Heathfield, Sussex.

Wanted Eggs.—Whinchat, wheatear, wood-warbler, kestrel, pipit, swift, stonechat, chiffchaff, woodpecker, hawfinch, goldfinch, cuckoo, dunlin, &c. Offered, choice American birds' eggs and skins, &c. Lists exchanged.—Charles Jefferys, Tethury, Gloucestershire.

Lantern Slides of Geological subjects and Glaciers, wanted in exchange for others.—Samuel Wells, Richmond, Yorkshire.

Offered.—"The Naturalist," 1891 to 1896, inclusive (complete). Wanted. "Geological Magazine," 1894 and 1895, or before 1893.—T. Sheppard, 78 Sherburn Street, Hull.

Microscope Slides of Diatoms, Botanical, and various; also recent books on Chemistry, Machine Drawing. Exchange for "Strasburger's Practical Botany," books on Microscope, or Beale's Neutral Tint Reflector, other slides or material.—John J. Ward, Lincoln Street, Coventry.

Wanted, eggs in clutches (side blown, with data) of birds of prey, including sparrowhawk and other British, also foreign. Offered, clutches of eggs, British and foreign birds' skins, books, &c.—H. K. Swann, 42 Dalmeny Road, Tufnell Park, London, N.

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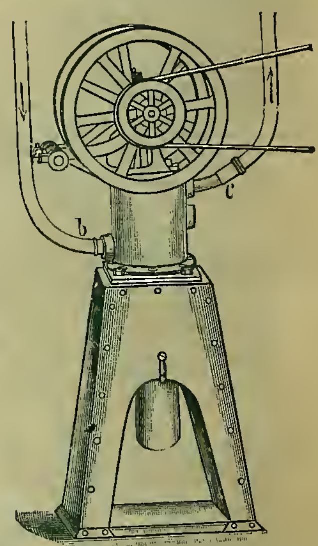

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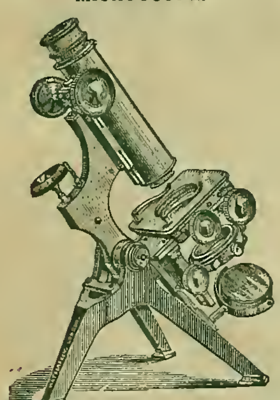

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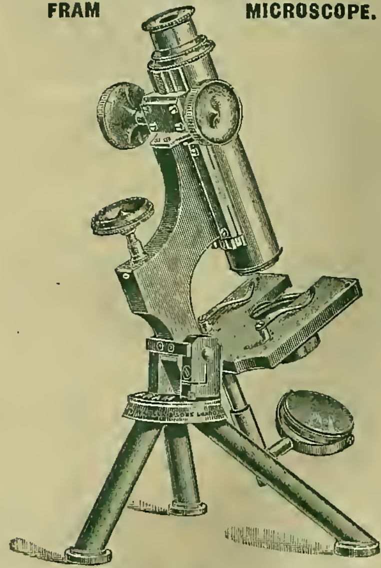

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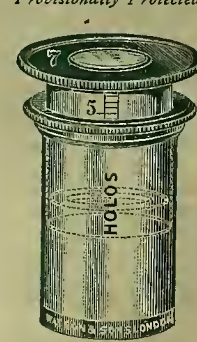

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